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Analysis of Wave 2 Broad Area Survey

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# **TravInfo Evaluation: Traveler Response Element**

## **Willingness to Pay for Traveler Information: Analysis of Wave 2 Broad Area Survey**

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## ABSTRACT

TravInfo is a Field Operational Test (FOT) sponsored by the Federal Highway Administration (FHWA) and California Department of Transportation. It aimed to develop a multi-modal traveler information system for the San Francisco Bay Area, combining public and private sector talents. The Broad Area Study is part of the TravInfo FOT evaluation. This paper addresses issues on the willingness to pay for traveler information. Two waves of telephone surveys of Bay Area households were conducted, one prior to and one after the Field Operational Test. The initial survey was conducted in November 1995, eight months prior to the TravInfo FOT began and the final survey was conducted in November 1998, three months after the FOT was ended.

The paper presents the findings of the second wave Broad Area survey regarding the willingness to pay for traveler information. The rationale is that information can help travelers make better decisions that ultimately reduce traffic congestion and pollution. However, the personal benefits of certain types of high quality travel information may motivate individuals to pay for information. This study analyzes the preferences of automobile and transit travelers' willingness to pay for a high quality advanced traveler information service.

The most desirable information content options were constant updates, alternate route information, in-car computer information, expected delay and comparing route times. The results also indicate that a significant population of "information seeking" travelers is willing to pay for specific information content. As expected, there are individual differences in preferences for information content. Future commercialization efforts may focus on experimenting with various types of information content and conducting demonstration projects that charge for information.

**KEYWORDS:** Traveler behavior, Advanced Traveler Information Systems, survey research, modeling, California

## EXECUTIVE SUMMARY

TravInfo is a federally funded Field Operational Test (FOT) to deploy real-time traveler information in the San Francisco Bay Area. The Broad Area study is part of the TravInfo FOT evaluation. For the Broad Area study, two household surveys were conducted, one in November 1995, eight months prior to TravInfo FOT began and the other one in November 1998, three months after the field test was over. The paper is concerned with the willingness to pay for traveler information. The data analyzed for this paper are from the 1998 survey.

Real-time travel information is presently available free of charge in many US urban areas. Commercial radio/television stations, highway advisory radio, changeable message signs, in-vehicle devices and the Internet provide individuals with travel information. Substantial government resources are invested in the collection, processing, and dissemination of this information. The rationale is that information can help travelers make better decisions that ultimately reduce traffic congestion and pollution. However, the personal benefits of certain types of high quality travel information may motivate individuals to pay for information. This study analyzes the preferences of automobile and transit travelers' willingness to pay for a high quality advanced traveler information service. A "Broad Area" survey of San Francisco Bay Area residents (N=1000) was conducted in 1998. The data collection was part of the TravInfo field test, which is a technology deployment effort, offered through a public-private partnership. The data were collected through a computer-assisted telephone interview, where individuals were chosen through random digit dialing. The study analyzes respondents' willingness to pay for a hypothetical ATIS (Advanced Traveler Information System) that provides: (1) Automatic notification of unexpected congestion on respondents' usual route, (2) Estimated time of delay from unexpected congestion on respondents' usual route, (3) Automatic alternate route planning around congestion, and (4) Estimated travel time on respondents' usual route and on any planned alternate routes.

This study analyzes the preferences of automobile and transit commuters' and non-commuters' willingness to pay for a hypothetical ATIS through a survey of San Francisco Bay Area residents. A summary of the key findings follows:

- Of the original 1000 survey respondents, 342 did not receive traffic or transit reports from any source--they were not asked the willingness to pay for ATIS questions. Of the 658 remaining respondents, 110 (17%) preferred to pay monthly, 371 (56%) preferred to pay on a per-call basis, 143 (22%) reported that they would not use the service for a fee, and 34 (5.2%) responded not sure or don't know.
- Many travelers were not entirely averse to paying for quality travel information. Almost all "information seeking" respondents to the stated preference questions (97%) acknowledged willingness to pay at least some amount for ATIS. A majority (53%) of the information seekers reported willingness to pay up to one dollar per call for information, while 38% are willing to pay \$7 per month.
- The most desirable information content options were constant updates, alternate route information, in-car computer information, expected delay and comparing route times. The results also indicate that a significant population of information seeking travelers is willing to pay for specific information content.

- The findings support the literature, showing that the majority (77%) of the information seekers prefer to pay for ATIS on a per-call basis, as opposed to a monthly fee. The link between information content desirability and willingness to pay for ATIS is important. Tailoring the content of ATIS to that desired by consumers may lead to higher willingness to pay.

Certain policy implications flow from this study. First, traffic/travel information is often gathered and processed using taxpayer dollars. While the goals of decreasing congestion and increasing mobility are in the public interest for economic and air quality reasons, it is still unclear whether or not public provision of ATIS is the best way to produce those ends. Although 53% (N=480) of the “information seekers” are willing to pay some amount for ATIS, it is open to question whether or not the nominal fees discussed in this paper could cover the costs of providing the services. If ATIS does not become self-sustaining in the future, a choice will need to be made to keep subsidizing the system or to cease providing service. The fact that almost all respondents were willing to pay some money for a futuristic system may indicate that with appropriately customized content and quality, future ATIS could be funded through user fees.

Secondly, more research needs to be conducted on ATIS. For example, the analysis conducted in this paper shows evidence that content of information is an important factor affecting willingness to pay. More studies focusing on the demand for specific content of ATIS are needed. In particular, the market potential for integration of weather, “yellow pages” and parking information with traffic and transit information needs to be explored.

