Willingness To Pay for Advanced Traveler Information Systems
SmarTraveler Case Study

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The issue of travelers' adoption of an advanced traveler information system (ATIS) and willingness to pay for such information services is addressed. A case study is presented of SmarTraveler, an ATIS that provides, via telephone, real-time location-specific traffic and transit information in the greater Boston area. The model is an integrated system of discrete choice and latent variable models. It predicts travelers' frequency of use and subscription under varying pricing scenarios. Two models are presented: one for current SmarTraveler users, and one for nonusers. The SmarTraveler usage rate is modeled as a function of payment method and pricing, travelers' travel and socioeconomic characteristics, and their attitudes and perceptions toward ATIS. The data used in model estimation included willingness-to-pay scenarios involving two methods of payment: a flat monthly fee, and a charge per call. It was found that for nonusers, the higher the expected benefit from an ATIS, the higher the willingness to pay. This expected benefit is a latent variable indicated via the importance placed by individuals on ATIS attributes such as reliability, relevance, and coverage. For users, the utility of SmarTraveler is affected strongly by the users' level of satisfaction with the service. A modeling framework is developed that captures response biases and presents figures on willingness to pay for an innovative ATIS actually implemented in the market.

The introduction of new advanced traveler information system (ATIS) products and services will create a unique market situation; initially, travelers will lack the information with which to effectively evaluate these products for possible adoption. Such complexity creates difficulties for institutions that must decide whether to invest heavily in developing new technologies and products long before they can be launched (*1*,*2*). Assessing the extent of adoption and willingness to pay in an uncertain product environment are particularly challenging problems for the ATIS program (*3*–*6*).

The purpose of the case study presented in this paper is to develop and estimate a statistical model system that captures the willingness to use ATIS under different pricing scenarios, using data collected for the SmarTraveler test market.

Attitudes toward travel information characteristics and perceptions of the service attributes are incorporated in the modeling framework to better predict travelers' tendency to adopt new technologies and become lead users. Travelers' importance ratings of service attributes and satisfaction ratings of SmarTraveler are used as indicators of the latent constructs conceptualized in our models.

In the absence of revealed preference (RP) data to capture travelers' decisions to access innovative or unimplemented ATIS, stated preference (SP) data can be used to determine willingness to pay for such services. However, SP data have inherent biases stemming from the respondents' lack of familiarity with the information sources. On the basis of the decision protocols respondents adopt while completing SP experiments, such biases include (*7*)

1. Prominence bias: when the respondents consider only the most important attribute of the service in their choice (for example, price);
2. Inertia or justification bias: when the respondents' answers in the SP experiments are influenced by their actual choice;
3. Policy response bias: when the respondents' choice reflects an opinion statement for their own benefit, such as receiving a service for free;
4. Noncommitment bias: when respondents overstate their willingness to pay for new products or services since there is no actual payment involved;
5. Cognitive dissonance bias: when respondents have associated a product or a service with zero price and are unable to assess its true value when asked their willingness to pay.

The proposed modeling framework attempts to capture the potential response to two methods of payment and account for such response biases. The authors use SP data from both current SmarTraveler users and nonusers, compare the results of each group, and draw conclusions on the validity of the estimation results.

SURVEY DATA AND DESCRIPTIVE STATISTICS

Two data sets are used in this study. The first data set corresponds to a survey of a random sample of users conducted in 1994 (*8*). Users were intercepted during a call to SmarTraveler and subjected to a screening survey that identified those willing to participate in a comprehensive survey. The users' survey covered a sample of land-line, NYNEX cellular, and Cellular One telephone users. The users were first asked their current frequency of use of SmarTraveler (when the service is free). Two pricing structures were presented. In the first pricing structure, SmarTraveler service is made available on a per-call service charge basis. In the second pricing structure, SmarTraveler service is available for a monthly subscription fee; the subscriber may make as many calls as desired without a per-call service charge. For each of the pricing structures, the respondents were asked their potential frequency of use and willingness to subscribe to the service under different pricing scenarios. Data from 442 respondents are used for modeling the willingness to use and subscribe to SmarTraveler.

The second data set consists of a sample of nonusers who were introduced to SmarTraveler and asked questions about their potential

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adoption of the service. SmarTraveler was introduced to a randomly selected group of travelers who were either unfamiliar with the service or aware of it but had never used it. SmarTraveler was presented as a government supported, privately operated telephone service that provides "continually updated traffic and transit information." Travelers were informed of the service's geographic coverage and its hours of operation. Furthermore, it was made clear to them that SmarTraveler provides information about congestion, accidents, construction areas, and estimated travel times between key intersections but does not suggest alternative routes when travel conditions are bad. No information was given on the accuracy or reliability of the service. Travelers who expressed an interest in trying the service were then introduced to the concept of SmarTraveler service being partially supported by usage charges. As in the nonusers' survey, they were then asked their frequency of use and willingness to subscribe to the service under different pricing scenarios. Data from 220 respondents are used in modeling the potential behavior of nonusers.

