Title
An Evaluation Study of a Low-Cost, Telephone-Based Traveler Information System

Authors
Kitamura, Ryuichi
Laidet, Laura
Mar, Fransisca

Publication Date
1995-09-01

An Evaluation Study of A Low-Cost, Telephone-Based Traveler Information System

Ryuichi Kitamura
Laura Laidet
and
Fransisca Mar

Institute of Transportation Studies
University of California, Davis
Davis, California 95616

Table of Contents

List of Tables iii

Preface iv

Abstract v

Executive Summary vii

1. Background and Literature Reviw 1

2. Study Objectives and Research Apporach 10

3. Sampling Procedures 14

4. Survey Procedures 18

5. Analysis of Survey Results 25

6. Conclusions 47

7. References 51

Appendix A -- Questionnaires 53

Appendix B -- Phase I, Question 10 59

Appendix C -- Phase III, Question 7 63

Appendix D -- Phase III, Question 8 65

Appendix E -- Respondents by Area Code 67

LIST OF TABLES

Table 4.1 - Survey Dates and Number of Responses 21

Table 4.2 - Call-back Results (Main Survey) 23

Table 5.1 - Importance of Information System Attributes 28

Table 5.2 - Importance of Traffic Information 33

Table 5.3 - Distribution of Comments, Travel Modes 34

Table 5.4 - Distribution of One-Way Distance to Work 36

Table 5.5 - Distribution of Commute Travel, Modes by Distance to Work 36

Table 5.6 - Use of the Fastline Traffic Information System by Survey Respondents 38

Table 5.7 - Frequency of Fastline Use by Survey Respondents 39

Table 5.8 - Distribution of Trip Types for Which Respondents Used Fastline . . 39

Table 5.9 - Service Attributes that Respondents Liked 41

Table 5.10 - Service Attributes that Respondents Disliked 42

Table 5.11 - Responses to Questions or System Attributes 43

Table 5.12 - Most Important Information Offered by Fastline 43

Table 5.13 - Other Information Which Would Have Been Useful 44

Table 5.14 - Use of Fastline in Travel Decisions 45

Table 5.15 - Use of Fastline by Commute Distance 46

Preface

This work was performed as part of the California Partners for Advanced Transit and Highways (PATH) program of the University of California, in cooperation with the State of California Business, Transportation, and Housing Agency, Department of Transportation; and the United States Department of Transportation Federal Highway Administration.

ABSTRACT

The purpose of this study is to assess the advantages and limitations of a low-cost, telephone-based traveler information system through the analysis of Fastline, a free, dial-in, traffic information service. Fastline is particularly well suited to this study because, unlike many other Advanced Traveler Information Systems (ATIS), it is already in use in the San Francisco Bay Area. Fastline is easily accessible and requires neither infrastructure development nor technology development; rather, it uses existing infrastructure and technology. This evaluation of the Fastline system is based upon user perceptions of the system's capacity to provide them with the information they need, desire, and will use to help pre-plan trips and encourage changes in trip-making behavior. Changes in trip characteristics, such as route choice, trip start-time, and perhaps, mode choice, may occur based upon the information provided by the system. The key to the study is an assessment of the degree to which users avail themselves of information to consider alternate route and/or mode choice, and to what degree the alternatives considered effect trip-making behavior. A review of other ATIS projects indicates that there are varying levels of technological complexity and system accuracy leading to use or non-use of such systems. This research is designed to assess system user's expectations and experience, as well as the resulting changes, if any, in their trip-making behavior. Thus, the intent of this study is to determine 1) information user's consider important; 2) system use patterns; 3) user's evaluation of the

information service attributes such as accuracy, timeliness, and ease of use; and 4) alteration of trip-making behavior due to system information. If a telephone-based form of Advanced Traveler Information System can produce desired results, it can be implemented in other urban areas as a low-cost means of helping to reduce traffic congestion, reduce automobile emissions, and potentially increase transit use.

EXECUTIVE SUMMARY

An existing telephone-based traffic information system was evaluated in this study by asking randomly chosen residents in the study area to use and assess the system with respect to its ease of use, usefulness of the information it offers, desirable and non-desirable aspects, and areas for possible improvement. Those who participated in the study offered varying degrees of opinions, many of which are positive. However, most telling is the result that many respondents did not use the system at all, despite the $20.00 honorarium offered to them. Only a small fraction of participants used the system on a recurrent basis. Based on these observations, the overall assessment of the system is that it is not effective, most likely because most of the information it offers is available from radio and other sources. It is therefore recommended that future systems be developed to offer specific information unavailable elsewhere, i.e., information for the individual traveler's origin-destination pair.

Of those participants able to be contacted for the post-use telephone survey, ten had used Fastline three or fewer times during a two week period of time. Respondents were not asked why they did not use the system. However, the low response rate may be attributed to several pre-existing factors. While many people agreed to use the system, they may have found their trip preparation time to be hectic, and they may not have had additional pre-trip time to make the telephone call. Lack of pre-trip planning time may be because of a set

departure time, or a set arrival time at their destination, or both. If the telephone call to Fastline is not part of their regular routine, a participant may forget to make the call or may not allot time for the call in their regular routines. There may also be the perception that the telephone call itself takes too long when participants listen to advertisements rather than information pertinent to their trip. They may also find that using the service saves no time. This result conflicts with the expectation that using Fastline will save and individual's travel time by allowing him or her to avoid traffic congestion, road work, or accident locations. If the normal commute trip is uncongested, or the information is inaccurate, then time savings may not be realized by the system user.

Participants may have been reluctant to use the system on a recurrent basis for several other reasons, including: a) inability to access the information menu until sponsor's messages were completed; b) using a menu access system; c) getting a "canned" voice rather than a person; and d) expecting to receive information which is unavailable.

1. Background and Literature Review

In California, as in many other areas, roadway congestion is increasing and transportation system efficiency decreasing. In the past, in order to accommodate the increased demand upon the transportation system caused by increased population and travel, new highways were built. In addition to traffic congestion, air pollution due to automobile exhaust increased as automobile ownership, and vehicle miles traveled, increased. Today, we can no longer afford transportation infrastructure construction and maintenance costs. As a result of inadequate transportation infrastructure funding, and increased demands on the transportation system, many forms of traffic control methods, including Advanced Traveler Information Systems (ATIS), are being evaluated for their potential to reduce traffic congestion and improve transportation system efficiency, preferably without developing new highway infrastructure. ATIS are a subset of Intelligent Vehicle Highway Systems (IVHS) technologies which provide travelers with up-to-date information thereby allowing them to arrive at their destinations in the least amount of time and with the least hassle (Willis, 1990).

Travelers receive information which will influence their travel decisions, including choice of departure times, modes of travel, and routes. Some information systems are in experimental stages of use. Trip-making decisions, such as mode choice, trip departure time, and route choice, may be made based upon information about the transportation system available to each individual traveler. Currently, however, information available to travelers to make these decisions is often incomplete,

unavailable, inconvenient and/or inaccurate (Euler, 1990). Providing accurate information to drivers is therefore important for traffic management systems because traffic conditions can be improved and system utilization made more efficient when travelers can make intelligent decisions about departure time, route choice and mode choice. Accordingly, a thorough understanding of driver behavior in the presence of information is needed (Willis, 1990). Providing travelers with roadway information permits them to make pre-trip decisions to avoid the most congested areas whenever possible, thereby improving system efficiency. When a driver has sufficient information about the road network and current traffic, informed route choice decisions can be made to reduce travel time (Honey, 1986) by avoiding congestion.

Travelers may alleviate some problems by using information systems. A common problem for motorists is route-planning while driving (Koh and Lew, 1989). Also, congestion on the road provides problems for motorists both in time delay and mental frustration (stress). An advanced traveler information system could provide drivers with information on location and degree of congestion, alternative routes, navigation, and roadway conditions, as well as data about local attractions, hotels and restaurants (Rose 1993; Euler 1990). With up-to-date traffic information, drivers can avoid congested areas. Ideally, information would be available for travelers both before they begin a trip and, as needed, during their trip (Willis, 1990).

Traveler information for pre-trip planning and enroute-trip planning can be provided in many ways, and with varying levels of technical complexity (CAPTS, 1993). Levels of complexity range from radio broadcasts to dynamic information systems. Pre-trip planning technologies include radio and TV broadcasts, as well as telephone-based information systems. Enroute travel decisions may be made based upon radio broadcasts, road-side signs, or telephone-based information systems when a cellular phone is available.

The preceeding information systems represent currently available technology; they are easily accessible by the majority of travelers. They require no infrastructure development by either public agencies or private enterprise. Furthermore, it is unnecessary for users to purchase specialized equipment in order to access information, as required with more complex information systems.

Less-Complex Technology: For travelers, dynamic information is currently available enroute via radio broadcasting technologies, cellular phones, and variable message roadside signs. But to be of the most use, this information should be current, detailed and combined with information about alternative routes (Willis, 1990). A radio broadcasting technology nearly everyone is familiar with is a traffic report provided during the morning and evening commute hours as well as during other periods of traffic congestion such as during holidays. Radio stations commonly provide traffic information using less than one minute to describe the traffic conditions for an entire

metropolitan area (Ben-Akiva et al., 1992) -- a practice presumably based on marketing decisions. Advanced traveler information systems allow the driver to obtain more detailed information and guidance on a specific trip at home or on local streets (Prendergast, 1993). The effectiveness of any system depends on factors, such as the distribution of information, retrieval of information from the system, and the perceived reliability of the system (CAPTS, 1993). Information can also be provided via radio broadcasts and electronic roadside displays. Less complex forms of information distribution are easier to implement than more complex systems; however, the information they provide is neither driver-exact nor route-specific.