Another line of future research follows from the fact that it is difficult to determine willingness to pay for information that is now free from stated preference surveys, as noted in this paper. Therefore, it is advisable to start more demonstration projects that charge for travel information and gain more revealed preference data. Comparing revealed and stated preference data will allow a more accurate picture of willingness to pay to emerge. In addition, more research is needed about changes in travel behavior/network performance in response to information. Only if ATIS is used to increase the efficiency of the transportation network can a case for strong public involvement be made.

In addition, a stated goal of the TravInfo project is to increase public transportation ridership (Crotty *et al.* 1995). More attention needs to be given specifically to this segment of travelers (in addition to non-commuters). Only by knowing exactly who is likely to benefit from ATIS can proper policy decisions be made about how much to invest in the technology.

## INTRODUCTION

Advanced Traveler Information Systems (ATIS) is a component of the broader Intelligent Transportation System (ITS) program to improve mobility/accessibility through the use of technology. Emerging information systems collect, process, and disseminate dynamic real-time information to travelers (Khattak 1999). This can be as simple as updated incident information available from radio broadcasts, or as sophisticated as a GIS-based in-vehicle route guidance system.

The goal of ATIS is to provide travelers with timely and accurate information that will allow them to change their route, mode, or the trip itself, in response to the current travel conditions. This will presumably enable more efficient use of the transportation network. The rapid growth of the Internet, global positioning systems, and geographic information systems are changing the accuracy and timeliness with which travel information can be provided. As these, and other, technologies develop, ATIS potentially could provide enough information to significantly improve the transportation systems of the United States.

TravInfo is an ATIS program serving the nine-county San Francisco Bay Area. Funded by the U.S. Department of Transportation as one of sixteen field operation tests in 1993, TravInfo is a free call-in information service with a stated goal of promoting public transportation (Crotty *et al.*, 1995). A public/private partnership, TravInfo has led by the San Francisco Bay Area metropolitan planning organization, with help from the California Department of Transportation (Caltrans).

This paper is a study of consumer willingness to pay for ATIS in the TravInfo context. ATIS now requires public subsidies to operate. Judging the extent of consumer's aversion to paying for information is a key component in determining the future of ATIS. Using a data set of 1000 respondents from the TravInfo service region, collected in November 1998, results are presented to determine the what content of information users may be willing to pay for and socioeconomic/contextual factors affecting willingness to pay for travel information.

## LITERATURE REVIEW

There is limited research available on ATIS because the technology is currently emerging. The literature focuses on three major areas of ATIS: The technology necessary to provide real-time information, traveler behavior in response to ATIS, and the willingness of users to pay for travel information. The first two areas are largely beyond the scope of this paper. The technology consumers are asked about is presumed to work effectively.

The findings of the literature review are summarized in Table 1. Currently, most ATIS is available free of charge via phone-in services. Many studies, however, attempt to measure the willingness of consumers to pay for travel information in the future. The most common measurement technique uses stated-preference surveys, as little empirical evidence is available. Almost all studies find a high price elasticity of demand for information. Direct comparison of value is not possible because the studies inquire about systems with different levels of information and different delivery sources (e.g., telephone, in-vehicle, pager). However, they are similar enough to discover broad trends. The fact is that consumers are willing to pay only modest sums no matter what content the ATIS provides. Although many studies present both

choices to the respondents, the literature is consistent in finding that users prefer a per-call fee to a monthly flat rate (Polydoropoulou *et al.*, 1997, Kim & Vandebona 1999, and Khattak *et al.*, 1999).

In two studies using only survey percentages, Englisher *et al.* (1994 and 1996) find that only 30% of SmarTraveler users in Boston would be willing to pay ten cents per call, and 50-60% are very unlikely to pay \$2.50/month. This sample may be biased because of its focus on early technology adopters. However, it gels with the results of Polydoropoulou *et al.*'s (1997) modeling study, which shows that the same fee would result in 38% purchasing SmarTraveler services. In addition, they find no profitable market in Boston for ATIS services.

New Jersey commuters are stated to be slightly bigger travel information spenders, valuing basic corridor-specific service in their home at an estimated \$3-\$4 per month. Interestingly, they state a preference for active (e.g., television) to passive (e.g., automatic call) delivery of service (Beaton & Sadana 1995). Very few (~ 7%) would demand even free service, however, and less than four percent would pay \$5/month. In a related 1994 paper, Beaton & Sadana found that 42% of respondents were willing to pay \$5/month, and 78% would sign up for \$2/month. The authors do not explain the large disparity in results based on similar data, however, which may be a result of small and non-random sample.

There is even greater demand for ATIS in New York. Harris & Konheim's (1995) survey responses show that 78% of New York area residents would be willing to pay a median of \$11 per month for dynamic information. The study also found that 56% said they would subscribe for \$5/month. Interestingly, desire for ATIS in New York is found to be strong among all demographics and types of travelers.

Results are comparable in San Francisco, and even in Australia. Khattak *et al.* (1999) used a panel type dataset to find that TravInfo users in the Bay Area would call frequently for 25 cents if service were customized, but calls would decline at higher prices. Similarly, Kim & Vandebona's (1999) ordered-probit model estimates that only 33% of Sydney residents will pay 25 cents for information.