Willingness To Use and Subscribe to SmarTraveler

This section presents the summary statistics of the data. As mentioned earlier, two alternative methods of payment to the SmarTraveler service were introduced: a measured pricing structure, and a flat-rate pricing structure.

For the measured pricing structure, respondents were asked their usage rates under different service charge scenarios. Four response categories for usage rates per week were allowed: less than 1 call, 1 to 4 calls, 5 to 9 calls, and 10 or more calls. Table 1 presents the descriptive statistics of usage rates for different pricing scenarios.

It must be noted that at the time of data collection, the service was free for NYNEX cellular phone users (free air time). For all other users (including Cellular One users and land-line users), the usage charge was equal to the cost of a phone call. The 0c column corresponds to the current average usage rate when the service is free.

In the flat-rate pricing structure, respondents were asked their willingness to subscribe to the service. Four response categories for subscription likelihood were allowed: very unlikely, somewhat unlikely, somewhat likely, and very likely. Table 2 presents the descriptive statistics of subscription likelihood under different pricing scenarios.

As expected, as the usage charge or the monthly subscription fee increases, the willingness to use or subscribe to the service decreases. Furthermore, nonusers may tend to overstate their willingness to use or subscribe to the service, whereas users are reluctant to accept new charges for using SmarTraveler. This suggests response biases inherent in such experimental settings. Nonusers are introduced to a new ATIS in the market, and hence are unfamiliar with certain attributes of the service and consequently overestimate willingness to pay (noncommitment bias). Conversely, those who currently use the service for free may try to express their reluctance to pay through their responses. The individuals attempt to influence policy through their responses—in this case, the policy of continuance with free service. Furthermore, cognitive response bias might also influence users' responses: users have associated the service with "zero" price as the reference point and therefore cannot reliably evaluate the willingness to pay. The reference alternative has been found to affect strongly the choices of the individuals in market research literature (*9*). On the other hand, users who are familiar with the attributes of the service may be able to provide more reliable responses than nonusers.

Characteristics of Users and Nonusers

Table 3 gives the descriptive statistics of respondent characteristics. Note that the only travel-related information available in the users' survey is trip-specific. This information cannot be used for the authors' modeling purposes, since it does not represent the general travel pattern of the travelers and therefore is not reported in this case study. Furthermore, the only travel characteristic that was asked of the nonusers was the number of trips conducted on highways. The average number of one-way trips per day conducted on highways is 2.16, with a standard deviation of 2.01. It is observed that the socioeconomic characteristics of nonusers and users are different. Compared with nonusers, users have a higher level of cellular phone ownership and higher income.

Attitudes and Perceptions

This section presents descriptive statistics of responses to select perceptual and attitudinal questions for users and nonusers.

User Perceptions

Table 4 presents the users' level of satisfaction with some of the attributes of SmarTraveler. For each of the attributes, respondents were asked to provide a satisfaction rating on a scale of 1 to 10, 1 representing *extremely dissatisfied* and 10 representing *extremely satisfied*.

Nonuser Attitudes

Table 5 presents the nonusers' attitudes toward the attributes of a travel information service. The respondents were given a list of attributes and were asked to rate the importance of each attribute on a scale of 1 to 10, 1 representing *not important at all* and 10 representing *extremely important*.

TABLE 1 Usage Rates Under Alternative Scenarios

	Non-Users % (220 respondents)			Users % (442 respondents)				
Service Charge (cents/call)	**10c**	**25c**	**50c**	**0c**	**10c**	**25c**	**35c**	**50c**
less than 1 call per week	43	58	72	10	29	49	64	74
1 to 4 calls per week	32	30	24	40	42	36	28	21
5 to 9 calls per week	19	11	3	32	24	13	7	5
10 or more calls/week	6	1	1	18	5	2	1	0

TABLE 2 Subscription Likelihood Under Alternative Scenarios

	Non-Users % (220 respondents)				Users % (442 respondents)					
Subscription Fee ($/month)	**$2.5**	**$5**	**$10**	**$15**	**$2.5**	**$5**	**$10**	**$15**	**$20**	**$25**
very unlikely	48	58	71	80	39	65	84	93	97	98
somewhat unlikely	11	15	15	13	18	12	7	3	1	1
somewhat likely	24	19	10	6	20	12	6	3	1	0.5
very likely	17	8	4	1	23	11	3	1	1	0.5

A traveler placing high importance on the attributes may suggest high expected benefits from an ATIS. It is presumed that the driving force influencing these importance ratings is the travel pattern of the individuals. Therefore, if an ATIS has the aforementioned attributes, and these attributes are very important to the traveler, then the attractiveness and the perceived benefits of such an ATIS will be high. The four attributes in Table 5 correspond to the description of the SmarTraveler service as introduced to the nonusers.

