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16. Abstract: Advanced Traveler Information Systems (ATIS) acquire, analyze, communicate, and present information for use in assisting surface transportation travelers in moving from a starting location to their desired destination (Strategic Plan for Intelligent Vehicle-Highway Systems in the United States, IVHS America 1992). The basic objectives of ATIS are to enhance the efficiency of travel, alleviate traffic congestion, minimize air pollution, and increase traffic safety. ATIS provides information both pretrip (through television, radio, telephone inquiry, kiosks and displays at terminals and interest points, and computer on-line services) and en-route (via traffic information broadcasting services, cellular telephone, radio, in-vehicle navigation systems, route guidance systems, and variable message signs), to assist tripmakers in trip planning and decision making with regard to destination selection, departure time, mode choice, route choice, congestion avoidance, and navigation to improve the efficiency of travel. In Texas, tourists (i.e., tripmakers unacquainted with the state) constitute an important user group for ATIS. Given that tourism represents a sizable industry and, consequently, has an enormous impact on the state's economy, technology that enhances the tourist's experience can help sustain this large industry. However, such enhancement requires that traveler guidance be adequately provided. While tourists provide the principal users for this study, the development of ATIS is best accomplished by a comprehensive ATIS development approach that considers all possible user types. In this study, a synthesis of pertinent ATIS implementation and field tests, including methodologies for evaluating systems/technologies, was performed. Interviews with district-level staff in Texas were conducted to define the focus issues and the target users within each locality. On-location surveys were conducted and statistically analyzed according to the specific information needs of users. The study identified candidate systems/technologies that match the information needs, technical regulations, legal constraints, and compatibility with ITS standards and systems in Texas. Possible public and private sector roles and cost/benefit analyses were performed to identify the leading candidate system/technology alternatives.			
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PROVIDING ADVANCE AND REAL-TIME TRAVEL INFORMATION TO TOURISTS: SAN ANTONIO CASE STUDY

by

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EXECUTIVE SUMMARY

With the increased deployment of Intelligent Transportation Systems (ITS), especially Advanced Traveler Information Systems (ATIS), there is a need to determine how this advanced technology can help unfamiliar travelers such as tourists plan and conduct their trips. In order to do so, we need to understand how these travelers plan and conduct their trips.

ATIS's analyze and communicate information to enhance efficiency of the travel, alleviate congestion, and increase safety. In Texas, tourists (unfamiliar tripmakers) constitute an important user group for ATIS. This study analyzes the behavior of travelers and determines their desires and preferences for information when planning and conducting trips to unfamiliar areas. The primary focus is on information requirements for tourists in San Antonio, Texas. In order to determine whether unique information requirements exist for tourists, it is necessary to understand tourists' needs and preferences for information when planning their trips. It is important to know what information items travelers like to obtain and their preferences regarding information display devices, in order to ascertain the ability of various ATIS's to satisfy these preferences. The principal objectives of this study are to understand the information search and trip-planning processes of travelers, specifically tourists, and to examine the role of personal and public pretrip and enroute information sources on selected vacation behavior. The principal focus is on travelers' behavior when planning their recreational trips, specifically with respect to the level of detail in formulating their plans.

To accomplish the above objectives, mail-back surveys were administered in the city of San Antonio, Texas. Surveys asked respondents about their visit to San Antonio, their preferences for information items and sources, their access to communication devices, and some demographics. Characteristics of respondents were analyzed using descriptive statistics. Respondents' attitudes toward trip planning were also analyzed using tests of independence of factors. A factor analysis was conducted to gain insight into the factors affecting the trip-planning behavior of travelers to San Antonio. The variables included in the factor analysis consisted of responses to questions regarding travelers' experience with recreational trips, their familiarity with San Antonio, and various demographic characteristics. Other questions included in the analysis addressed the time at which travelers made their hotel reservations and decided on specific destinations to visit in San Antonio. Attitudinal questions were also included in the analysis.