Very few surveys address the behavior and decision-making processes related to the route and departure time choices of drivers. Khattak (1991) evaluated the effect of radio traffic reports on commuters' route and departure time decisions. He solicited suggested improvements to the traffic information system. Radio traffic reports are widely available and many commuters use them. Radio traffic reports are generally perceived as being accurate. If this same perception can be developed for ATIS, then the potential for influencing drivers' diversion decisions is increased. Drivers were willing to divert their routes in response to incident-related congestion, a willingness which implies that ATIS should improve the capability to detect incidents and disseminate incident-related information in a timely manner. Also, drivers who normally experienced longer travel times were more willing to divert. This finding suggests the possibility of tailoring information to specific types of drivers who are

more willing to respond. [...provide information formatted specifically for targeted subgroups.] To improve the overall traffic system ATIS need only affect the behavior of a certain percentage of all drivers. Thus information systems could be designed to impact those drivers of a known behavioral type (Haselkorn et al. 1992).

One low-technology type of advanced traveler information system, a pre-recorded telephone message service, Fastline in the San Francisco Bay Area, was used for this survey. Systems such as Fastline are accessible to a larger number of people than systems requiring more expensive and dedicated equipment. No dedicated equipment is required to use Fastline. All one needs is access to a touch-tone telephone. However, the traffic information provided by Fastline is available on commercial radio stations and accessible to anyone with a radio. Furthermore, radio station information is available enroute while Fastline information is available enroute only if one has a portable or cellular telephone.

Private enterprise and government programs provide information systems requiring no individualy owned dedicated equipment. For example, Fastline and commercial radio broadcasts are private enterprises. CalTrans, a state agency, also provides traveler information for vehicle users in the form of special radio broadcasts during incidents or with roadway signs alerting drivers of problems ahead. In comparison to most other ATIS this is a relatively low-cost, and less complex, means of providing traveler information.

More-Complex Technology: Several more complex information systems are in limited use in the United States, Europe and Japan. However, to provide information, these systems require infrastructure development to provide information. Anyone wishing to access information from a more complex system would be required to purchase a specially equipped vehicle or to retrofit an existing vehicle with specialized, dedicated navigational equipment. These systems are much more costly than a simple telephone message system or a radio broadcast and they may price many potential users out of the market. Furthermore, the more complex systems are designed for use in private passenger vehicles and freight vehicles. While this technology can improve system efficiency, it probably will not encourage use of alternative travel modes.

Several Advanced Traveler Information Systems test the viability of implementing technologies on a large scale by analyzing the effects of ATIS on a small group of drivers in a real traffic environment. These include 1) Pathfinder, 2) Travtek (U.S.), 3) Ali-Scout, and 4) Autoguide (Europe), 5) Racs and 6) Amtics (Japan). These systems use various means of providing traffic information, as well as different types of travel information. The Pathfinder system[1] uses an in-vehicle navigational system to improve traffic flow. This system provides real-time information about accidents, congestion, highway construction, and alternate routes to drivers of specially equipped cars. A control center manages communication, detecting traffic density and vehicle

[1]Pathfinder is an experimental system being tested in the Smart Corridor, a 13-mile stretch along the Santa Monica Freeway in California.

speeds while transmitting that information back to the equipped vehicles in the form of an electronic map shown on the display screen. The Travtek project[2] provides navigation, real-time traffic information, route selection, route guidance, and motorist information services to specially equipped rental cars. Ali-Scout[3] is a dynamic route guidance system with on-board equipment, receiving routing information from a centrally located traffic guidance computer. This system receives information when passing infrared communications beacons installed at selected traffic signal lights and other strategic locations. Information consists of a route tree giving the best routes based on current traffic conditions for traveling from the beacon location toward various destination zones. From the route tree the on-board equipment selects routes according to the destination input by the driver. The equipment issues route guidance instructions along the way by means of a simplified graphic display and synthesized voice. Navigation between beacon locations is accomplished by dead reckoning with map-matching. Travel times from the participating vehicles are communicated to the beacons to augment the traffic information database of the central traffic guidance computer.

In addition to the two systems already described another, Autoguide, is a complex traveler information system consisting of an electronic unit installed at the roadside to store information and transmit it to passing vehicles. This information is relayed to

---

[2]TravTek experiments are being conducted in the Orlando, Florida, area.

[3]Ali-Scout is has been in operation in London, England, since early 1988 and has been in operation in Berlin, Germany, since 1989.

the driver through in-vehicle video displays or voice synthesizers (Abdel-Aty et. al., 1992). Ali-Scout, the in-vehicle subsystem of Autoguide, enables real-time communication between vehicles and a management center. Other information technologies include radio data communications, cellular systems, satellite communications, microcomputers, and roadside beacons used in conjunction with infrared or microwave transmissions or low-powered radio signals (Rose 1993, Euler 1990). Telephones, direct computer links, and cable television could also be used to provide traveler information (CAPTS, 1993).

Summary

As described, two extremes of traveler information exist: the low-tech, currently existing technologies that are very general, and the very high-tech, experimental technologies that are more expensive and predominantly in-vehicle. The equipment is relatively expensive and out of reach of most travelers. The high-tech systems afford no opportunity to influence mode choice. The information provided is directed to vehicle drivers and does not promote transit use, carpooling, vanpooling, or other alternate modes of transportation. In addition, the high-technology systems are region specific. Conversely, systems such as Fastline are accessible to a larger number of people than the hige-tech systems. To use Fastline all one needs is access to a touch-tone telephone. However, the information provided by Fastline is available on commercial radio stations and accessible to anyone with a radio. Radio station information is available enroute while Fastline information is available enroute only if

one has a portable or cellular telephone. To fill the gap, a high-tech targeted (individual specific) system, is available pre-trip (i.e. in the home) and, ideally, inexpensive is needed.

While complex systems deliver user specific, route specific data for a few, simpler technology remains the most practical system for wide-spread consumer use. For example, Fastline delivers transportation and road condition information gathered from a variety of sources for a larger number of travelers/drivers than more complex systems offer. Transportation information is accessed through a direct computer link with "Traffic Central," one of two traffic information centers available in the Bay Area (the other is Metro Traffic). Traffic Central information is updated at ten minute intervals, or more often as needed. In addition to Traffic Central, Fastline accesses CalTrans road information, city parking information, events information, and air quality levels. Fastline can also connect users to mass transit information services. Other information sources are updated less frequently than Traffic Central transportation information. For example, CalTrans information is updated twice a day. Each city in the service area provides current parking information, such as low cost parking lots or availability of parking, updated daily, weekly, or as needed. Cities also provide regularly updated events information.

2. Study Objectives and Research Approach

Objectives

The Fastline research project evaluates the importance of a low-cost telephone-based, traveler information system on travel demand in the San Francisco Bay Area. Ordinarily travelers' pre-trip and en-route decisions are made under uncertainty because accurate, timely information is unavailable. By providing better information, traveler information systems have the potential to decrease the degree of traveler uncertainty. Thus the objectives of this research project are to evaluate the effect on travel demand of information technology by measuring frequency of system use, user satisfaction with the system, and change in user's trip-making behavior as a result of information received from the system. Further objectives of this study are to assess the roles low-cost information systems such as Fastline can best serve, and by deduction, what role the private and pubic sectors should follow in providing information.

This project is one in a series of multi-disciplinary and multi-campus efforts to evaluate the impact on urban travel demand of new information technologies. These evolving information technologies form the initial components of Intelligent Vehicle Highway Systems (IVHS) and its sub-set, Advanced Traveler Information Systems. Though more limited in scope than other ATIS projects and systems the Fastline research project provides useful input and can be used in coordination with larger efforts such

as the California Advanced Public Transportation Systems (CAPTS) evaluation of more elaborate pre-trip information systems.

A low-cost system, such as Fastline, has several benefits to users. For example: information is available upon demand and is region specific; it has low user costs (cost of telephone call only in the case of Fastline); it requires no dedicated infrastructure; and operating costs are low. At the same time, it is subject to the following limitations: much of the information is available from the radio; a user cannot choose a specific trip-end location, but only a general trip-end area; and, in the case of Fastline, a user must have a touch tone telephone to access the information. The survey is designed to assess the balance of benifits and limitations of the Fastline traveler information system.

Survey Questions

To achieve the objectives, a survey research approach, involving experimentation with the Fastline information system, was taken in this study. The survey and analysis addresses the following issues:

- whether the Fastline traveler information system helps travelers to pre-plan routes, modes, or trips;
- time-of-day, trip-purpose, and other characteristics of Fastline use;
- whether travelers alter their route or start time based on Fastline information; and
- which information users find important.