MODELING FRAMEWORK

This section presents separate frameworks for modeling the willingness to use or subscribe to SmarTraveler under different pricing scenarios for users and nonusers. A description of the model system equations can be found in work by Polydoropoulou (*10*).

Modeling Framework for Nonusers

For a traveler to use SmarTraveler, the service should have features or attributes that differentiate it from other traffic information sources, and these attributes should be perceived as important. In the case of SmarTraveler, these attributes reflect, from a traveler's perspective, the perceived benefits of information. The overall benefit includes the notion of acquiring up-to-the-minute traffic information that meets the traveler's needs and covers the routes he or she is interested in and at the desired time of travel. Such information is not available from existing traffic information sources, such as radio and television. On the other hand, there are costs (usage charge or subscription fee) that may be associated with a more advanced traveler information service such as SmarTraveler. Consequently, the valuation of the SmarTraveler service entails cost-benefit analysis. Figure 1 emphasizes the cost-benefit trade-off made while evaluating the SmarTraveler service, in terms of ascertaining the perceived value or utility of the service. In the figure, ellipses represent constructs that are not directly observable, and hence are called latent variables, and rectangles represent observable variables (either explanatory variables or indicators of aforementioned latent variables).

It is assumed that an individual's socioeconomic and travel characteristics affect his or her perception of the benefit of information. This benefit is directly unobservable and so is construed as a latent variable. Perceived benefit is assumed to be reflected through importance ratings of attributes of travel information, including

- Availability on demand,
- Availability at all times,
- Up-to-the-minute information, and
- Detailed travel time, construction, and congestion information.

Consequently, these responses form the indicators of the benefit latent variable. These responses also match the description of the SmarTraveler service that was presented to the respondents. The response categories for the indicators range from 1 to 10, permitting the adoption of a latent variable model with continuous indicators.

The authors assume that each traveler has an underlying utility for the SmarTraveler service. This utility is a function of the service attributes such as the benefit of information provided by SmarTraveler, service charge and method of payment. Since utility is not directly observable, it is conceptualized as another latent

TABLE 3 Characteristics of Users and Nonusers

Variable Name	**Non-Users % (220 obs)**	**Users % (442 obs)**
Infoseeker	80	--
Unaware of SmarTraveler	57	--
Cellular phone ownership	35	54
NYNEX	--	42
Cellular One	--	12
Gender (male)	56	69
Income		
< $30,000	15	9
$30,000-$50,000	29	20
$50,000-$75,000	24	30
> $75,000	32	41
Age		
less than 25 years old	13	6
25 to 35 years old	31	32
35 to 55 years old	45	56
> 55 years old	11	6

TABLE 4 Satisfaction Ratings of SmarTraveler Attributes

Attribute	**Mean**	**Std. Dev.**
Ease of use	9.06	1.57
Up to the minute information	8.31	2.01
Availability on demand	9.24	1.49
Accuracy of information	8.09	1.85
Detailed travel time, construction, and congestion information.	8.32	1.79
Suggestion of alternative routes	6.61	2.35
Availability at all times	8.62	2.05
Coverage of major routes	8.93	1.55
No charge for use	9.76	0.97
Overall satisfaction with SmarTraveler service	8.65	1.44

TABLE 5 Importance Ratings of Traffic Information

Attribute of a Travel Information Service	Mean	Std. Dev.
Availability on demand	7.82	2.42
Availability at all times	7.83	2.44
Up to the minute information	8.64	1.93
Detailed travel time, construction, and congestion information	7.75	2.29

variable. The responses to the alternative pricing scenarios serve as indicators of the utility.

All attributes of SmarTraveler are held constant except for the service charge in the measured pricing scenarios and the subscription fee in the flat-rate pricing scenarios. It is expected that the willingness to use or subscribe to the service will decrease as the price levels increase. Affecting the traveler's utility are socioeconomic characteristics such as income and cellular phone ownership. For example, the authors expect the usage rate or subscription likelihood to increase with income. Travel pattern includes frequency of travel on highways covered by SmarTraveler, and so on. The authors also expect individuals who travel often on highways covered by SmarTraveler to value the information more than others.

Modeling Framework for Users

Figure 2 presents the modeling framework for users' willingness to use or subscribe to SmarTraveler under different pricing scenarios. It is very similar to the nonusers' framework. Herein, instead of the benefit latent variable conceptualized in the nonusers' framework, the construct Overall Satisfaction with SmarTraveler is considered a latent variable influencing the utility of the service. The authors assume that a user's socioeconomic characteristics affect his or her perceived satisfaction with SmarTraveler information.

Overall satisfaction is assumed to be manifested in responses to questions related to satisfaction, which include

- Ease of use;
- Up-to-the-minute information;
- Availability on demand;
- Accuracy of information;
- Detailed travel time, construction, and congestion information;
- Suggestion of alternative routes;
- Availability at all times;
- Coverage of major routes;
- No charge for use; and
- Overall satisfaction with SmarTraveler service.