Another key issue for the future of ATIS is just what content of travel information consumers demand. The obvious hypothesis that more detail increases demand and value is the common result of research, with a consensus that length of delay and travel times on alternate routes are the most important information (Beaton & Sadana 1995 and 1994, Khattak *et al.* 1999, Kim & Vandebona 1999, Harris & Konheim 1995). Perhaps this is best illustrated in the paper by Beaton & Sadana (1994), which finds nearly universal demand for dynamic information, with strong demand (78%) for basic incident reports. They quantify the value of extra detail, estimating the extra payments for transit information (\$0.75), length of delay (\$0.48), and route guidance (\$1.41). The one major disagreement is a driver simulation by Yang *et al.* (1998). This study shows that drivers familiar with an area prefer limited and audible information on expected delay length, while those unfamiliar want more dynamic information such as recommended alternate routes and visual directions.

Many studies find that consumers prefer dynamic information to static (Khattak *et al.* 1995, Kim & Vandebona 1999, Thakuriah & Sen 1996), and are more likely to change behavior if the information is prescriptive (Khattak *et al.* 1996). This means that simple travel time estimates are not enough. People want information on the length of delays on their primary and alternate routes so they can make informed decisions.



The most abundant information on personal behavioral response to ATIS is on route choice selection, which is also an indicator of the type of information people need. The literature here is broad and remarkably consistent. People are more likely to divert from their route if they are young, male, face a longer the travel distance, face more unexpected the congestion, reliable traffic information is available, they are familiar with alternate routes, or will likely arrive late at their destination (see Abdel-Aty *et al.* 1995, 1996, 1997, Khattak & Khattak 1999, Khattak *et al.* 1993, 1995, 1996, 1999 (2), Mahmassani & Liu 1997, Mannering *et al.* 1994, and Polydoropoulou *et al.* 1996). There are trouble spots in many of the above studies. For example, Khattak *et al.* (1996) and Polydoropoulou *et al.* (1996) both use a study of route choice in the Golden Gate Bridge corridor, where few alternate routes or modes of transportation exist. However, the fact that not a single study contradicts the previously stated route-choice factors bodes very well for their accuracy.

Bias is an issue in stated preference surveys. The consensus is that stated preference has increased validity and reduced bias when combined with a revealed preference base (Khattak *et al.* 1996, Polydoropoulou *et al.* 1996). Still, Polydoropoulou *et al.* (1997) warn of prominence bias (attention to most important attribute), justification bias (respondents answer to justify prior choices), policy response bias (opinion for personal benefit), non-commitment bias (overstatement of willingness to pay because there is no commitment), and cognitive bias (inability to grasp true value).

Willingness to pay data may be biased because travel information is typically free today. Travelers who currently accrue benefits from real-time information may not perceive the incremental benefits of enhanced systems to be worth the cost of giving up free information. They might underestimate the true value of information.

Publication bias is likely not a large problem, however. In a newly developing field, almost any information adds to the body of knowledge, making it unlikely that some viewpoints are excluded, though it is possible that studies skeptical of ATIS benefits will be less likely to be published.

Several gaps are apparent in the literature. Most obvious is the lack of revealed preference data available. The reason for this is obvious; much of ATIS is not currently available, and thus cannot be studied empirically in real-life situations. Thus, stated preference questions are often substituted, despite some questions as to their validity. Another major gap is the fact that most ATIS studies focus on people commuting to work by car. This makes sense, as the majority of workers travel by automobile and drivers most commonly encounter congestion. Still, there is almost no study of the potential benefits of ATIS for transit commuters and non-commuters. Finally, more attention needs to be given to the specific content demanded of travel information. Few studies, if any, combine knowledge from route choice data with stated preference information to find the true needs of end users.

## **METHODOLOGY AND DESCRIPTION OF THE DATA SET**

This section presents the theorized relationships and analytical techniques used to study consumers' willingness to pay for Advanced Traveler Information Systems. There are four distinct sections in the presentation of methodology. First, the data set is described. Next, hypothesized relationships are explained, and descriptive statistics presented for each

independent variable. Third, respondents' willingness to pay for ATIS is presented, and cross-tabulations run with selected independent variables.

### **The Broad Area Survey**

The University of California at Berkeley collected data about travelers' behavior and preferences in the San Francisco Bay Area in 1995, and again in 1998. This paper analyzes results from the latter survey. Utilizing a computer-aided telephone interview (CATI) process, the Broad Area Survey (BAS) obtained 1000 records from residents in the nine-county Bay Area. Khattak, Yim, and Stalker (1999) present the structure of the 1995 survey, and data collection methodology in detail. There were few significant structural changes in the 1999 version, and the methodology is the same as the description of the 1995 survey given in the above article. For this survey, the data were meant to reflect the population of the Bay Area. The respondents were selected through random digit dialing, except for ensuring that the population density of the counties and modal split of commuters (based on the 1990 census) responding reflected the overall percentages of the region. In addition, respondents were required to be at least eighteen years of age, with no more than 52 percent being female. Among households contacted, about 50 percent responded to the survey.

A unique feature of the BAS is that it categorizes respondents into four groups: auto commuters, transit commuters, auto non-commuters, and transit non-commuters. All respondents were asked preliminary information at the beginning, and about personal characteristics at the end of the survey. In between, however, there are four separate (but similar) protocols for each group (see Figure 1). The advantage of this design is data on each group can be separated out and analyzed easily. The disadvantage is that many questions are asked only of certain groups.

### **Hypothesized Relationships**

A variety of factors are identified through the literature as affecting travelers' willingness to pay for ATIS. These are split into two broad categories: socioeconomic factors, and contextual factors. Each of these factors represent independent variables that theoretically affect willingness to pay for ATIS. The variables analyzed in this paper are presented in Table 2A and Table 2B on the following pages, with the theoretical link to willingness to pay and rationale in the right-hand columns. In addition, there are two types of dependent variables: monthly payment and per-call payment. Although the literature suggests the majority prefer per-call payment, there is no theoretical reason to expect the independent variables to affect the dependent variables differently because of the payment type.