In addition, an initial probe was made into who tends to use Fastline. Survey responses evaluated reasons travelers either use, or do not use Fastline, or other similar low-cost trip information services. More specifically, questions which motivated the design of this study include:

- Are people aware of the service?
- Of those people who are aware of the service and don't use it, why don't they use it?
- Who uses the service?
  - Are they commuters?
  - People unfamiliar with the area?
- Is Fastline information presented understandably and conveniently?
  - Was the information specific enough?
  - Was the information accurate?
  - Was the information detailed enough?
  - Was the information timely?
- What is the most important information being offered?
  - What information is being provided by the service?
  - What information did the user find most useful?
  - What other information would the user have liked?
- Why do travelers utilize the service?
  - Do they use the service because they are unfamiliar with the area?
  - Do they use the service because they want to take the least congested route to their destination?
  - Is it quick and easy to use?
- How do people use the service?
  - Is the service used only during unusual events (such as earthquakes, during storms, etc.)?
  - Is the service used routinely to plan mode choice and route choice?
  - Was their route choice changed based on Fastline information?
  - Was their mode choice changed based on Fastline information?
- What additional information would people like?
  - Are people interested in multi-modal trip itineraries?
  - Would people like real-time rideshare matching?

In order to assess system use patterns, participants of the survey were asked how often they used Fastline. User satisfaction was measured by asking survey participants what information they would like (open-ended question), for which types of trips the information was used, for which trips they found the information to be most useful. Survey participants were asked a series of open-ended questions as well as scaled preference questions in order to assess their expectations of a traveler information system. Then they were asked to rank, on a scale of 1 to 5, the importance of certain system attributes. Finally, changes in user travel behavior were determined by asking the participant if trip start time, route choice, or mode choice had been changed based on system information.

Participants were not asked for their opinions of the appropriate roles for public agencies and private enterprise in regard to gathering and disseminating traveler information. Potentially appropriate roles are evaluated based upon four criteria: 1) the complexity of the information system, 2) users' perception of accuracy and 3) timeliness of information provided, and 4) users' satisfaction with the current system and available information.

3. SAMPLING PROCEDURES

Pre-Fastline use and post-Fastline use telephone interview surveys were conducted with randomly selected San Francisco Bay Area residents. Participants were asked to use the Fastline traffic information system for two weeks. They were then given the post-use survey. The pre-use and post-use questionnaires used for the telephone interviews are presented in appendix A. The following sections describe the survey procedure.

Sampling Frame

Data for this case study were collected through random-digit dialing telephone interviews for several reasons, including:

- telephone interviews produce higher response rates compared with mail surveys;
- accurate responses can be obtained through interactions between the interviewer and respondent;
- sampling bias can be reduced through random-digit dialing;
- explaining the nature of the Fastline service and requesting its use is easier on the telephone; and
- survey costs are not expected to be substantially larger than those of a mail survey for this particular study.

The Fastline telephone survey was pre-tested to assess the survey instrument and data collection methods. The target goal for the pre-test was five completed surveys. A target goal of 50 participants was set for the total number of survey completions.

Several sampling frames are available for use in a telephone survey including directory sampling, commercial list sampling and random-digit-dialing (Groves, 1988). In order to reduce possible bias against non-listed numbers, a random-digit-dialing method based on the frame of all possible telephone numbers was used in this survey. The sampling frame for this survey is a set of all the possible telephone numbers in the geographic area of interest: the San Francisco Bay area.

Sampling Pool

There are four area codes of interest in the San Francisco Bay area: 408, 415, 510 and 707. A list of the prefixes for the appropriate areas in Alameda, Marin, San Francisco, San Mateo, Contra Costa, Solano and Santa Clara counties was generated from the telephone directories from each of these areas. This produced 36 prefixes in the 707 area, 356 in the 415 area, 211 in the 408 area and 302 in the 510 area code area for a total of 905 prefixes.

Random Digit Generation

Pilot Survey: After a list of prefixes for each area was generated, random six-digit area-code/prefix numbers were chosen from the entire pool of 905 prefixes for the four area codes. Because of the small size of the pilot survey, only one four-digit combination was chosen from each selected prefix. Once selected, a prefix was discarded from the list of prefixes from which to choose. Then, a four-digit suffix was

assigned to each prefix using a table of random digits. This produced 128 complete telephone numbers from the designated sampling area.

Main Survey: The method of number generation was modified for the actual survey for a more efficient generation of eligible numbers. The initial calls revealed that many of the telephone numbers are not assigned to households. For the main survey, which required a larger number of respondents, a more efficient random number generation technique was used. To eliminate unproductive numbers, a two-stage procedure was utilized, similar to the Waksberg design of number generation (Lavrakas, 1987). Once an area code and prefix were established as working residential numbers, that particular area-code/prefix combination was used as a basis for a random generation of the last two digits in the telephone number. This resulted in the more expedient generation of working residential numbers rather than disconnected, electronic or business numbers.

Calling Procedures

The target group for this survey was residential occupants. Therefore all numbers that reached a business or office were discarded. Once the sampling pool of numbers was established, recruitment began. Calls were made during evening hours to reach people working during the day. Any telephone number reaching an answering machine of a business establishment was discarded. A telephone number reaching a residential answering machine was called again. No messages were left on answering machines

during initial recruitment. Numbers that rang and were un-answered, and numbers that gave a busy signal, were called again. Five call-backs were made to answering machines, busy signals and no answers. Telephone numbers that were answered by a non-resident of that household were discarded if it was established that the residents would not be returning soon. A telephone number was discarded if it belonged to an individual who had difficulty understanding and speaking English, reached a "disconnected" recording, or an electronic signal.

Call Sheets

All numbers dialed were logged onto call sheets. The call sheets were used to record recruitment progress. The information date, approximate time of the calls, the number of call attempts, and the disposition/outcome of the call (busy, answering machines, disconnected numbers, electronic numbers, refusals to participate, and participating respondents) were recorded for each telephone number and for each call on a call sheet.

4. Survey Procedures

Survey

There were three phases to the survey: *Phase I*: The first phase of the survey consisted of the initial telephone contact. This included an explanation of a traveler information service and information about the survey. The participant answered a 16 question pre-use survey and was informed that the menu for Fastline would be mailed to them to use during their two week participation period.

Phase II: Participants were asked to participate in an on-line survey while using the Fastline traffic information system. The questions asked were very similar to an earlier survey conducted by Steve Wollenberg of Fastline. Unfortunately, this phase did not offer data adequate for analysis due to the small number of survey participants who actually responded to questions while on line with Fastline.

Phase III: The third phase telephone interview was completed after the two-week period assigned to the participant to use Fastline. This post-use interview consisted of 19 questions about his/her use of the service. A finished survey refers to a respondent that completed both Phase I and Phase III.

Interviews

The initial survey was conducted once a household member who was willing to participate in the survey was reached. A mailing address was obtained during Phase

I of the survey in order to mail the Fastline menu and instructions. The participant was assigned a two-week time period during which to use the Fastline system for any trips made during their assigned use period. Phase III follow-up telephone interviews were conducted at the end of the assigned time period. Those who completed Phase III received a $20 cash incentive. Phase III of the survey was completed only if the survey participant was able to be reached by telephone and if they had used the service at least once during their assigned time period. If the participant indicated that s/he had not used the Fastline system during the survey days the interview ended[4]. Phase III could not be completed and the twenty dollar incentive was not sent.

Upon initial contact the interviewer provided information about the survey. Potential participants were briefly informed about traffic information systems. They were told that this survey would require them to answer this initial short survey, taking about five minutes, then they would be required to use the Fastline information service during a two-week period. Then they would complete Phase III of the survey through another phone interview. Potential participants were told that the cash incentive would be given to those participants who used Fastline and completed both Phase I and Phase III of the survey. They were then asked if they would be willing to participate and the first phase of the survey questions were asked.

---

[4]The survey focused on the features of a telephone-based traveler information service rather than on why or why not one would use such a service. Respondents were not asked why they did not use the service.

Interview Results

Pilot Survey: Calling recruitment for the five pilot survey participants was completed in two evenings; on a Monday evening from 7:00 PM to 9:00 PM and on a Tuesday evening from approximately 6:45 PM to 7:30 PM. Call sheets were completed for each call attempt. In the two evenings, 95 call attempts were made to 78 telephone numbers. Of the 78 numbers called, 28 were disconnected or out of service, 14 were unanswered, 9 were electronic (such as a FAX machine), 5 numbers had changed, 1 was a pager number, and 6 were business numbers. A total of 14 people were contacted. Of those, 1 was not a household resident, 8 people refused to participate, and 5 agreed to participate.

All five participants from the pilot survey were reached within two call-back attempts, and all five completed the Phase III of the survey. Four twenty dollar incentives were sent after one person, presumably from altruistic motives, requested not to receive the money. Responses from the pilot survey are included with the other survey participants.

Pilot sruvey participation dates were August 23, 1993 to September 5, 1993. All participants in the pilot survey were reached for Phase III, the post-information system use interview, with one or two phone calls. All reported they had used the service at least once. Based upon the pilot survey, redundant survey questions were eliminated and the order of some questions was changed.

Main Survey: Recruiting participants took much longer than anticipated. Estimated recruitment time for the main survey was calculated based upon the amount of time it took to recruit the pilot survey participants. Calling recruitment for 50 survey participants began on September 11 and was completed on October 2. A total of 1,639 call attempts were made to 1,177 telephone numbers. Because the main survey recruitment took longer than expected the main survey group was divided into three sections each with different two week participation dates. Twenty people were assigned to use Fastline from September 27 to October 9. Nineteen people were assigned to use Fastline from October 4 to October 17, and eleven people were assigned to use Fastline from October 11 to October 24 (See table 4.1).