Travelers preferred to use travel information sources they have already used or known while planning or taking their trip. Travelers to San Antonio did not make frequent use of kiosks. Previous visitors to San Antonio were not likely to seek information on the locations of activity destinations. People who were traveling to San Antonio in cars looked for information on entrance fees, children's activities, and directions to locations. Travelers who called the destination directly also were more likely to consult the yellow pages and to watch television.

A cluster analysis was conducted with the intention of grouping survey respondents on the basis of the extent of prior planning that precedes a recreational trip. The analysis clearly distinguished planners from nonplanners, and helped identify factors associated with this behavior, as well as differing information needs. An ordered probit approach was used to study the level of detail in trip planning for two particular dimensions of trip planning behavior, namely the time at which hotel reservations were made and the time at which decisions on specific destinations were made. The corresponding questions in the survey provided the response variables for this analysis. The ordered probit approach provided insights into the determinants of travelers' decisions, and allowed the researchers to relate them to the tripmakers' characteristics, as well as to ascertain the role of information in the trip-planning process. One model captured the factors that influence the time when hotel reservations are made. A second model captured the time when decisions on specific destinations to visit are made.

More than one-half of the respondents were classified in the cluster analysis as trip planners. These survey respondents appeared to be travelers who planned their trips far in advance but did not travel frequently. Because these travelers do not travel very often, they prefer to use travel information sources they have already used or known. They are not especially aware of new technologies such as ATIS. Agencies and service providers need to increase the awareness of these travelers of the different options available to them. For example, the City of San Antonio can orient residents and visitors about their deployment of kiosks throughout the city. Existing sources of information should include information about kiosks because most people are not aware of their existence or of the way they work.

At present, it does not appear that there is a large market willing to rely on new technology to avoid congestion or simply drive through unfamiliar areas, though this may be a result of lack of availability and lack of familiarity with the technologies. Because market acceptance and traveler utilization of ATIS services will determine their success or failure, Advanced Traveler Information Systems must be promoted based on their benefits, ease of use, and the costs of acquisition and operation to be borne by users.

The challenge for ATIS is to influence travelers' behavioral processes, to provide incremental information that is useful, used, and contributes to improving the travel experience for individuals and their community.

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CHAPTER 1: INTRODUCTION

MOTIVATION

Tourism is the world's largest and fastest growing industry. According to the World Travel and Tourism Council, tourism accounts for approximately 10% of the world's gross domestic product. It is estimated that tourism will be a $10 trillion industry by the year 2010. In the United States, tourism generates approximately $400 billion in economic activity each year and is the third-highest employer in the nation (American Association of Museums 1998).

Americans spend more than $120 billion each year on vacation travel and on leisure-time activities both within the United States and abroad. Moreover, 65% of Americans take at least one annual vacation trip (Mayo and Jarvis 1982). Tourists from other states and other countries are creating a sizable impact on the economy of the state of Texas. According to the Tourism Division of the Texas Department of Economic Development, tourism in Texas is a $27.5 million business, which generates 464,000 jobs throughout the state (Mahmassani, Kraan, and Abdelghany 1998). In order to serve tourists effectively and profitably, we need to understand what motivates them and what influences the various travel-related decisions they make.

People travel for various reasons, including business, to visit friends and relatives, and for recreation. Travel and its related decisions are affected by individual attributes (demographic, psychological, and social) that interact with physical and social features of the environment to produce specific activity-travel behavior.

Travelers make decisions about destinations, accommodations, modes of transportation, and attractions. In order to reach such decisions, travelers rely on various sources and types of information while planning and conducting their trips. With the increased deployment of Intelligent Transportation Systems (ITS), especially Advanced Traveler Information Systems (ATIS), in Texas there is a need to determine how this advanced technology can help unfamiliar travelers, such as tourists, plan and conduct their trips.

ATIS's acquire, analyze, communicate, and present information for use in assisting travelers in moving from a starting location to their desired destination. The basic objectives of ATIS's are to enhance the efficiency of travel, increase travelers' satisfaction and convenience, alleviate traffic congestion, minimize air pollution, and increase traffic safety (Mahmassani, Kraan, and Abdelghany 1998).