### **RESULTS: WILLINGNESS TO PAY FOR ATIS**

Each survey respondent was asked a set of stated preference questions about their willingness to pay for ATIS. Specifically, they were asked about a device that offered the following features: (1) Automatic notification of unexpected congestion on your usual route, (2) Estimated time of delay from unexpected congestion on your usual route, (3) Automatic alternate route planning around the congestion, and (4) Estimated travel time on your usual route and on any planned alternate routes. The first question asked was whether respondent would prefer to pay monthly or per call

for the use of the above service. Of the original 1000 survey respondents, 342 were not asked the stated preference questions because they had earlier said they did not get traffic or transit reports from any source. Of 658 remaining respondents, 110 (17%) preferred to pay monthly, 371 (56%) preferred to pay on a per-call basis, and 143 (22%) volunteered that they would not use the service for a fee, and 34 (5.2%) responded not sure or don't know. Those who did not state a preference for either payment type were not asked any further stated preference questions. Thus there is a substantial group of "information seekers" who is willing to pay for travel information.

The next two sets of questions attempt to determine the value of the ATIS service to each respondent. The first set asks the respondents willingness to pay \$7 for the ATIS service. If the reply is negative, the respondent is asked if he/she is willing to pay \$5. If this response is negative, the asking price drops to \$3. A similar system is used to determine willingness to pay for ATIS on a per-call basis. The starting value is \$1, descending in \$0.25 increments down to 25 cents per call.

Using the questions described above, a maximum payment the respondent is willing to incur monthly and per-call can be determined. The assumption made is that anyone willing to pay a higher value would also be willing to pay the lower values. If a respondent answered "no" to each price, it is assumed that he is not willing to pay anything for ATIS. The results of this analysis are listed in Tables 3A and 3B. Of 1000 survey respondents, only 481 (48%) answered the willingness to pay questions. Respondents were not asked the willingness to pay questions if they did not affirmatively say they ever get traffic information from any source, or if they said they would not use the ATIS for a fee--22% said they would not use the ATIS described (Table 3B). Of those responding to the questions, 465 (96.7%) were willing to pay some money (monthly and/or per call) for ATIS.

Surprisingly, the mode response for both monthly and per-call payment willingness is the highest possible value. A majority (52%) of the "information seekers" reported willingness to pay \$1.00 per call, while 39% said they would pay \$7 per month for ATIS.

Tables 4A and 4B present the basic relationships between theorized independent variables and willingness to pay for ATIS. Some interesting relationships that both support and do not support the hypothesized relationships are as follows.

Supporting the literature, all groups stated more willingness to pay per call than for a monthly subscription (measured by percent not willing to pay for information). On average, respondents do not want to pay a monthly fee, but will pay a per-call charge. In addition, with only three exceptions (men, carpoolers, and those who usually travel more than 15 miles each direction), all groups were more willing to pay the top rate for calls (\$1) than they were to pay the highest rate (\$7/month) for a subscription.

Surprisingly, auto travelers do not appear more willing to pay for information than transit riders. For both the monthly and per-call charges, more auto users (32.8%, 7.3%) and carpoolers (38.2%, 7.9%) stated no willingness to pay for information at all than transit users (26.3%, 0.0%). Though many solo drivers are willing to pay the \$7 per month and/or \$1 per call (38.9% and 53.7% respectively). There is a bimodal distribution of willingness to pay for ATIS among solo drivers—those willing to pay a high price and those not willing to pay at all.

Travel distance, intuitively a key independent variable, shows mixed results. In accordance with the theory, those with longer commutes are more willing to pay for ATIS at any monthly fee (except a small gap at \$7). However, this reverses with the per-call preferences. Those with the shorter commutes were more willing to pay for information on a per-call basis.

Men are more likely to pay a monthly subscription of any amount for ATIS. Women, however, are more likely to pay a per-call fee of any amount. Similarly, those with longer drives are more likely to pay for ATIS by the month, but less likely to pay per-call. Other studies have also shown in the past that gender is a factor in willingness to pay (Abdel-Aty *et al.*, 1997).

Respondents with higher incomes reported greater willingness to pay a monthly fee for ATIS, as hypothesized. However, this relationship becomes muddled in relation to per-call charges. Also surprising, those experiencing unexpected congestion show no pattern of greater willingness to pay for information than those that do not. The former group has fewer members willing to pay nothing, but also has fewer willing to pay top dollar. Commuters, workers, minorities, and those who currently access traffic information similarly do not show preference patterns consistent with the hypothesized relationships.

Information content is likely to be of major importance to respondents. Therefore, we expect those who rated the information content provided through the hypothetical ATIS highly to be more willing to pay for ATIS. The survey asks stated preference questions about content, requesting respondents to rate the following eight features of a proposed ATIS on a scale of one (not at all desirable) to 5 (very desirable):

- Current traffic conditions on your radio or television that are updated every minute.
- Detailed information about alternate routes around congestion, including where to exit and what surface streets to take with compared travel time.
- Information about traffic conditions at specific locations, which you could request over the telephone or on-line through your computer.
- An in-car navigational computer with a display showing highways and roads. The computer could show where congestion exists and map the fastest routes in terms of time around congestion.
- Detailed information about mass transit alternatives to avoid congestion including up-to-the-minute bus, ferry, and train schedules and where to take them.
- An estimate of the time of delay on your usual route from unexpected traffic congestion.
- An estimate of the travel time to get from your point of departure to your point of arrival on your usual route and any planned alternate routes.
- Automatic notification of unexpected traffic congestion on your usual route through a pager or cellular phone.