Table 4.1
Survey Dates and Number of Responses for Main Survey

Use Date	Participated in Phase I	Completed Phase III
9/27/93-10/09/93	20	12
10/04/93-10/17/93	19	10
10/11/93-10/24/93	11	4
Total	50	26

Phase III

At the end of each assigned survey period the participants were telephoned to complete Phase III of the survey. If no one answered, an answering machine was reached, the participant was not home, or a busy signal was encountered, the number

was called back until the participant was reached or it was determined that the participant could not be reached. Messages were left on telephone answering machines after several calls were attempted and only the answering machine was reached. As Phase III was completed, thank-you letters and twenty dollar incentives were mailed to each survey participant.

Although Phase I for the main survey recruitment took longer than expected, the delay did not lead us to anticipate the problems encountered attempting to reach participants to complete Phase III. After several attempts were made to the same number, and an answering machine picked up, a message was left on the answering machine requestion the participant to call the interviewer and indicate where and at what time s/he could be reached for the interview. Likewise, when participants were not at home at the time of call-backs, but another household member was reached, a time was set for the interviewer to call again.[5]

Twenty-six participants completed Phase III of the main survey. Fifteen people who answered Phase I did not use Fastline and could not complete the post-use, Phase III,

---

[5]Three people from the group assigned to use the service from September 27 to October 9 were reassigned to the last survey group. During the call-back, one participant responded that the information packet never arrived. After agreeing to be reassigned, a new packet was sent. Another participant had moved during the survey period and did not have time to use the service. This participant was also reassigned to the last survey date group. One participant did not receive the information until October 4 and did not use the service but agreed to be reassigned to the last survey group. Two letters from the October 4-17th group of participants were returned as undeliverable. The participants were called and reassigned to the last group of Fastline users and a new set of instructions were sent to the correct address.

survey. One participant called during her survey week and said she was having difficulty using the service (rotary telephone rather than touch tone). She did not complete the survey. At the time of call-backs, three numbers had been disconnected. At the remaining five numbers, repeated messages were left on either an answering machine or with a household member for the survey participant to call the interviewer, but no calls were received, leaving the survey unfinished (see table 4.2).

Table 4.2
Call-back Results
(Main Survey - Phase III)

Number of Calls	Number Reached	%	Number Dis-Connected	%	Number Unreached	%	Total	%
1	14	29	1	2			15	31
2	16	33					16	33
3	3	6			1	2	4	8
4	2	4					2	4
5	1	2					1	2
6	1	2			2	4	3	6
7	2	4					2	4
8	2	4					2	4
9			1	2	2	4	3	6
10			1	2			1	2
TOTAL	41	84	3	6	5	10	49[6]	100

Travelers have several choices available to them which will allow them to avoid congested areas. These choices include: changing trip departure time; changing trip

[6]The forty-nine numbers presented here are those remaining in the survey after one person was eliminated because she has a rotary phone.

route; or, changing mode choice. In order for travelers to derive benefits information about road conditions must be timely and accurate.

5. Analysis of Survey Results

This section of the report describes responses to survey questions. Included here are responses to the open-ended questions used to elicit individuals' opinions about what they might expect from a traveler information service as well as what they liked and didn't like about the service after they had tried it for two-weeks. Responses to the pilot survey and main survey were combined. Discussion and evaluation are based upon a total sample size of 55 respondents to Phase I, and 31 respondents to Phase III.

5.1. Responses Before Using the Traffic Information System

Respondents reached via random-digit dialing in Phase I of the survey were asked whether they had ever heard of the Fastline traffic information system. Of the 55 respondents only 3 people indicated that they had heard of the service. Those three respondents were further asked the question, "Where did you hear about Fastline?" Responses indicated that one person heard about Fastline on the radio, another person from acquaintances, and the third person on the telephone (it is likely that the question was misunderstood by the third respondent). To the question, "Have you ever used a phone-in traffic service before?" only one participant responded positively.

The Fastline traveler information system advertised its service extensively throughout the Bay Area on billboards, through newspaper advertisements, through radio advertising, and through a mobile telephone system. Information about the availability

of Fastline has been available in the Bay Area for several of years. Those who had not heard of the Fastline system may have recently moved into the area, or do not pay attention to advertising, or had insufficient motivation to notice the service.

It can be inferred that those who had heard of the service but had not used it, had insufficient incentive to use it. They may not commute, may not experience enough delay due to congestion, or may receive adequate traffic information from radio broadcasts. Because of the small number of observations, however, no conclusions can be drawn.

Possible Features of a Traffic Information System

During the Phase I survey participants were asked to rate several possible features of a traffic information service. Rating was done on a scale of one to five with one being the most important and five being the least important (table 5.1). The feature, "information provided is up-to-date", was most often rated as most important by 52 respondents, or 95% of the sample. The next most often rated as very important by 49 respondents is, "information is available for the route I use". The third most often rated as very important by 47 respondents is, "information is available for my area code". The second and third most important features are similar because information based upon a telephone area code would cover a specific geographic area just as route specific information does.

After identifying the most important system information, the least important information was identified. The most often cited as least important feature was, "alternative forms of transportation available" (4 respondents). The feature second most often cited as least important (3 respondents) is, "information is available state-wide with one telephone call". Two features are tied for the third least important (1 respondent each): "service is low cost" and "information is available state-wide without regard to area code". However, the response that the cost of the service is least important is probably misleading because cost of service was rated as most important 45 times.

Table 5.1
Importance of Information System Attributes

Responses to " Please rate possible features of a traffic information system."						
	1 (Most Important)	2	3	4	5 (Least Important)	Total
Service is low cost.	45	2	6	1	1	55
	81.8%	3.6%	10.9%	1.8%	1.8%	100.0%
Service is available 24 hours a day.	37	5	15	2	0	55
	60.0%	9.1%	27.3%	3.6%		100.0%
Information provided is up-to-date.	52	3	0	0	0	55
	94.6%	5.5%				100.0%
Information is available for my telephone area code.	47	3	4	1	0	55
	85.5%	5.5%	7.3%	1.8%		100.0%
Information is available state-wide without regard to area code.	26	11	14	3	1	55
	47.3%	20.0%	25.5%	5.5%	1.8%	100.0%
Information is available state-wide with one telephone call.	18	11	13	10	3	55
	32.7%	20.0%	23.6%	18.2%	5.5%	100.0%
Information is available for the route I use.	49	3	3	0	0	55
	89.1%	5.5%	5.5%			100.0%
Alternative forms of transportation are available.	29	14	4	4	4	55
	52.7%	25.5%	7.3%	7.3%	7.3%	100.0%

Name Five Types of Information You Expect From a Traffic Information Service

Participants were asked to name up to *five* types of information they would like from a traffic information service. The responses are grouped into six response categories; a) route specific information, b) road conditions/accidents, c) traffic, d) transit information, e) other, f) don't know. Individual responses in each group can be found

in appendix B. Some responses can be assigned to more than one category. Each response, however, is assigned to only one category.

a. Route Specific Information. Forty-one respondents suggested route specific information as a feature they expected from a traveler information system. Comments indicated that the users would like to be able to access up-to-date, route specific information in order to either go to places they have never been before or to ensure that their normal route is uncongested. Additionally, they would like to be able to access directions for traveling to unfamiliar areas both within and outside the Bay Area.

Responses to the follow-up (Phase III) survey indicate that some participants expected to reach a person rather than a recorded message and were disappointed that they were unable to access route specific information. Participants want to find the shortest, quickest route to their destination, and expect the information to be clear, accurate and up-to-date. These responses indicate that a successful travel information system will have the ability to provide route specific information to the user.

b. Road Conditions or Accidents. This group includes 59 replies indicating that respondents would avoid the area of accidents or road construction if they had traffic information before beginning their trip. Twenty-one respondents replied would like up-to-date accident locations, and 18 made requests for construction and maintenance

information. Another 25 respondents requested that information on road conditions and road closures be provided. One participant said that road closure and alternate route information should be available for disasters (such as an earthquake or fire). It seems obvious that some participants plan ahead in order to avoid delay and congestion caused by various road conditions. A pre-trip planning system would be beneficial to the group of people who plan ahead. However, only 31 people used the system even one time, this would seem to indicate that either most people do not plan ahead or it takes too much time to use the system before leaving for a trip.

c. Traffic Information. As in the road conditions and accident responses, the replies requesting traffic information indicate that respondents may change their departure times or change their routes in order to avoid congestion. They wanted to know how to avoid traffic jams and the best time to leave to avoid congestion. They also wanted information about special events which would create traffic congestion in the affected areas. This is an indication that this type of information may have the desired influence on travel behavior. That is, users may change either their route choice or start times, or both.

d. Public Transit Information Several respondents indicated that they would like more up-to-date and accurate information on public transit. This includes forms of public transit available, route information and fare schedules. While many people thought transit information was the least important information that might be available from

a transportation information system, others requested better transit information. While public transportation information may not be important to the majority of users, or as a means of reducing congestion, it remains an important aspect of a traveler information system and should be included as an alternative mode choice, or as part of a multi-modal trip.

e. Other. This group contains responses which did not fit specifically into any of the previously discussed categories, or were not directly related to travel. Eight respondents said that they would like information on weather conditions. Weather conditions, especially fog, vary from one part of the Bay Area to another. Furthermore, weather conditions change throughout the day. Therefore, providing weather information is important because it may help travelers decide upon a mode choice, route choice or departure time as an adjustment to inclement weather conditions such as heavy rain or fog. A few of the responses about the type of information travelers would like seem to be given in humor, such as ,"to know the way back," "would like to know in advance" (perhaps precognition), or "what to wear" (though the last comment may be a request for information about weather conditions). One person thought that the tide charts for sailing should be available from a traffic information service.