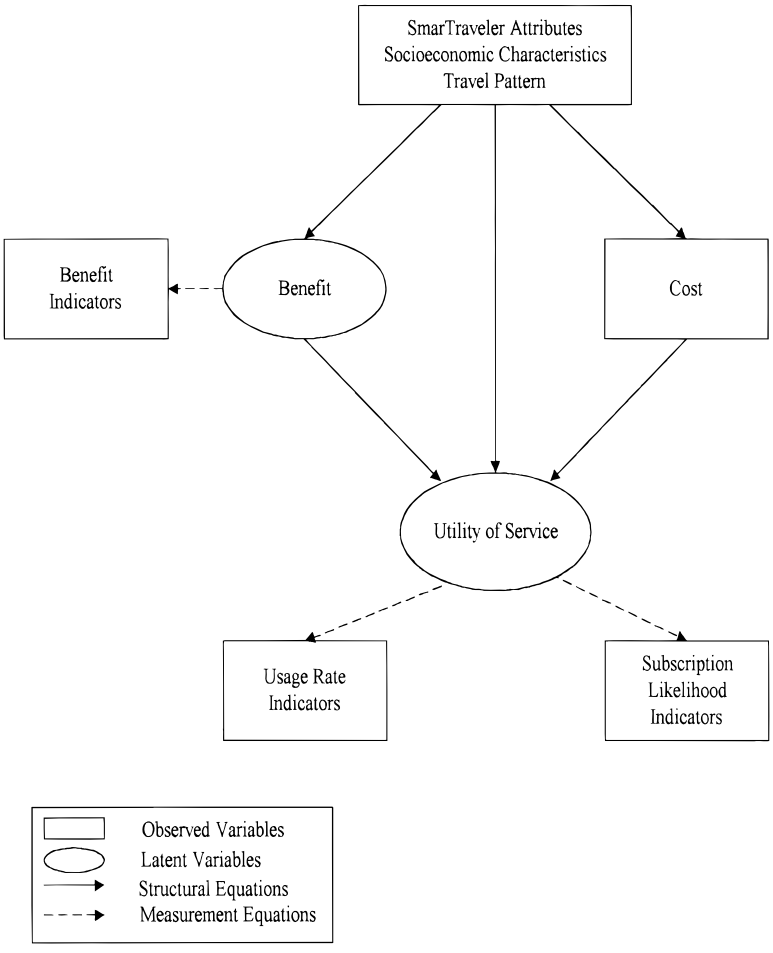

FIGURE 1 Nonusers' willingness to use or subscribe to SmarTraveler.

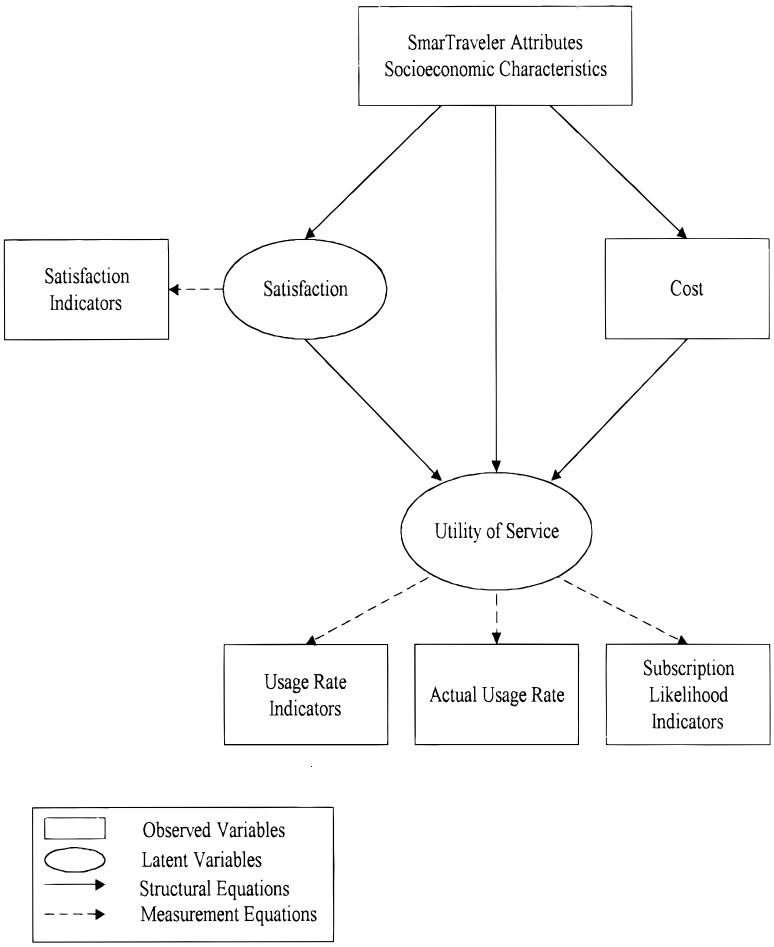

FIGURE 2 Users' willingness to use or subscribe to SmarTraveler.