Of the eight different ATIS features, four make up the components of the ATIS for which respondents were asked their willingness to pay. The desirability scores given by each survey participant for the four components of the ATIS (2, 6, 7, and 8 above) were averaged for each respondent to approximate a total desirability for the ATIS asked about in the willingness to pay section. Table 5 shows cross-tabulations of the average rating respondents gave for the four relevant variables regarding their willingness to pay. The results show that those who desire the content of the hypothetical ATIS were willing to pay more for it, particularly via monthly subscription. Figure 2 shows the mean desirability of information content for the respondents. The results indicate that constant updates (1 above), alternate route information (2 above), in-car computer (4 above), expected delay (6 above) and comparing route times (7 above) are the most desirable information content options. Overall, the analysis illustrates that individual preferences

vary across content options and the link between content desirability and willingness to pay for ATIS is important.

## Limitations

No data set is perfect, and there are some limitations of the Broad Area Survey that should be pointed out. First, the complex skip patterns in the survey mean that certain questions were not asked of all respondents. More than half the respondents (520 out of 1000 records), were never asked the willingness to pay for information questions mainly because they did not indicate any interest in receiving travel information. Second, the sample size is relatively small for non-auto commuters (223 out of 1000 for all other travelers). Third, biased responses may be an issue. In addition to the stated preference biases discussed earlier, fatigue is also a factor in long surveys. After many revealed preference questions, when stated preference questions were finally asked, the respondents may have experienced fatigue. Cognitive bias is also a concern, as the system asked about is not currently available. Finally, respondents were asked only about a very specific ATIS. They could be provided more ATIS scenarios. Despite the limitations, we emphasize that the survey was implemented professionally using the CATI technique. Within the constraints of such surveys, all attempts were made to ensure that the survey represent the Bay Area resident population. Furthermore, the results are reasonable, and largely consistent with our expectations and with the findings from other studies.

## CONCLUSION

This study analyzes the preferences of automobile and transit commuters' and non-commuters' willingness to pay for a hypothetical ATIS through a survey of San Francisco Bay Area residents. A summary of the key findings follows:

- Of the original 1000 survey respondents, 342 did not receive traffic or transit reports from any source--they were not asked the willingness to pay for ATIS questions. Of the 658 remaining respondents, 110 (17%) preferred to pay monthly, 371 (56%) preferred to pay on a per-call basis, 143 (22%) reported that they would not use the service for a fee, and 34 (5.2%) responded not sure or don't know.
- Many travelers were not entirely averse to paying for quality travel information. Almost all "information seeking" respondents to the stated preference questions (97%) acknowledged willingness to pay at least some amount for ATIS. A majority (53%) of the information seekers reported willingness to pay up to one dollar per call for information, while 38% are willing to pay \$7 per month.
- The most desirable information content options were constant updates, alternate route information, in-car computer information, expected delay and comparing route times. The results also indicate that a significant population of information seeking travelers is willing to pay for specific information content.
- The findings support the literature, showing that the majority (77%) of the information seekers prefer to pay for ATIS on a per-call basis, as opposed to a monthly fee. The link between information content desirability and willingness to pay for ATIS is important.

Tailoring the content of ATIS to that desired by consumers may lead to higher willingness to pay.

Certain policy implications flow from this study. First, traffic/travel information is often gathered and processed using taxpayer dollars. While the goals of decreasing congestion and increasing mobility are in the public interest for economic and air quality reasons, it is still unclear whether or not public provision of ATIS is the best way to produce those ends. Although 53% (N=480) of the “information seekers” are willing to pay some amount for ATIS, it is open to question whether or not the nominal fees discussed in this paper could cover the costs of providing the services. If ATIS does not become self-sustaining in the future, a choice will need to be made to keep subsidizing the system or to cease providing service. The fact that almost all respondents were willing to pay some money for a futuristic system may indicate that with appropriately customized content and quality, future ATIS could be funded through user fees.

Secondly, more research needs to be conducted on ATIS. For example, the analysis conducted in this paper shows evidence that content of information is an important factor affecting willingness to pay. More studies focusing on the demand for specific content of ATIS are needed. In particular, the market potential for integration of weather, “yellow pages” and parking information with traffic and transit information needs to be explored.

Another line of future research follows from the fact that it is difficult to determine willingness to pay for information that is now free from stated preference surveys, as noted in this paper. Therefore, it is advisable to start more demonstration projects that charge for travel information and gain more revealed preference data. Comparing revealed and stated preference data will allow a more accurate picture of willingness to pay to emerge. In addition, more research is needed about changes in travel behavior/network performance in response to information. Only if ATIS is used to increase the efficiency of the transportation network can a case for strong public involvement be made.

In addition, a stated goal of the TravInfo project is to increase public transportation ridership (Crotty *et al.* 1995). More attention needs to be given specifically to this segment of travelers (in addition to non-commuters). Only by knowing exactly who is likely to benefit from ATIS can proper policy decisions be made about how much to invest in the technology.