Importance of Type of Traffic Information

After answering the open-ended questions on system expectations, respondents were asked to rate the importance of several types of traffic information service. Forty-three (43) participants indicated that traffic accident locations and delay due to traffic congestion were the most important information (See table 5.2). Information on lane or ramp closures due to construction and maintenance work was the next highest in level of importance to participants. Information on transit schedules was least important information to the most participants (6).

That transit information is viewed as least important can be interpreted in several ways. It may be an indication that the participants are not interested in using transit; that they can get the information more conveniently elsewhere; that they already know the transit schedules and therefore don't need the traffic information service to provide transit information; or that a traffic information service is not the appropriate medium for transit information.

That transit information is consistently rated as least important may be because a large percentage of travelers (67.2 percent in this survey) drive alone or carpool and only 5.4 percent use transit for any part of their commute trip. However, providing transit information may be an incentive to use the system, especially during unusual circumstances (inclement weather, a disaster, etc.).

Responses indicate that a successful service should include accident locations, delay due to traffic congestion, ramp and/or lane closures due to construction or maintenance, and the shortest route to the traveler's destination.

Table 5.2
Importance of Traffic Information

Responses to " Rate the importance of the type of information you get from a traffic information service with 1 being the most important and 5 least important."						
	1 (Most Important)	2	3	4	5 (Least Important)	Totals
Transit schedules	26	9	9	5	6	55
	47.3%	16.4%	16.4%	9.1%	10.9%	100.0%
Traffic accident locations	43	5	5	1	1	55
	78.2%	9.1%	9.1%	1.8%	1.8%	100.0%
Delay due to traffic congestion	43	8	4	0	0	55
	78.2%	14.6%	7.3%			100.0%
Average travel time to destination	18	20	13	2	2	55
	32.7%	36.4%	23.6%	3.6%	3.6%	100.0%
Lane or ramp closures due to construction and maintenance work	40	10	2	1	1	55
	72.7%	18.2%	3.6%	1.8%	1.8%	100.0%
Shortest route to your destination	36	6	8	3	2	55
	65.5%	10.9%	14.6%	5.5%	3.6%	100.0%
Regional events	18	10	17	7	3	55
	32.7%	18.2%	30.9%	12.7%	5.5%	100.0%
Road conditions	30	15	6	4	0	55
	54.6%	27.3%	10.9%	7.3%		100.0%
Parking costs	16	16	16	5	2	55
	29.1%	29.1%	29.1%	9.1%	3.6%	100.0%
Route directions to destination	28	15	7	2	3	55
	50.9%	27.3%	12.7%	3.6%	5.5%	100.0%
Weather conditions	28	11	10	4	2	55
	50.9%	20.0%	18.2%	7.3%	3.6%	100.0%
Least cost way to destination	28	11	9	3	4	55
	50.9%	20.0%	16.4%	5.5%	7.3%	100.0%

Do You Commute to Work? How Do You Get There? How Far Is It?

Participants were asked if they commuted to work outside the home. Forty-four of the 55 total participants commute to work (table 5.3). Thirty-three drove alone, two each drove a carpool and rode in a carpool. Two rode the train, one rode the train and one rode the bus. Three walked to work. Eleven (20.0 percent) participants use more than one form of transportation to get to work. The first leg of the trip is counted in the table. All multi-modal travelers work less than 25 miles from their work location.

Table 5.3
Distribution of Commute Travel Modes

How do you get to your work site?			
Mode	Number	Percent Total	Percent of Working
Not applicable	11	20.0%	
Drive alone	33	60.0%	75.0%
Drive carpool	2	3.6%	4.6%
Ride carpool	2	3.6%	4.6%
Ride vanpool	0	0.0%	0.0%
Ride train	2	3.6%	4.6%
Ride bus	1	1.8%	2.3%
Bicycle	1	1.8%	2.3%
Walk	3	5.5%	6.8%
Total including non-workers	55	100.0%	
Total workers only	44		100.0%

One-Way Distance to Work

Participants were asked the distance in miles to their work site. Most respondents (28) lived within 10 miles of their work site. Thirteen lived within five miles of work;

fifteen within 5 to 10 miles; ten less than 25 miles; and five more than 25 miles from work (table 5.4).

Mode Choice By Distance to Work

Table 5.5 shows the participants' mode choice by distance to work. All five participants who worked more than 25 miles from home drove alone to work. None of the six participants working a mile or less from home drove alone. Instead three walked to work. One each rode a carpool (with spouse), the bus or a bicycle. Twenty-seven participants working from 1 mile to 25 miles from home drove alone. In that group, two drove a carpool, one rode in a carpool and two took the train. There was no participant who commuted in a vanpool. These results indicate that for longer commutes an individual is more likely to drive alone than to carpool, vanpool, or to use transit. This result is consistent with other studies which show that commute trips by bus are shorter on average than commute trips by personal vehicle (Figure 8 of Hu and Young, 1992).

Table 5.4
Distribution of One-Way Distance to Work

One way distance from home to work (miles).			
	Number responding	Percent responding	Percent of working
Not Applicable (Didn't commute)	11	20.0%	
No Response	1	1.8%	2.3%
< 5 miles	13	23.6%	29.5%
5 to 10 miles	15	27.3%	34.1%
11 to 25 miles	10	18.2%	22.7%
> 25 miles	5	9.1%	11.4%
Total including non-workers	55	100.0%	
Total workers only	44		100.0%

Table 5.5
Distribution of Commute Travel Modes by Distance to Work

Mode Choice by Distance to work						
	0 to 1 mile	> 1 mi <= 5 mi	> 5 mi <= 10 mi	> 10 mi <= 25 mi	> 25 miles	TOTAL
Drive Alone	0	11	7	9	5	32
Drive Carpool	0	0	1	1	0	2
Ride Carpool	0	1	0	0	0	2
Ride Vanpool	0	0	0	0	0	0
Ride Train	0	0	2	0	0	2
Ride Bus	1	1	0	0	0	1
Bicycle	1	0	0	0	0	1
Walk	3	0	0	0	0	3
Multi-Modal	1	3	5	3	0	10
TOTAL	5	16	15	9	5	44

One person declined to provide the distance to their work site. This accounts for one less trip/mode choice split than one would expect from the number of persons working.

5.2. Survey Responses After Using the Traffic Information Service

Participants used Fastline for two weeks then were called for Phase III of the survey. Phase II was an on-line survey which participants were to answer when using Fastline. Response rate to the on-line survey was too low to report (8 total responses). Results of Phase III are presented in this section.

Did You Use the Service?

Of the 55 people who agreed during the initial telephone interviews to use the Fastline information service, 31 responded that they had in fact used the service (table 5.6). Fifteen said they had not used the service at all. Nine people used the service two to three times. Nine used it four to six times and eight used the service daily. Three people used the service more than once a day (table 5.7).

As stated earlier, one person could not access the Fastline service because a touch-tone telephone is required to access the menu system and the participant had a rotary telephone. Eight participants from Phase I could not be reached by telephone for Phase III of the survey. For some, telephone service had been disconnected; others did not answer their telephones or were otherwise unavailable to respond to Phase III questions.

Table 5.6
Use of the Fastline Traffic Information System by Survey Respondents

Did you use the traffic information service?		
Yes	31	56.4%
No	15	27.3%
Could not use service*	1	1.8%
Unable to contact**	8	14.6%
Totals	55	100.0%

* Has a rotary dial telephone rather than a touch-tone telephone.
** Participants from Phase I were not contacted for Phase III (see explanation in text).

Types of Trips for Which Service Was Used

The thirty-one respondents used the traffic information service for the following trip types. Twenty-three respondents used the traffic information service to obtain information on commute traffic conditions (table 5.8). Seven calls were for special events information, three each for shopping and entertainment trips. Five calls were to find road conditions for an unfamiliar area. Eight calls were for other purposes including: "Called about ferry and airport parking menu," "Trip to San Francisco," "Appointments," and "To school, San Mateo, San Francisco South Bay." Twelve people used the traffic information service for more than one purpose.

Table 5.7
Frequency of Fastline Use by Survey Respondents

How often did you use the traffic information service?		
Once	1	3.2%
2 to 3 times	9	29.0%
4 to 6 times	9	29.0%
Daily	8	25.8%
More than once a day	3	9.7%
No response	1	3.2%
TOTAL USERS	31	100%
Not applicable	16	
Unreachable	8	
TOTAL SAMPLE	55	

Table 5.8
Distribution of Trip Types for Which Respondents Used Fastline

For which of the following types of trip did you use the service?	
Commute	23
Shopping	3
Entertainment	3
Special Events	7
To go somewhere unfamiliar	5
Other	8

Was the Traffic Information Service Helpful?