According to the 1995 American Travel Survey published by the Bureau of Transportation Statistics and the U.S. Department of Transportation, Americans registered nearly 827 billion long-distance travel miles while completing 656 million household trips, whether traveling for business, leisure, to visit friends or relatives, or personal business. Over one-half of all the travel in 1995 (52% or 515 million person trips) was for vacations. About 47% of vacation travel was for leisure and 43%

was to visit friends or relatives. Because vacation travel is not conducted on a daily basis, systems such as ATIS can help inform drivers of unexpected road conditions as well as provide alternate routes to their predetermined destinations.

Real-time information can improve travelers' perceptions of travel conditions and assist them with pretrip and enroute travel choices (Adler and McNally 1994). ATIS' provide a source on which travelers, such as tourists, can rely to obtain information to plan their trips.

RESEARCH OBJECTIVES AND APPROACH

The overall goal of this study is to analyze the behavior of travelers and determine their desires and preferences for information when planning and conducting trips to unfamiliar areas. The primary focus is on information requirements for tourists. In order to determine whether unique information requirements exist for tourists, it is necessary to understand tourists' needs and preferences for information when planning their trips. It is important to know what information items travelers like to obtain and their preferences regarding information display devices in order to ascertain the ability of various ATIS's to satisfy these preferences. The principal objectives of this study are to understand the information search and trip-planning processes of travelers, specifically tourists, and to examine the role of personal and public pretrip and enroute information sources on selected vacation behavior.

To accomplish the above objectives, mail-back surveys were administered in the city of San Antonio, Texas. Surveys asked respondents about their visit to San Antonio, their preferences for information items and sources, their access to communication devices, and some demographics. Characteristics of respondents were analyzed using descriptive statistics. Respondents' attitudes toward trip-planning were also analyzed using tests of independence of factors. A factor analysis was conducted to gain insight into the factors affecting the trip-planning behavior of travelers to San Antonio. The variables included in the factor analysis consisted of responses to questions regarding travelers' experience with recreational trips, their familiarity with San Antonio, and various demographic characteristics. Other questions included in the analysis addressed the time at which travelers made their hotel reservations and decided on specific destinations to visit in San Antonio. Attitudinal questions were also included in the analysis.

A cluster analysis was conducted with the intention of grouping survey respondents on the basis of the extent of prior planning that precedes a recreational trip. An ordered probit approach was used to study the level of detail in trip planning for two particular dimensions of trip- planning behavior, namely the time at which hotel reservations were made and the time at which decisions on specific destinations were made. The corresponding questions in the survey provided the response variables for this analysis. The ordered probit approach provided insights into the determinants of

travelers' decisions and allowed the researchers to relate them to the tripmakers' characteristics, as well as to ascertain the role of information in the trip-planning process.

STRUCTURE OF THE REPORT

The report is organized as follows. A literature review is presented in Chapter 2. The literature review presents a discussion of the theory on travel behavior and trip planning. The levels of trip planning and the possible applications of ATIS's in the trip-planning process are discussed in this chapter.

Chapter 3 presents the survey of recreational journeys conducted for this study in the city of San Antonio, Texas. First, it presents the design of the survey, its administration, and its content. Second, it presents a discussion of the characteristics of respondents, followed by an analysis of respondents' attitudes toward trip planning.

Chapter 4 presents the factor analysis conducted to understand the factors affecting the behavior of travelers to San Antonio. The cluster analysis of survey respondents into groups is also presented in Chapter 4. This chapter includes an ordinal probit model of the survey data estimated in order to study the level of detail in trip planning by San Antonio visitors. The conceptual framework and model specifications are first explained followed by estimation results. Finally, Chapter 5 provides some concluding remarks.

CHAPTER 2: LITERATURE REVIEW

INTRODUCTION

Traffic congestion has long been recognized as a major problem in large metropolitan areas. Attempts to provide a solution to this problem have resulted in the implementation of a wide array of strategies ranging from supply-oriented approaches, such as new road construction and improved signal timings, to strategies designed to redirect travel demand, including carpool and van-pool incentives and improved public transportation. These attempts have only been partially successful, as traffic congestion continues to be a major source of frustration for a large percentage of travelers (Mannering 1989).