These responses form the indicators of the satisfaction latent variable. The response categories for the indicators range from 1 to 10, where 1 denotes extremely dissatisfied and 10, extremely satisfied. The utility of SmarTraveler is affected by a user's level of satisfaction with the service, the service charges, and the user's socioeconomic characteristics. It is expected that the higher the user's satisfaction with the service attributes, the greater the user's willingness to pay.

MODEL ESTIMATION AND APPLICATION RESULTS

In this section the authors present an overview of the estimation results for nonusers and users and findings from the application of the models.

Nonuser Estimation Results

Utility

For both methods of payment, the willingness to use or subscribe to the service decreases as the price increases. If the insurance value of the flat-rate pricing structure is ignored, the implied number of calls to SmarTraveler (or desired calling frequency), calculated as the trade-off between subscription and charge per call, is 32. This suggests that individuals may call approximately once a day. This compares to the actual usage pattern of SmarTraveler users, who primarily call for information on their return trips from work to home (*8*).

As income increases to $75,000, the willingness to use the service increases. However, the willingness to use SmarTraveler drops slightly for travelers with incomes greater than $75,000. As expected, as the perceived benefit increases, willingness to pay for the service increases as well.

Travelers who were aware of SmarTraveler are less willing to pay for the service than those who were unaware before the experiment. This captures the response biases inherent in the SP experiment. It can be interpreted as justification bias (the individual justifying market behavior of never using SmarTraveler) or inertia bias (the individual was aware of SmarTraveler's existence but never actually used the service and is not willing to do so in the future).

Benefit

As income increases, so does the perceived benefit of travel information. Compared with men, women perceive higher benefit. The expected benefit of SmarTraveler is higher for individuals who own

a cellular phone. These travelers can use the service en route when they actually encounter traffic, or before a decision point.

Users' Model Estimation Results

Utility

The higher the subscription or usage charge, the less likely the individuals were to use the service. The implied calls per month derived from the trade-off between subscription rate and charge per call is 25. This suggests that, on average, users make 25 calls a month, which is slightly less than the corresponding figure for nonusers. One would have expected that SmarTraveler users, familiar with the attributes of the service, would tend to use the service more often than nonusers. Herein the coefficients of income are monotonically increasing, as expected, and as the income increases, the utility of SmarTraveler increases. The coefficient of the satisfaction variable is positive and significant, indicating that the higher the travelers' satisfaction, the higher the utility of the service.

Satisfaction

Women are more satisfied with SmarTraveler attributes than men are. Overall, land users are more satisfied than cellular phone users. Cellular One phone users are the least satisfied with the service.

Sensitivity Analysis

The authors present the application results of the willingness to use or to subscribe to the SmarTraveler service. There are three graphs for each method of payment, and for users and nonusers. The first presents the probabilities of usage rate indicator or subscription likelihood indicator for different price levels. The second presents the average number of calls per week or subscription probability for different price levels based on the assumptions of expected number of calls in each response category. The third presents the elasticity of the average number of calls per week or subscription probability for different price levels. The authors are interested in identifying the unit elastic point where the service provider maximizes its revenue, since the marginal cost of using the service is assumed to be zero.

The authors further vary the satisfaction and perceived benefit of individuals and observe how the price elasticity changes. Changes on the level of satisfaction could result from the following:

1. *Improvement of the service attributes*. For example, up-to-the-minute information is a very important attribute; it influences the reliability of the service. Newspaper articles have reported occurrences of SmarTraveler providing information that does not correspond to the actual traffic conditions. These incidents create bad experiences for users of the service and generate negative word of mouth, which can be detrimental for a new service in the market.
2. *Changes of perceptions of attributes of the service.* For example, there are major misconceptions about the service's hours of operation and the way in which SmarTraveler collects its data. The result of the first case is a very high number of phone calls at times when the service does not operate. The second case results in travelers who do not know about SmarTraveler's relative advantage over radio and television traffic reports.

Changes in the perceptions of benefit could be attributed to exogenous factors such as

1. Promotional advertising of the potential benefits of ATIS, and
2. Education of travelers via articles or other informational media on the importance of traffic information acquisition.

Measured Service

Measured service graphs present the probabilities of usage rates under alternative charges per call, and the number of calls per week for different charges (in cents) per call. The latter is accompanied by another graph presenting the price elasticity for each charge per call.

Nonusers Figure 3 shows the nonusers' probabilities of usage rates, frequency of use, and demand elasticity for measured service.