In response to the question, "Did you find the service useful?" 81% (25) of the respondents indicated that the traffic information service was useful, while 19% (6) did not. Respondents often cited the fact that the same information is available from the radio -- costing them neither extra time to make a telephone call nor the amount

of a toll call. Other comments provided in response to the question include: "Yes, but a little discouraging using the menu," "Sometimes - Not all the time," "And no, didn't use at prime times so not updated," "There was not really any traffic for me," "Limited," and "Once I allowed enough time to listen to the menu."

Types of Trips for Which Service Was Helpful

Respondents were asked whether the service was more helpful for one type of trip than another, and for which type of trip it was most useful. Eight people responded that the service was more helpful for certain types of trips. Seven said no, and 11 didn't know whether it was more useful for one type of trip than for another. When asked for which type of trip it was most useful, two said commute trips, and one each said special events, and to go somewhere unfamiliar.

What Did You Like About the Traffic Information Service?

This was an open-ended question. A summary of the responses is given in table 5.9, and individual responses are listed in appendix C. As reflected in the number of responses in each category, respondents frequently gave more than one answer. Thirteen people found the service easy to use and convenient. Eleven liked other features. Eight people thought the information was up-to-date. Seven found the traffic information to be very helpful. Four liked the option available to them. Two respondents didn't know what they liked about the service. Options available were important to four respondents.

Table 5.9
Service Attributes that Respondents Liked

What did you like about the service?		
Options	4	8.9%
Current/Up-to Date	8	17.8%
Easy to Use/Convenient	13	28.9%
Traffic Information	7	15.6%
Other	13	28.9%
Total	45	100.0%

What Did You Dislike About the Traffic Information Service?

After respondents were given a chance to tell us what they liked about the traffic information service, they were asked what they disliked about the service (table 5.10). Ten participants responded that they disliked nothing about the service. Many, on the other hand, listed more than one feature that they were dissatisfied with. Thirteen responses did not like either the menu, or the message voice. After participants had accessed the system once, they wanted to be able to skip to the section of the menu in which they were interested. Part of the dissatisfaction with the menu was listening to the advertisements. Six people specifically mentioned disliking the commercials. It took participants too long to go through the menu (6). Four people expected a route planning feature. One person specifically mentioned they expected to get a live person at the service. Eleven respondents said the information was not updated often enough. Many of these called during off-peak hours when traffic information is not updated on a ten to fifteen minute basis as is done during peak commute hours. One way to improve the service would be to provide callers with a message when accidents have been cleared, or that no current information is available. The final

category "other", has eight responses, ranging from "it was a waste of time" to "I thought it was toll free." Individual comments can be found in appendix D.

Table 5.10
Service Attributes Which Respondents Disliked

What did you dislike about the service?		
Nothing	9	15.5%
Menu	14	24.1%
Not Current/Accurate	11	19.0%
Advertising	6	10.3%
Took Too Much Time	6	10.3%
No Route Planning Feature	4	6.9%
Other	8	13.8%
Total	58	100.0%

Responses to Specific Questions About System Attributes

A set of questions were asked to evaluate specific aspects of the Fastline service. The responses are summarized in table 5.11. Most respondents found the menu system easy to use, and the information offered was specific enough and accurate. However, the fraction of respondents who thought the information was up-to-date is much smaller.

Most Important Information Offered

The most frequent response to the question, "What is the most important information offered?" is congestion and traffic information (table 5.12). Only a few people indicated that accident and road work information, which needs to be updated often

to be useful, as most important. Likewise, few found route-specific information and public transit information most important.

Table 5.11
Responses to Questions on System Attributes

Question	Yes	No	Don't know	Total
Did you find the menu easy to use?	26 100%	0	0	26 100%
Was the information specific enough?	26 90%	2 7%	1 3%	29 100%
Was the information accurate?	22 73%	2 7%	6 20%	30 100%
Was the information up-to-date?	18 58%	8 26%	5 16%	31 100%

Table 5.12
Most Important Information Offered by Fastline

What is the most important information offered?		
Alternate/Specific Route	2	7.4%
Accidents/Road Work	4	14.8%
Congestion/Traffic	17	63.0%
Transit	2	7.4%
Other	2	7.4%
Total	27	100.0%

Other Useful Information

Responses to the question, "What other information would have been useful?" are rather limited (table 5.13). Of the 27 people who responded to this question, a total of 14 replied, "Don't know" or "Nothing." Five people responding want information on alternate or specific routes. Two people want information on public transit. Overall, the responses suggest that route-specific information would be valued by the

user of information such systems, while many travelers may not have contemplated what additional information they could use.

Table 5.13
Other Information Which Would Have Been Useful

What other information would have been useful?		
Alternate/Specific Route	5	18.5%
Accidents/Road Work	1	3.7%
Congestion/Traffic	1	3.7%
Transit	2	7.4%
Other	4	14.8%
Don't Know	7	25.9%
Nothing	7	25.9%
Total	27	100.0%

How Fastline information might influence its users' travel decision can be inferred from responses to four questions in the survey (table 5.14). Only five (or 19%) of the 26 respondents who responded to "Did you use the information to plan your means of transportation?" indicated they did so. An overwhelming majority of the respondents thus had their travel modes pre-planned prior to their use of Fastline information. On the other hand, over 60% of the respondents indicated that they used the information to plan their routes. When asked, "Did the information cause you to change your route?" 42% of the respondents indicated that they changed their routes. From the survey results, it may be said that information is more often used to confirm the use of pre-selected routes they had in mind before accessing the information service. This, however, is not surprising because Fastline information was accessed mostly for commute and other recurring trips (see table 5.8). In fact, it is significant that the

information did alter route choice decisions for over 40% of the respondents. System information affected departure time choice for 23% of the respondents. These results indicate that an information system can reduce congestion during traffic incidents by providing information travelers allowing them to alter route choice or departure time thereby reducing congestion.

Table 5.14
Use of Fastline Information in Travel Decision

Question	Yes	No	Total
Did you use the information to plan your means of transportation?	5 19%	21 81%	26 100%
Did you use the information to plan your route?	19 61%	12 39%	31 100%
Did the information cause you to change your route?	13 42%	18 58%	31 100%
Did the information cause you to change the time you began you trip?	7 23%	24 77%	31 100%

Who Tended to Use Fastline?

One hypothesis that can be advanced about the use of the information system is that those who have long trips to make tend to be frequent users of the system because of the higher degrees of uncertainty associated with long trips. To examine this hypothesis, 36 commuting respondents are classified by their commute distance and use of Fastline during the experiment (table 5.15). The table exhibits a clear tendency that those who had commute distances greater than 10 miles tended to use the information system. Among those who used Fastline, the fraction of those who commuted less than 10 miles is 48% while that of those who commuted 10 miles or longer is 52%. The corresponding percentages for non-users are 73% and 27%.

Although the contingency table has a χ^2-value of 1.39 (one degree of freedom), which is not significant at a 10% level, Fisher's exact test[1] indicates that commute distance and system use are statistically significantly associated.

Table 5.15
Use of Fastline by Commute Distance

Used Fastline	Distance to Work		Total
	< 10 miles	≥ 10 miles	
Yes	12 48%	13 52%	25 100%
No	8 73%	3 27%	11 100%
Total	20 56%	16 44%	36 100%

Appropriate Role of Public and Private Sectors

Participants were not asked for their opinions of the appropriate roles for public agencies and private enterprise in regard to gathering and supplying traveler information. Potentially, appropriate roles can be evaluated based upon the complexity of the information system, users' perception of accuracy and timeliness of information provided, the pre-trip time it take to use the system, and users' satisfaction with the current system and available information.

[1]Fisher's exact test is used to test whether the probability of success is the same for two independent binomials. Note that this test does not depend on any large sample approximations so it is exact even for small samples (Christensen, 1990). For 2 x 2 tables, Fisher's exact test is computed when a table a cell with an expected frequency less than 5 (SPSS, 1990).

6. CONCLUSIONS

This report is an evaluation of a telephone-based traveler information system currently in operation in the San Francisco Bay Area. The study is based on a telephone interview of randomly selected San Francisco Bay Area residents who agreed to use Fastline, a telephone-based traffic information system, for two weeks. Areas evaluated based on responses to the survey questionnaire are: (1) Fastline system usage patterns, (2) Possible changes in travel choices because of the system information, (3) Importance of different types of information to travelers, and (4) respondents' evaluation of the system.

To assess system use patterns, subjects were asked background questions such as, "Are you employed outside the home," "How do you get to your work site," and "How far is it to your work site." After using the system, participants were asked if they had used the information system, how often they used it, for what types of trips they used the information, for which trips the information proved most useful, and whether they had changed trip time or route based upon system information.

System Usage Patterns

Despite a $20 incentive, only 31 respondents out of 55 participants ever used Fastline; calling in to get traffic information appears to take effort and motivation. A total of 15 people contacted for the post-use survey did not use the service. Most

people used the service for commute trips. The second most frequent use was to go somewhere unfamiliar, and to go to special events.

Travel Behavior Changes

Changes in travel behavior were determined by asking the participant if trip start time, route choice, or mode choice were changed based upon system information. Seven respondents changed their trip start times based upon system information. Nineteen of the 31 respondents who used Fastline indicated that the system was used to plan the trip route.