Tourism occurs as a result of thousands of individual travelers making individual decisions on how, where, and when to travel. These individual decisions are affected by many factors such as demographic, psychological, and social, as well as by the choice dimensions (destination, route, and mode) and specific alternatives available for the trip (Beimborn 1995). Theoretical elements related to individual travel can be found across a spectrum of disciplines, including transportation planning, economics, sociology, geography, and psychology (Allaman, Tardiff, and Dunbar 1982).

In the past few years, there has been an abundance of research that has attempted to understand drivers' information needs and the possible role that in-vehicle systems could play in fulfilling these needs (King 1986; Lunenfeld 1989; Transportation Research Board 1991; Mast 1991; Wierwille 1993). Many of these studies have focused on the type of information needed while others have dealt more with the form (e.g., audio or visual) in which this information can be most effectively supplied (Parkes et al. 1991; Erlichman 1992). Although interest in the tourist decision-making process has been steadily growing, very little study has been reported on tourist information needs and preferences.

The literature review is conducted in three parts. The first explores relevant aspects of the theory of travel behavior. The second focuses on the trip-planning process of travelers. The last part reviews studies conducted on travel behavior and trip-planning from the perspective of new technologies such as Advanced Traveler Information Systems (ATIS).

TRAVEL BEHAVIOR THEORY

Travel behavior is the process of individual decision making about what trips to make, where to visit, when to depart, what mode of travel to utilize, and what route to follow. Because these choices are predicated on individual preferences of the tripmakers, the decision process is difficult to understand and predict (Schoffer, Khattak, and Koppelman 1993).

Travel behavior is part of an individual's overall lifestyle. We can better explain travel behavior by understanding how travel fits into an overall lifestyle pattern. Travel behavior is the result

of a complex process, influenced by many interacting factors, such as an individual's perception of destinations, travel distances, and the various attributes of the choice alternatives. We must understand how travelers make decisions and how personality affects those decisions. We must understand also what motivations influence individuals' travel decisions and how these motivations interact; how attitudes are formed and how these attitudes influence individuals' behavior; and how other people's influences affect travel behavior (Mayo and Jarvis 1982).

Travelers are affected by both internal and social influences. The internal psychological factors that influence travel behavior include perception, learning, personality, motives, and attitudes. Perception is the process by which individuals select, organize, and interpret information to create a meaningful picture of the world. Learning refers to changes in individuals' judgment and behavior based on experiences. Personality refers to the patterns of behavior displayed by individuals, and to the mental structures that relate experience and behavior in an orderly way. Motives are thought of as internal forces that direct people's behavior toward the achievement of personal goals. Attitudes consist of knowledge and positive or negative feelings about an object, an event, or another person. The social influences that affect travelers are the ones exerted by other people, such as the role of family influences, reference groups, social classes, and culture (Mayo and Jarvis 1982).

Travel behavior researchers view individual travelers as decision makers. Mayo and Jarvis (1982) proposed a description of the travel decision-making process, which is divided into five steps. The first of these steps involves the recognition of need, during which a person or a family will ask themselves whether they should travel or not. If the decision is made to travel, certain questions must then be addressed, such as where to go, where to stay, how to get there, and how long to stay.

Information will be needed to help answer some or all of these questions. Hence, the second step of the decision-making process is the search for information. During the information search stage, traveler information systems can be of real assistance by making available information that aids the decision-making process. According to studies conducted by Murray (1991), information search is a risk reduction strategy that uses internal and external information sources. Internal searches rely on memory and past experience. External searches include personal and public communication as well as direct experience. In concept, accurate, timely, and understandable information can contribute to choices that are somehow better, either for the individual traveler, society as a whole, or both (Schoffer, Khattak, and Koppelman 1993).