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**Table 1: Summary of Literature Review (v indicates a “yes”)**

Author	Key Relevant Findings	Topics Addressed in Study				Approach	
		Willingness to Pay for Info	Traveler Behavior under ATIS	Content of Info to Provide	Other Than Auto Commuters Examined	Method	Location and Sample
Abdel-Aty <i>et al.</i> 1997	Info has significant effect on route choice. Travel time <u>not</u> dominant choice criterion. ATIS has great potential. Gender, age, freeway use, length, variation in time affect route choice.		v			Phone and mailback surveys (2 models)	N = 564 (phone), N = 143 (mail)
Abdel-Aty <i>et al.</i> 1995	Females more likely to get pre-trip info and change route, males more likely to use en-route info, usually radio, and to divert. Carpools also likely to divert. Avoiding bad neighborhoods important.		v			Two CATI phone surveys	Los Angeles N = 944, 564 follow-up
Abdel-Aty <i>et al.</i> 1994	Freeway users, long commute time, males, educated more likely to receive traffic info. Either pre-trip (females) or en-route (males), not both. Perception of traffic as bad or variable increases access to info.		v			CATI phone survey	Los Angeles N = 944
Beaton & Sadana 1995	Commuters value basic corridor-specific, pre-trip in-home ATIS at \$3-4/mo, extra \$0.70 for delay length. 7% demand free service, 3.1% if \$5/mo. fee. Most desired are existence of problem and delay length.	v		v		SP Survey of commuters in Rte. 22 corridor	New Jersey N = 67 (pilot) N = 43 PSE&G employees
Beaton & Sadana 1994	79% want basic pre-trip Incident Alert Service, over 90% extra features such as transit schedule (worth \$0.75), delay length (\$0.48), and route guidance (\$1.41). 42% would use at \$5/mo, 78% at \$2/mo.	v	v	v	v (no specific analysis)	SP Survey of PSE&G commuters in Rte. 22 corridor	New Jersey N = 67 (pilot) N = 43 employees
Englischer <i>et al.</i> 1997	SmartTraveler marketing somewhat successful. Users very sensitive to price. 61% won't use at \$2.50/mo, 70% at \$5/mo, 32% would switch cell phone to use free.	v			v (no specific analysis)	Survey of users & others	Boston Area, N = 1000 users, 2000 non-users

Author	Key Relevant Findings	Topics Addressed in Study				Approach	
		Willingness to Pay for Info	Traveler Behavior under ATIS	Content of Info to Provide	Other Than Auto Commuters Examined	Method	Location and Sample
Englischer <i>et al.</i> 1996	61% SmarTraveler users have cell phones, long commutes on roads 75%+ covered by info, 67% on work trips, more calls from work than to work. 50% very unlikely to pay \$2.50/mo., none pay \$10, 30% pay \$.10/call for pretrip info.	v	v		v (no specific analysis)	Survey of perceptions of SmarTraveler users and non-users	Boston N = 452 follow-ups, 547 users, 1920 non-users
Harris & Konheim 1995	88% want ATIS, 78% willing to pay (51% of transit users) a median \$11/mo. Interest in location/duration of delays, alt route time, transit schedule. Like radio and VMS.	v	v	v	v	Phone Survey of peak-hour travellers	New York metro area N = 1002
Khattak & Khattak 1998	En-route diversions affected by availability & knowledge of alt. rtes., travel time, amount of delay, and source of info.		v			Survey of peak auto commuters	Chicago (n=700) and SF (n=3238)
Khattak <i>et al.</i> (1) 1999	WTP for info rises if customized info, longer trips, work trips, and auto used. Calls would increase if \$.25 charge for customized service, decrease if more. 35% change trip based on pre-trip info.	v			v	Broad Area Survey of TravInfo users	Bay Area, N = 511
Khattak <i>et al.</i> (2) 1999	Workers, long trips, radio users more likely to adjust trips with pretrip information.		v		V (no specific analysis)	Random CATI phone Survey	Bay Area N = 947
Khattak <i>et al.</i> 1996	Travelers may change behavior in response to long delays and with info, especially if it's prescriptive		v	v		SP & RP Survey	Golden Gate N = 586
Khattak <i>et al.</i> 1995	Commuters more likely change route if they perceive info be accurate and timely. Need for comprehensive ATIS w/ historic, real-time, and predictive info		v	v		Survey of downtown commuters	Chicago N = 700
Khattak <i>et al.</i> 1993	More will divert as incident congestion rises. More likely if use radio, going home (not to work), know alternate route. Incident duration and traffic forecasts important.		v			SP Survey of auto commuters	Chicago N = 700

Author	Key Relevant Findings	Topics Addressed in Study				Approach	
		Willingness to Pay for Info	Traveler Behavior under ATIS	Content of Info to Provide	Other Than Auto Commuters Examined	Method	Location and Sample
Kim & Vandebona 1999	Drivers want dynamic info on accident clearing time and alternate routes. They do not want to pay for info, but would prefer per-call fee. 33% would pay \$0.25/call. Females, older, richer more WTP.	v	v	v		Attitudinal survey of commuters	Sydney, Australia N = 83
Mahmassani & Liu 1999	Males more likely to switch departure time due to info, older not. Late arrival causes more route change than early, as does unreliable info.		v			Lab experiment with travel simulator	N = 45
Mannering <i>et al.</i> 1994	More route changes on work to home trips. 26% sometimes change route. Males, higher earners, more familiar, more likely to change. Females change more based on pre-trip. Inertia present.		v			Survey of I-5 commuters	Seattle N = 3893
Orski 1997	ATIS must increase in scope & customization to be marketable. Many unwilling to change regular commute now.		v	v		Summary of symposium of Transportation professionals	Tampa Bay, FL N = 60
Polydoropoulou <i>et al.</i> 1997	Per-call fee more profitable than flat-rate for ATIS info, but demand is highly elastic (38% will pay \$2.50/mo), and costs far exceed potential revenue. Results not generalizable beyond Boston.	v			v (no specific group)	Phone SP survey of SmarTraveler users and non.	Boston area N = 442 users, 220 non-users
Polydoropoulou <i>et al.</i> 1996	Expected delay, alt. rte. travel time, congestion level, and info quality (predictive and prescriptive best) increase route changes.		v	v		SP & RP Survey of automobile commuters	Golden Gate N = 1492
Thakuriah & Sen 1996	Assuming perfect information, dynamic ATIS useful only under congestion and with alt routes available.		v	v		Driving simulation	
Yang <i>et al.</i> 1998	Drivers familiar with area prefer less detail, audible info including expected delays en-route. Those unfamiliar want alternate route with travel time and route guidance.			v		Driver simulation	W. Lafayette, IN N = 20