For 10 cents a call, nonusers are willing to make 2.3 calls per week. The point at which the elasticity takes the value of –1 is the point at which demand turns from inelastic to elastic and at which the revenue is maximized. For the nonusers, this point occurs at a service charge of approximately 50 cents. Under the scenario that all individuals perceive a maximum benefit from using ATIS, for 10 cents per call, the demand increases to 3.2 calls per week. No change is observed in the unit elastic point.

Users Figure 4 shows the users' probabilities of usage rate levels, frequency of use, and demand elasticity for measured service. Under no charges, users may make 4 calls a week (compared with the average number of calls in the RP data, which is 5.4 per week). For 10 cents per call, users are willing to make 3 calls per week. This is higher than the 2.3 calls per week of the nonusers, and is as expected since users can evaluate the service better than nonusers. Furthermore, the demand curve has a steeper slope than the nonusers' curve. This indicates users' reluctance to admit that they would be willing to pay high service charges. The unit elastic point is 40 cents, which is less than that of nonusers. Under the scenario that all users are extremely satisfied with the service, for 10 cents per call the demand increases to 4.8 calls per week. No change is observed in the unit elastic point.

Flat-Rate Service

Flat-rate service graphs present the subscription probabilities of each response category calculated on the basis of equations, and the subscription likelihood for the SmarTraveler service for different monthly charges (in dollars), calculated using equations. Each of the latter figures is accompanied by a graph presenting the price elasticity for alternative monthly subscription fees.

Nonusers Figure 5 shows the nonusers' subscription likelihood indicator probabilities, subscription likelihood, and demand elasticity for flat-rate service. For a $2.50/month subscription fee, there is a 33 percent probability of subscription to the service. The unit elastic point for the nonusers is $11/month. Under the scenario that all individuals anticipate a maximum benefit from ATIS, for $2.50/month the subscription probability increases to 38 percent.

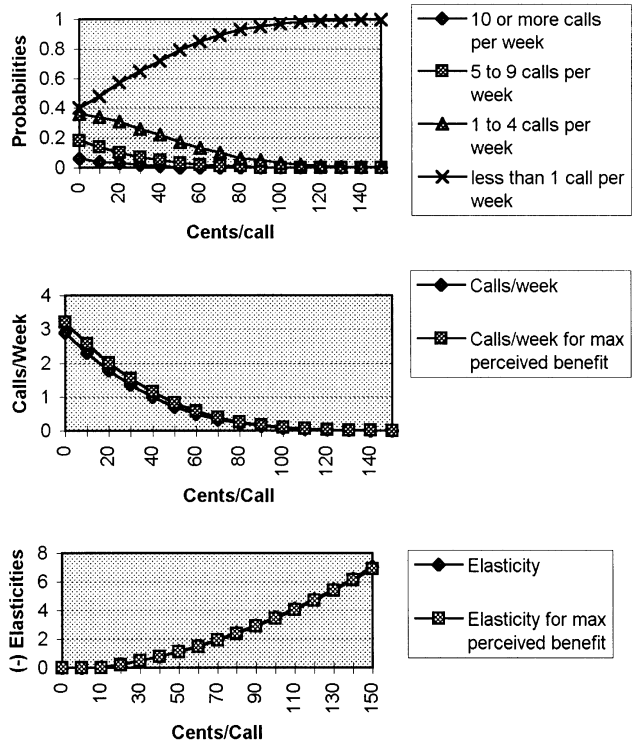

FIGURE 3 Nonusers' probabilities (*top*), frequency of use (*middle*), and demand elasticity (*bottom*) for measured service.

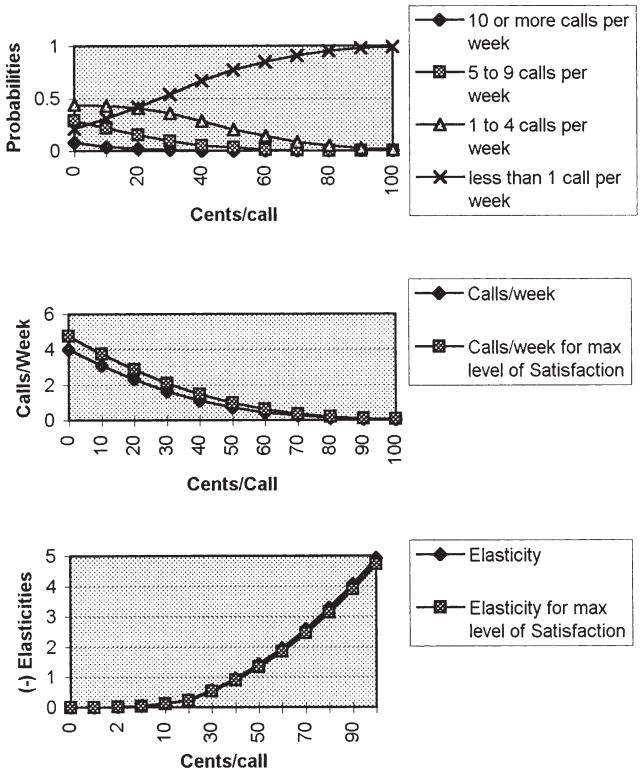

FIGURE 4 Users' probabilities (*top*), frequency of use (*middle*), and demand elasticity (*bottom*) for measured service.