Studies on motivations for consumer information searches indicate that a greater degree of information search is associated with more experienced travelers, those with minimal experience with a destination, and travelers with a college education (Etzel and Wahler 1985; Gitelson and Crompton 1983; Snepenger, Meged, Snelling, and Worrall 1990). Studies have also suggested that the amount of information provided to decision makers may not be as important as the method of presentation or the stage in the choice process in which it is presented (Hogarth 1987).

The information gathered feeds into the alternative evaluation process, which constitutes the third step of the decision-making process, resulting in a series of decisions. In the fourth step, the travel is conducted as planned. Finally, in the fifth step, ex-post facto evaluation of the trip in general takes place. Figure 2.1 illustrates the five steps above.

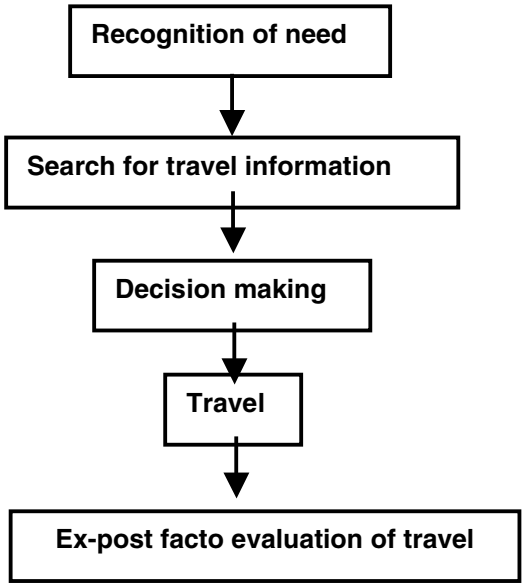

Figure 2.1: Travel decision-making process

The manner in which individuals solve various travel problems changes over time for various economical, psychological, social, and cultural reasons. Incomes fluctuate, as do the prices for different travel products and services. Motivations and perceptions change. Individuals change, physically and psychologically, and the environments in which they live change in ways that force them to alter their behavior (Mayo and Jarvis 1982).

When individuals use a routine decision process, they usually make travel choices based on an inventory of knowledge and attitudes that already exists in their minds. They are confident of an adequate store of information on which to base their choices and will not actively seek additional inputs. In sharp contrast to routine decisions, which are usually repetitive, impulse travel decisions are not considered in advance. When individuals make travel decisions using the extended decision approach, they are more likely to be receptive to information that will assist them in making their choices. During the extended decision process, individuals might turn to personal sources for assistance (travel agents, business associates, and friends). In addition, they will be receptive to advertising, brochures, and other impersonal sources of assistance relating to the choice at hand.

Now that decisions must be made, they may recall information that was previously ignored, because it was not needed for any particular purpose (Mayo and Jarvis 1982).

Interest in the tourist decision-making process has been steadily growing (Crompton 1992; Goodrich 1978; Um and Crompton 1990). Surveys conducted by Changuk and Norman (1996) throughout the midwestern United States revealed that summer travel, short overnight trips, and long overnight trips were significantly different across life stages of individuals. The specific research questions of the study addressed the manner in which 1) travel patterns, 2) vacation motivations, and 3) destination attributes differ over the life span. Significant differences existed across life stages with regard to vacation motivation. Young singles were the most action motivated, whereas older married couples were least motivated by action. Results also indicated that significant differences existed with regard to attributes desired when selecting vacation destinations. Young singles placed much greater emphasis on outdoor experiences while older marrieds did not regard outdoor activities as important. Older unmarried, young married, and young singles thought cultural attractions were important. For the older married and older unmarried segments, weather was very important in vacation destination selection. Man-made attractions such as theme parks were important for divorced travelers with children and young married travelers with children. For the young single market, the tourism industry needs to provide diverse activities and emphasize budget accommodations

The literature suggests that individuals' perceptions of, familiarity with, and knowledge about destinations influence their behavioral intentions involving future travel. Prior experience with a destination is likely to affect perceptions of it, which in turn can influence the likelihood of future travel to it. It is also possible for future travel decisions to be related to risks associated with travel activity in general, as well as degrees of safety that individuals feel during travel (Sonmez and Graefe 1996).