**Table 2A: Descriptive Statistics for Socioeconomic Variables**

Variable Name	Description	Question Asked to Whom	$\mu$	$\sigma$	n	Measure	Effect on WTP (hypo) <sup>1</sup>	Rationale for to Willingness to Pay
Gender	Gender of Respondent	All	.48	--	1000	1 = male 0 = female	+/-	Included to describe population
Residency	Length of residency in the Bay Area	All	26.51	17.05	932	Continuous Variable	+	Familiarity with the area increases willingness to use alternate routes
Employed	Respondent employed for pay	All	.73	--	1000	1 = Employed 0 = Not employed	+	Those who work are more sensitive to delays
College	Respondent graduated from college	All	.46	--	956	1 = College graduate 0 = Not a college graduate	+	Those with college degrees are used to technology. This variable may interact with income.
Minority	Respondent is self-described as non-white	All	.28	--	910	1 = Non-White 0 = White	+/-	Included to describe population
Age	Age of respondent	All	44		931	Continuous Variable	-	Older respondents are less likely to adopt new technology
Income	Annual income reported by respondent	All	64.45	32.42	762	Midpoints of categorical variable used to make continuous variable	+	Those with more disposable income are more willing to pay for info

<sup>1</sup>Hypothesized relationship to Willingness to Pay

**Table 2B : Descriptive Statistics for Contextual Variables**

Variable Name	Description	Question Asked to Whom <sup>1</sup>	$\mu$	$\sigma$	n	Measure	Effect on WTP <sup>2</sup>	Rationale for to Willingness to Pay
Commute	Respondent commutes to work or school	All	.70	--	999	1 = commute 0 = no commute	+	Commuters are likely to be more sensitive to delay
Mode	Most frequent mode of travel	All	--	--	1000	1 = drive alone (78%) 2 = motorcycle (0.6%) 3 = carpool (7%) 4 = transit (8%) 5 = combination (7%)	+	Auto travelers likely more WTP b/c driving is usually less predictable & has more alternate routes
Distance	Mileage (one-way) of typical drive	AC, ANC	16.91	18.26	829	Continuous Variable	+	Those who travel farther have more exposure to possible congestion, and may have more alternate routes
Time	Minutes (one-way) of typical drive	AC, TC, ANC	28.85	23.31	934	Continuous Variable	+	Longer travel time creates greater potential savings from information
Congestion	Ever experience unexpected congestion	AC, ANC	.64		284	1 = yes 0 = no	+	Those that never experience unexpected delays have no need for real-time information
FreqInfo	Frequency get traffic info from any source	All			1000	1 = Every time (19%) 2 = Most of the time (13%) 3 = Some of the time (19%) 4 = Only when expecting a problem (15%) 5 = Never (33%)	+	The more often people use information currently available, the more likely they are to pay for more detail
Gotinfo	Ever got traffic information from fax, internet, roadside sign, pager, other	All	.39	--	1000	1 = ever received information 0 = never received information	+	People who have used technology to receive information in the past are more likely to pay to do so in the future

<sup>1</sup> AC = auto commuter, ANC = auto non-commuter, TC = transit commuter, TNC = transit non-commuter

<sup>2</sup> Hypothesized relationship to Willingness to Pay

**Table 3A: Willingness to Pay for ATIS**

Payment Amount	Respondents Willing to Pay	Percent of Valid Responses Willing to Pay Price	Percent of Total Respondents Willing to Pay Price
\$0 Per Month	153	31.9%	15.3%
\$3 Per Month	81	16.9%	8.1%
\$5 Per Month	61	12.7%	6.1%
\$7 Per Month	185	38.5%	18.5%
\$0 Per Call	30	6.3%	3.0%
\$0.25 Per Call	40	8.3%	4.0%
\$0.50 Per Call	99	20.6%	9.9%
\$0.75 Per Call	59	12.3%	5.9%
\$1.00 Per Call	252	52.5%	25.2%

N = 480 for both the monthly and per-call series

N = 1000 total (all respondents)

**Table 3B: Willingness to Pay for ATIS**

Payment Type	Number Preferring	% Responses	% Stating Preference
Monthly	110	18%	23%
Per-Call	371	60%	77%
Would Not Use ATIS	143	22%	--