Users Figure 6 shows the users' subscription likelihood indicator probabilities, subscription likelihood, and demand elasticity for flat service. For a $2.50/month service charge, there is a 37 percent probability of subscription to the service. The unit elastic point for the users is $9/month. As in the previous case, the users' curve has a steeper slope than the nonusers' curve. Under the scenario that all users are extremely satisfied with the service attributes, for $2.50/month the probability of subscription increases to 45 percent. However, the unit elastic point in this case is $10.

Impact of Perceived Benefit

The results indicate that an increase in the perception of expected benefit from an ATIS has minimal effect on nonusers' willingness to pay for SmarTraveler. This could be explained as follows. The individuals who were recruited for pricing scenarios were the ones who expressed an interest in the SmarTraveler service. Therefore, it is presumed that these individuals a priori expected a high benefit from using the service. It is a segment of the population that would be the early adopters of the service. However, it is believed that if a similar survey were administered to the general population, the model system would be able to capture the perceptual differences of the population and the effect of expected benefit in the willingness to pay could be significant.

Impact of Satisfaction Level

Users who responded to the pricing scenarios were randomly selected among callers to the SmarTraveler service. Therefore, the sample of users is representative of the user population. For the measured service, if all the users were extremely satisfied with SmarTraveler, the service would receive on average two extra phone calls per week, for charges up to 40 cents a call. For the flat service, assuming that all users have the maximum level of satisfaction with the service, the subscription probability increases on average by 10 percent for monthly fees up to $10. Therefore, it was demonstrated that satisfaction level significantly affects the willingness to pay for the SmarTraveler service.

Discussion of Model System

An important issue for consideration is the quality of the data collected. Response biases are inherent in all SP experiments. In practice, in the case of new products in the market, there exist correction factors to adjust the amount of response bias in willingness-to-pay experiments (*9*). The absence of a perfect match between the attitudinal and perceptual data in the users' and nonusers' data sets—for example, there are satisfaction ratings for users but for nonusers, importance ratings for service attributes—precludes the development of a single combined model for users and nonusers. Such a combined model could systematically capture the response biases of users compared with nonusers, and vice versa.

Since one cannot assess the magnitude of response bias for users and nonusers, it is useful to compare the results obtained for the two groups of travelers. The authors actually do not observe any extreme differences among the users' and nonusers' usage rates or subscription likelihood. This renders confidence that the predicted demand figures are realistic.

Another issue worthy of discussion is the SP experiment. In the experimental setup, the only attribute of the service that varies is

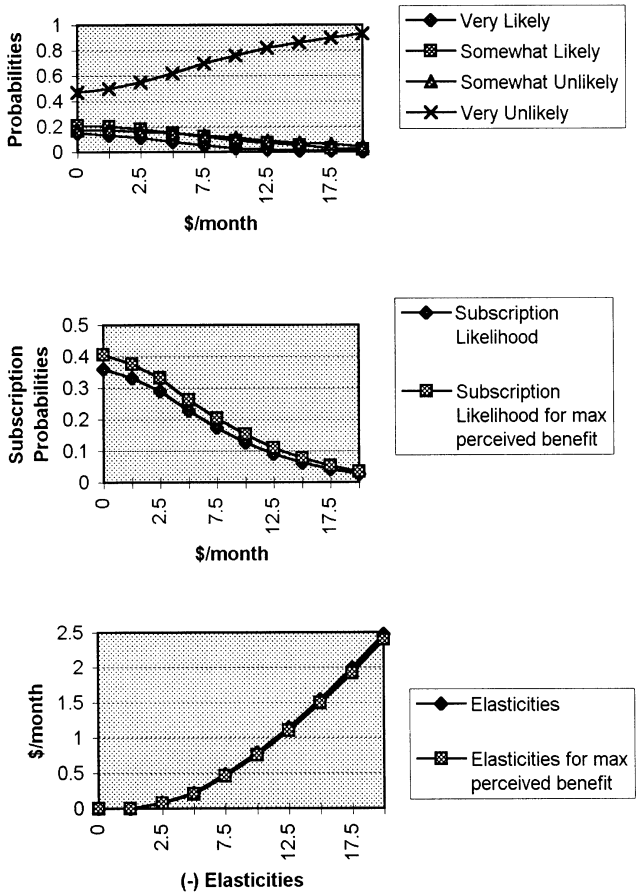

FIGURE 5 Nonusers' probabilities (*top*), subscription likelihood (*middle*), and demand elasticity (*bottom*) for flat-rate service.