Most Important Information

Questions to determine the information potential system users would find most useful, included both open-ended questions and questions in which they rated attributes on a scale of one to five, from very important to least important.

The two types of information most participants said they thought was very important were traffic accident locations and delay due to traffic congestion. Ramp or lane closures due to construction and work were the next most often rated as very important followed by, shortest route to your destination, and road conditions. Transit schedules and regional events were most often rated as not important.

User's Evaluation of System

After using the Fastline traveler information system for two weeks participants were asked what they liked and disliked about the system. They were also asked whether they found the service to be helpful and for which type of trip the system was most helpful.

Everyone responded that the menu system was easy to use. Twenty-six of the 31 Fastline users found the information specific enough. Twenty-two people found the information to be accurate. When asked whether the information provided was up-to-date or current eighteen people said that it was current and another eight people said information was not current. At least one of those who found the information to be obsolete called during off-peak hours when the information is not updated as frequently as during peak hours.

Respondents were asked open-ended questions about what they liked and disliked about the traveler information system. The most frequently cited feature they liked was that the system is easy to use or convenient. The most frequently cited feature they disliked about the system was the menu. These apparently contradictory results are an indication that while respondents found the menu very easy to use, waiting for the advertisements to finish before accessing traffic information proved to be a point of major dissatisfaction with the information system. The reason may be that it takes too much time to use the system before leaving for a trip and listening to unnecessary

information, such as advertising, caused too much delay -- perhaps users experienced more sense of delay waiting for information than waiting in traffic. The next most often cited dis-liked attribute was the lack of current or accurate information.

High technology information systems, such as the Smart Highway in the Los Angeles area, require users to purchase equipment dedicated to that use alone. The equipment is relatively expensive and out of reach of most travelers. The information provided is directed to vehicle drivers and does not promote transit use, carpooling, vanpooling, or other alternate modes of transportation. In addition, the high-technology systems are region specific. The technologies are not coordinated with each other.

7. REFERENCES

Abdel-Aty, Mohamed A., K. M. Vaughn, R. Kitamura, P. P. Jovanis. 1992. *Impact of ATIS on drivers' travel decisions: A literature review*. Research Report UCD-ITS-RR-92-7. Institute of Transportation Studies, Davis, CA. June.

Ben-Akiva, M., D. Bernstein, A. Hotz, H. Koutsopoulos, J. Sussman. 1992. *The case for smart highways*. Technology Review. **95**(5), 38-47.

CAPTS. 1993. *Field Operational Test: Real-time rideshare matching and pre-trip planning systems: Progress Report #1.*

Christensen, Ronald. 1990. Log Linear Models. 56-57. Springer-Verlag. New York, NY.

Ervin, R.D., K. Chen. 1988/1989. *Toward motoring smart*. Issues in Science and Technology. Winter, 92-97.

Euler, G.W. 1990. *Intelligent vehicle/highway systems: Definitions and applications*. ITE Journal, 17-22.

Groves, R.M. 1988. *Telephone survey methodology*. John Wiley & Sons, New York, NY.

Haselkorn, M. et. al. 1992. *Real-time motorist information for reducing urban freeway congestion: Commuter behavior, data conversion and display and transportation policy.* Washington State Department of Transportation, Olympia, WA.

Honey, S.K. 1987. *A driver guidance and information system concept*. Technology Options for Highway Transportation Operations. California Department of Transportation, Sacramento, 94-97.

Hu, P.S. and J. Young. 1992. Summary of Travel Trends: 1990 Nationwide Personal Transportation Survey. Washington, DC: Office of Information Management, FHWA, March.

Khattak, A.J., J.L. Schofer and F.S. Koppelman. 1991. *Effect of traffic reports on commuters' route and departure time changes.* Vehicle Navigation and Information Systems Conference Proceedings, Vol. 2. Society of Automotive Engineers, Warrendale, PA.

Koh, K.H., and S.C. Lew. 1989. *DRIVES: A low-cost retrofittable module for enhanced vehicular safety and driver information*. International Journal of Vehicle Design, (5), 553-559.

Lavrakas, P. J. 1987. *Telephone survey methods: Sampling, selection, and supervision.* Applied Social Research Methods Series, Volume 7. SAGE Publications, Inc., Newbury Park, CA.

Prendergast, J. 1993. *IVHS: The invisible revolution*. Civil Engineering. **63**(4), 42-45.

Rose, T. 1993. *Intelligent vehicle highway systems: Going places fast*. Microwave Journal, **36**(5), 172-178.

SPSS, Inc. 1992. SPSS/PC + Base System Users' Guide, Version 5.0. 190 - 191. Chicago, IL.

SPSS, Inc. 1990. SPSS Reference Guide. 104. Chicago, IL.

Willis, D.K. 1990. *IVHS technologies: Promising palliative or popular poppycock?* Transportation Quarterly, **44**(1), 73-84.

FASTLINE SURVEY QUESTIONNAIRE
Initial Contact & Phase 1

"Hello, I am _____ with the University of California. We are conducting a telephone survey of traffic information services in the Bay Area. Traffic information systems help you find routes and transit services to wherever you are traveling locally with just a touch tone phone. This survey will take about five minutes now. We will ask you some questions about traffic information services during this interview. Then we would like you to use a traffic information service for two weeks. At the end of two weeks I will call again with some follow-up questions, again taking about five minutes. We will send you $20 as a token of our appreciation for your participation in the survey. All information will remian confidential and your address will not be released to anyone else.

1. Will you participate in the survey?

☐ No If "No" then, thank you, good-by."
☐ Yes The traffic information service you will be using is called Fastline. You contact the service by telephone. Please use the service for two weeks starting on September 27, 1993 and continuing through October 9, 1993. When using the Fastline traffic information system, please answer their on-line survey (once only please). At the end of two weeks, I will call again to ask your opinion about the traffic information service.

Fastline has a menu system. This means that when you call the service you use your touchtone telephone number pad to get the information that you want. We will send the Fastline menu to you to make using the system easier. Please give me your name and a mailing address.

_____

_____

_____

Is this your home address? ☐ Yes ☐ No

Now I would like you to answer the following questions about traffic information systems.

2. Have you ever heard of the FASTLINE traffic information service?

☐ No Skip to Q5 ☐ Yes Go to Q3

3. Where did you hear about FASTLINE? _____

4. When did you hear about FASTLINE? _____

5. Have you ever used a phone-in traffic information service before?

☐ No Skip to Q8 ☐ Yes Go to Q6

6. Which traffic information service did you use?

_____

7. Do you still use the traffic information service?

☐ No Go to Q8 ☐ Yes Skip to Q9

8. Why did you stop using the service?

_____

_____

_____

9. In this section we ask you to rank several possible features of a traffic information system. On a scale of 1 to 5 with 1 being most important and 5 being least important, please rate the importance of each type of information that you might expect from a traffic information service.

a. Service is low cost	1 2 3 4 5
b. Service is available 24 hours a day	1 2 3 4 5
c. Information provided is up-to-date	1 2 3 4 5
d. Information is available for my telephone area code	1 2 3 4 5
e. Information is available for the entire Bay Area without regard to area code	1 2 3 4 5
f. Information is available state-wide with one phone call	1 2 3 4 5
g. Information is available for the route I use	1 2 3 4 5
h. Alternative forms of transportation available	1 2 3 4 5

10. Name up to five types of information that you would like from a traffic information service.

1. _____
2. _____
3. _____
4. _____
5. _____

11. On a scale of 1 to 5, please rate the importance of the type of information you get from a traffic information service.

a. Transit schedules	1 2 3 4 5
b. Traffic accident locations	1 2 3 4 5
c. Delay due to traffic congestion	1 2 3 4 5
d. Average travel time to your destination	1 2 3 4 5
e. Lane or ramp closures due to construction and maintenance work	1 2 3 4 5
f. Shortest route to your destination	1 2 3 4 5
g. Regional events	1 2 3 4 5
h. Road conditions	1 2 3 4 5
i. Parking costs	1 2 3 4 5
j. Route directions to your destination	1 2 3 4 5
k. Weather conditions	1 2 3 4 5
l. Least cost way to your destination	1 2 3 4 5

12. Do you commute to a place of work outside the home?

☐ No Skip to END ☐ Yes Go to Q14

13. How do you get to your work site? *(Read all choices then have respondent answer.)*

☐ Drive alone	☐ Drive carpool	☐ Ride carpool
☐ Ride vanpool	☐ Ride train	☐ Ride bus
☐ Bicycle	☐ Walk	
☐ Combination of _____ and _____		

14. How far is it to your work site? _____ (miles)

15. What are the major cross streets and the postal zip code for your work?

_____

16. What are the major cross streets and postal zip code for your residence?

_____

END: That was the last question for this part of the survey. Your FASTLINE traffic service menu will arrive in the mail in a few days. If you have any questions, or if your FASTLINE information doesn't arrive, please call me or _____ at (916) 752-7435. I will call you again in two weeks with the second and last part of the survey. When we have completed survey you will receive $20. Thank you for your help.

DRAFT
FASTLINE SURVEY QUESTIONNAIRE
Phase Three

"Hello, I am _____ with the University of California Davis.