N = 624

**Table 4A: Socioeconomic Factors and Willingness to Pay**

Charge →	Monthly Subscription								Per-Call Charge									
	Will Not Pay for ATIS		Pay \$3		Pay \$5		Pay \$7		Will Not Pay for ATIS		Pay \$0.25		Pay \$0.50		Pay \$0.75		Pay \$1.00	
	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N
<b>Men</b>	25.6	227	74.4	227	61.9	223	54.6	224	8.4	227	91.6	227	81.1	227	57.7	227	47.1	225
<b>Women</b>	37.5	253	62.5	253	43.2	250	33.7	252	4.3	253	95.7	253	89.3	253	70.9	254	57.9	252
<b>Employed</b>	31.6	393	68.4	393	52.4	389	39.9	391	5.6	393	94.4	393	85.2	393	63.2	394	51.4	391
<b>Not Employed</b>	33.3	84	66.7	84	50.0	84	34.1	85	9.2	87	90.8	87	86.2	87	71.3	87	59.3	86
<b>College Educated</b>	31.9	226	68.1	226	50.7	225	38.7	225	6.2	226	93.8	226	84.1	226	61.7	227	51.3	226
<b>Not College Educated</b>	31.7	246	68.3	246	53.8	240	39.3	244	6.1	246	93.9	246	87.0	246	67.5	246	54.5	244
<b>White</b>	33.7	326	66.3	326	49.4	322	36.5	323	4.9	326	95.1	326	87.5	327	66.7	327	56.3	325
<b>Minority</b>	28.0	132	72.0	132	58.1	129	43.9	132	8.3	132	91.7	132	82.4	131	61.4	132	47.3	131
<b>Income &lt; 30k</b>	32.4	71	67.6	71	50.0	70	31.4	70	4.2	71	95.8	71	83.1	71	62.0	71	50.0	70
<b>Income 30-60</b>	41.5	108	68.5	108	51.9	106	40.7	108	5.6	108	94.4	108	88.9	108	63.9	108	49.5	107
<b>Income &gt;60k</b>	29.3	222	70.7	222	55.5	220	42.1	221	7.2	222	92.8	222	84.2	222	63.7	223	53.4	223

\*Those not stating a willingness to pay the minimum amount asked (\$3/month or \$0.25/call) are listed as not willing to pay for ATIS

\*\* The percentages listed above represent the percent of respondents willing to pay the amount listed in the column *or any larger amount*

**Table 4B: Contextual Factors and Willingness to Pay**

Charge →	Monthly Subscription								Per-Call Charge									
	Will Not Pay for ATIS		Pay \$3		Pay \$5		Pay \$7		Will Not Pay for ATIS		Pay \$0.25		Pay \$0.50		Pay \$0.75		Pay \$1.00	
	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N
<b>Auto</b>	32.8	369	67.2	369	50.8	364	38.9	367	7.3	369	92.7	369	84.1	370	64.9	370	53.7	369
<b>Transit</b>	26.3	34	73.7	34	44.1	34	29.4	34	0	34	100	34	88.2	34	70.6	34	47.1	34
<b>Carpool</b>	38.2	38	61.8	38	62.2	37	44.7	38	7.9	38	92.1	38	81.1	37	47.4	38	36.8	38
<b>Got Info</b>	31.2	231	68.8	231	51.1	227	36.2	229	5.6	231	94.4	231	86.6	232	62.5	232	51.1	231
<b>No Info</b>	32.5	249	67.5	249	52.8	246	41.3	247	6.8	249	93.2	249	84.3	248	66.7	249	54.5	246
<b>Travel &lt; 5 miles</b>	45.1	102	54.9	102	36.0	100	33.3	102	5.9	102	94.1	102	89.2	102	68.6	102	57.4	101
<b>Travel 6-15 miles</b>	33.3	126	66.7	126	50.4	125	33.1	124	6.3	126	93.7	126	84.9	126	67.5	126	56.3	126
<b>Travel &gt;15 miles</b>	24.0	171	76.0	171	62.3	167	46.5	170	9.4	170	90.6	170	81.2	170	56.1	171	45.0	171
<b>Unexpected Congestion</b>	38.1	63	61.9	63	35.3	62	23.8	63	7.8	64	92.2	64	87.5	64	68.8	64	55.6	63
<b>No Congestion</b>	51.3	39	48.7	39	36.8	38	31.6	38	10.3	39	89.7	39	82.1	39	64.1	39	56.4	39
<b>Commute</b>	30.8	360	69.2	360	53.1	354	40.6	357	6.1	359	93.9	359	84.4	359	63.1	360	50.3	358
<b>No Commute</b>	35.3	119	64.7	119	48.3	118	33.1	118	6.7	120	93.3	120	88.3	120	69.2	120	60.2	118

\*Those not stating a willingness to pay the minimum amount asked (\$3/month or \$0.25/call) are listed as not willing to pay for ATIS

\*\* The percentages listed above represent the percent of respondents willing to pay the amount listed in the column *or any larger amount*



**Table 5: Willingness to Pay for Desired Content**

Charge →	Monthly Subscription								Per-Call Charge									
	Not Willing to Pay		Pay \$3		Pay \$5		Pay \$7		Not Willing to Pay		Pay \$0.25		Pay \$0.50		Pay \$0.75		Pay \$1.00	
	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N
1	70	27	30	27	19	27	15	27	15	27	85	27	78	27	63	27	56	27
2	40	63	60	63	36	62	27	62	8	63	92	63	79	63	58	63	44	62
3	42	137	60	137	42	134	26	135	6	137	94	137	87	137	65	137	49	135
4	23	155	77	155	62	154	46	154	3	91	97	156	91	155	72	156	61	155
5	15	93	85	93	70	91	60	93	8	82	92	92	82	93	58	93	51	93

\* The percentages listed above represent the percent of respondents willing to pay the amount listed in the column *or any larger amount*.

FIGURE 1: Broad Area Survey Structure

Wolinetz, Khattak & Yim