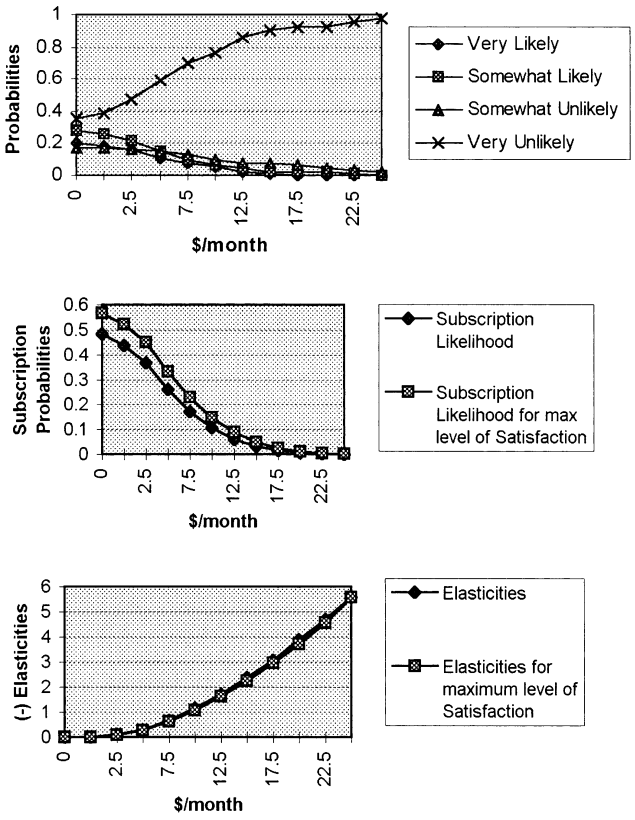

FIGURE 6 Users' probabilities (*top*), subscription likelihood (*middle*), and demand elasticity (*bottom*) for flat-rate service.

price. A more complete SP data collection effort would involve choice experiments with a more elaborate experimental design encompassing additional service attributes such as accuracy, reliability, and coverage (*11*). For the users, the effect of quality on willingness to pay is captured indirectly, via the satisfaction latent variable. Individuals have different levels of satisfaction that are used in the valuation of the service. The model predicts the willingness to pay under alternative satisfaction scenarios. For example, assuming all travelers are extremely satisfied with the service, it predicts the number of calls per week that they would make or the subscription likelihood under alternative pricing scenarios, as described earlier in the section. However, the current model cannot predict the willingness to pay for alternative ATIS offerings of varying quality levels.

Implications of Results

The modeling and analysis approach can be used by ATIS providers to

1. Set "optimal" prices for the service, including the method of charging customers. In the SmarTraveler case, it is possible to calculate demand for the service and the total revenue under the two alternative pricing structures. The authors found that the measured service would be more profitable than the flat-rate service. Furthermore, the calculated revenue is much lower than the total cost for operations and marketing as estimated by Multisystems, for 1994. Therefore, the service requires subsidization by the government and other private corporations. Although travelers' individual assessments of SmarTraveler's value are low, as reflected in their willingness to pay, the societal benefits of the ATIS service such as alleviation of traffic congestion, reduction of environmental impact, and a lessening of traveler anxiety may justify the need for governmental subsidies to finance such ATIS operations.
2. Assess the cost-benefit trade-off of improving the attributes of their service. In principle, by understanding the effect of each attribute on the users' willingness to pay, ATIS providers can alter service characteristics in order to increase the level of satisfaction. The providers may assess whether the service improvement is cost-effective.

However, note that the results obtained from the estimation and prediction of the model system are specific to the SmarTraveler ATIS in the Boston area, at the time of data collection. These results cannot be generalized for other types of ATIS. Many factors influence the willingness to pay for ATIS, such as the normal travel pattern of an individual, which depends on the transportation network under consideration. In any given city, travelers may have different needs for traffic information. Furthermore, the availability of competing ATIS offerings in the same market may influence the travelers' ATIS adoption decisions.

CONCLUSIONS

In this paper the authors presented a unique modeling framework for addressing travelers' willingness to pay for ATIS. The contribution to the state of the art is the following:

1. Actual figures of willingness to pay for the SmarTraveler service were presented. It was found that the number of calls per week and the subscription likelihood are strongly affected by the charge per call and monthly rates, respectively.
2. The authors calculated the trade-off in terms of number of calls between a measured service and a flat-rate service. Demand elasticities for different pricing scenarios were presented. The perceived importance of ATIS features—such as up-to-the-minute information, coverage, and availability—was quantified, and their influence on the travelers' preferences toward ATIS was measured. The effect of users' satisfaction on the willingness to pay for ATIS was also quantified.

Overall, it was found that travelers are very price sensitive to ATIS-related usage charges, and that demand is highly elastic.

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