I telephoned you about two weeks ago to ask you to participate in a survey of an on-line traffic information service. I am calling to follow up and conduct the last part of the survey. Let me be sure that I have your correct name and address

_____

_____

_____".

1. Did you use the traffic information service?

☐ No Skip to END ☐ Yes Go to Q

2. How often did you use the service? *(Read all choices then have respondent answer.)*

☐ Once ☐ 2 to 3 times ☐ 4 to 6 times
☐ Daily ☐ More than once a day

3. For which of the following types of trip did you use the service? *(Read all choices then have respondent answer.)*

☐ Commute ☐ Shopping ☐ Entertainment
☐ Special Events ☐ To go somewhere unfamiliar
☐ Other

4. Did you find the service helpful?

☐ No Skip to Q7 ☐ Yes Go to Q5

5. Was the service more useful for one type of trip than another?

☐ No Skip to Q7 ☐ Yes Go to Q6

Please continue on the next page. Page 57

6. For which type of trip was the service most useful? *(Read all choices then have respondent answer.)*

☐ Commute ☐ Shopping ☐ Entertainment
☐ Special Events ☐ To go somewhere unfamiliar
☐ Other

7. What did you like about the service?

_____

_____

_____

8. What did you dislike about the service?

_____

_____

_____

9	Did you find the menu system easy to use?	☐ Yes ☐ No
10.	Was the information specific enough?	☐ Yes ☐ No
11.	Was the information accurate?	☐ Yes ☐ No
12.	Was the information up-to-date?	☐ Yes ☐ No

13. What is the most important information offered?

_____

_____

_____

14. What other information would have been useful?

_____

_____

_____

15.	Did you use the information to plan your means of transportation?	☐ Yes ☐ No
16.	Did you use the information to plan your route?	☐ Yes ☐ No
17.	Did the information cause you to change your route?	☐ Yes ☐ No
18.	Did the information cause you to change the time you began your trip?	☐ Yes ☐ No
19.	Would you like a copy of the survey results?	☐ Yes ☐ No

END: Thank you for your participation in this important survey. We appreciate your time and interest. You will receive $20 in the mail with-in a week.

Please continue on the next page. Page 58

Appendix B
Responses to Phase I, Question 10:
"Name up to Five Types of Information That You Would Like from a Traffic Information Service"

a) Route Specific Information

very clear directions
directions
special events along a certain corridor/area
fastest & best route to get where I want to go
information on traffic - highways 101, 680, & 880
how to get there - best routes
time of travel - point to point
shortest route to reach destination quickest routes
quickest route to Orinda tunnel to Palo alto
quickest way to get around grid lock traffic
how to get there - outside the bay area
route you have to use - where to make transport
information to get around different routes
delays on route I am taking
most direct route to unfamiliar area
routes (2 responses)
traffic routes
easiest way alternate route to San Jose before/after 6
alternate routes (6 responses)
suggested alternative routes
know exactly how traffic is on route I take
alternate routes-very specific
alternate routes when roads are being worked on
alternative routes (especially on saturday)
bridges information-length of wait
if Bay Bridge is stalled
bridge traffic
if bridge is clogged in area I am traveling
which bridge to use if going across the bay
easy routes to specific destination
best way to get there
best way to get where I am going
best way to get somewhere
road conditions out of my area

b) Road Conditions/accidents
accidents on the road
accidents (6 responses)
locations (of accidents)
any accidents
accidents that may cause delay
traffic accidents
up to date accident information
accidents on main freeway
possible accidents in area (to take alternate route)
location of accidents
where accidents are
accident conditions
accidents & delays
backup because of accidents
if there are accidents slowing traffic down
freeways
whether there are accidents on the freeways
construction information - what times / alternate routes
construction (4 responses)
construction information
Cal-trans schedule of construction
which areas are being worked on by Cal-trans
scheduled Cal-trans activity
road construction-availability of ramps
maintenance on road I'm using
repair work that may be a problem
road closures
road work
if roads are being worked on
delays or detours
whether there are any detours unusual highway conditions
lights that have gone down
closures
ramp closures
road conditions (13 responses)
road information
condition of road to destination
roads that are open/closed during natural disaster
to know ahead of time of any special problems

c) Traffic
how to avoid traffic jams
if tracked traffic - when is best time to go
commuting information before starting in morning
where traffic jams are when I am leaving
where to avoid traffic
where bottlenecks are
place of traffic
where traffic is
where traffic jams are - where slowing
traffic at certain times
traffic tie ups on freeway
traffic jams
heavy traffic flow
traffic conditions
traffic congestion
commuter slowdowns
what traffic is like on route I take to work
events that may obstruct traffic
(traffic) backup information
information about all traffic
bay area - nearby traffic
Traffic (2 responses)
traffic type information
up to date traffic status

d) Transit Information
buses being on time
buses up to date
bus routes and times
up to date BART status
information on bart and delays with BART
available public transportation options
different forms of public transportation & if on time
alternative transportation
availability of public
transportation alternatives
if there is public transportation available
means available to get there
availability
hours public transportation is available schedules
time schedules
price of a ticket
fares outside my area

d) Transit Information (cont.)
length of travel and wait for transporting
length of time for alternative transportation
if the bus is going where I am going
alternate transportation routes to entertainment landmarks

e) Other

weather conditions (8 responses)
current information
accurate up-to-date information
accurate information to decide what time to leave
accurate information
reliable information
would like to access the information quickly
be able to get information when I need it
24 hour service
would want 24 hours and in my area
don't necessarily need 24 hr service - morning & evening only low cost (2 responses)
good quality
want information by just pushing 1 button
courteous service
good service
expected wait during rush hours - main freeways (2 responses)
how long are delays
CHP activity
comparative cost
cost to go where I am going
time frame
when is best time to go
would like to know days in advance
what to wear
the way back
football or baseball games
tides-for sailing

Appendix C
Comments that Followed Phase III, Question 7: "What Did You Like About the Service?"

Options
Lot of things to let you know about
Interesting to know different events
Lots of options
Could get a lot of information from different sources in one place

Up-to-date
It was updated real often
Anytime I called the information had been updated 10-15 minutes earlier
Up to date service
Liked the idea that information was updated every 10 minutes
Up to date

Easy/Convenient
It was free and convenient
Could call whenever I needed it
It was convenient
Convenience
Easy to use
Easy to get into and figure out
More convenient than listening to the radio
It is quick and easy to use
It's simple and self explanatory
Easy to access
Very direct menu
I could call whenever I wanted instead of waiting like for TV and radio

Traffic Information
Liked information on traffic
The information so I can know my route
It gave up to date information about traffic
Was helpful to know what's in front of me before each commute
For bridge information. Once I changed my route entirely because it said there was a problem on the bridge.
Being able to check how the roads to San Francisco were-if backed up or any problems
Is a good idea-if leaving town-necessary to know traffic
Really liked traffic information

Other

Worked ok
Went pretty quickly
Good information
Helped for planning time
It was free
Was free
Prompt replies, it answered quickly
Told me specifically what I wanted to know
Can give you information if traveling outside of ordinary area
Made me more aware
The idea that it is there in case you need it
It is most helpful when you don't know where something is-are unfamiliar with the area
More repetitive updates than the radio
Could go to menu area you wanted rather than wait
Nothing

APPENDIX D
COMMENTS THAT FOLLOW PHASE III QUESTION 8: "WHAT DID YOU DISLIKE ABOUT THE SERVICE?"

Nothing
did not dislike anything
nothing (5)
nothing-overall it was good
nothing really
no complaints

Menu/Voice
recording spoke too rapidly
once got out of primary menu and lost connection
menu system does not work like a normal one - voice a little unclear - hard to understand
dealing with menu
there was no way to shortcut through the menu
had to listen to menu
if in a hurry would like to push a number to go through menu
original message kept repeating over
could not get information from events menu
some of the talking about traffic was very fast speaking
once in a certain menu, could not get back to main menu
once I got used to the menu system, I would want a way to bypass the complete explanation-for people who are on the go
getting a canned response

Not Current/Accurate
was not very timely
information on radio more timely and different
updates were not very current
at 8:30 got 6:30 updates
Caltrans information was a week old
information not current at 11:30.
been more explicit-when road work is being done
couple of times information was and hour late
once heard roads were clear but there was traffic
on two occasions information was late - called at 8:45, got information from 8:00.
called once at midmorning and once at mid-afternoon, and it was not very updated-information almost 40 minutes old
heard about accidents on radio not on service

Advertising
did not like advertisements
the call did take a while
too many recordings
commercials had to listen an wait to go to menu
not like waiting for announcement, no comparison
information was 1 1/2 hours old - too old compared to radio

Took too Much Time
took a long time to get the information
phone call was a little time consuming
I had to wait even when I knew what I wanted to do
the call did take a while
adds extra 10 minutes to morning routine
waiting to get the information that I need

No Route Planning Feature
if wanted to find information on quickest routes
could not find live person to talk to
did not give alternate routes
thought there would be a route planning system to get information on commute alternatives (times & fees for buses & bart)

Other
information not much better than radio
had to pay for toll call
was not helpful
don't know
thought it was toll free, had to pay long distance call
times and fees for buses and bart
did not say anything for where I drive
this was a waste of time

Appendix E
Number of Main Survey Respondents by Area Code

Participants by Area Code		
Area Code	Number	Percent
408	14	28.0%
415	19	38.0%
510	15	30.0%
707	2	4.0%
Total	50	100.0%