Anderson's (1981, 1982) Information Integration Theory (IIT) and Roger's (1975, 1983) Protection Motivation Theory (PMT) lend theoretical support to the concept of future travel behavior serving as risk avoidance. IIT proposes individuals form psychophysical and value judgments according to complex decision-making steps. PMT focuses on various cognitive processes that individuals experience in risky decisions. IIT and PMT imply that future travel behavior may be influenced by images of safety and risk that individuals have of regions, which may be based on past travel experience.

Studies conducted by Sonmez and Graefe (1996) examined influences of past travel experience, types of risk associated with international travel, and overall degree of safety felt during travel compared to an individuals' likelihood of travel to various regions or avoidance of particular destinations because of perceived risk. Results revealed significant differences between individuals with past travel experience with various regions and those without experience, in terms of likelihood of travel. Types and degrees of risk associated with travel were found to predict the likelihood of

travel to ten regions. Risks most often associated with the desire to avoid certain regions included health, terrorism, political instability, financial, and psychological. Results support earlier findings that previous travel experience and risk perceptions influence future travel behavior. In addition, the degree of safety individuals feel during different travel situations determine interest in future travel. Risk perceptions and feelings of safety during travel appear to have stronger influence on avoidance of regions than the likelihood of travel to them. Past travel experience appears to be a powerful influence on behavioral intentions. Individuals with past travel experience to various regions may become more confident as a result and thus be more likely to return. Findings imply that personal experience may outweigh perceptions in international vacation travel decisions.

TRIP-PLANNING THEORY

The success of any major trip rests on careful planning. Trip planning is the process by which travelers select a destination, route, time, and mode of travel. Trip planning is usually considered a pretravel activity that includes gathering information, choosing a destination, and so on, but situational factors, new information, and unanticipated events can reshape plans during a trip and thus modify travel behavior (Stuart, Vogt, and Reynolds 1995).

Studies conducted by Mackay, Brayley, and Lamont in 1996 explored the role of personal and public pretrip information sources, as well as the role of enroute information sources on selected vacation behavior at the destination. The study was conducted on a nonresident highway travel exit in Manitoba, Canada. The sample included 2,472 responses. Several significant relationships were found in terms of pretrip information search, vacation behavior variables (length of stay, general future travel, return travel, trip satisfaction), and demographics. Personal sources (past experience and advice from friends and family) were more influential than public sources (destination publications) on the length of stay at a destination and satisfaction with the destination. Analysis of enroute information sources revealed significant relationships with activity participation, attraction visitation, return travel, general future travel, and trip satisfaction for the local residents of Manitoba. For respondents who were very likely to travel anywhere in the near future, significant pretrip information sources were past experience (next 3 years, 12 months, 6 months, and 2 months); travel books (12 months, 6 months); and provincial publications (6 months). Respondents who were very likely to make a return visit to the destination in the next year used past experience and advice from family and friends. Further, significant relationships were found between high trip satisfaction and information sources pertaining to past experience and advice from family and friends.

Travelers' perceptions of travel conditions and degree of network knowledge influence pretrip and enroute travel choices as well. In an ideal world, travelers might have perfect information on travel conditions and network path options and, therefore, be better able to select more efficient travel

choices. In reality, travelers' perceptions of network conditions are not perfect; thus, travelers often have some degree of uncertainty when determining travel choice strategies.

Travelers' decision making may be enhanced through the acquisition of real-time traffic conditions or route-guidance information. Providing travelers with real-time information about current network conditions can decrease uncertainty, improve perception, and result in more efficient travel behavior. Furthermore, such information can help travelers in their trip-planning process.

The trip-planning process is certainly different for each individual traveler. However, a basic framework for the trip-planning process can be established despite individual characteristics of travelers. Figure 2.2 presents the basic framework for the trip-planning process.

In terms of when it is performed, the trip-planning process can be divided into pretrip planning, enroute planning, and on-site planning. Pretrip planning is usually performed before leaving for the destination, enroute planning during the trip, and on-site planning once at the destination and during the rest of the trip.

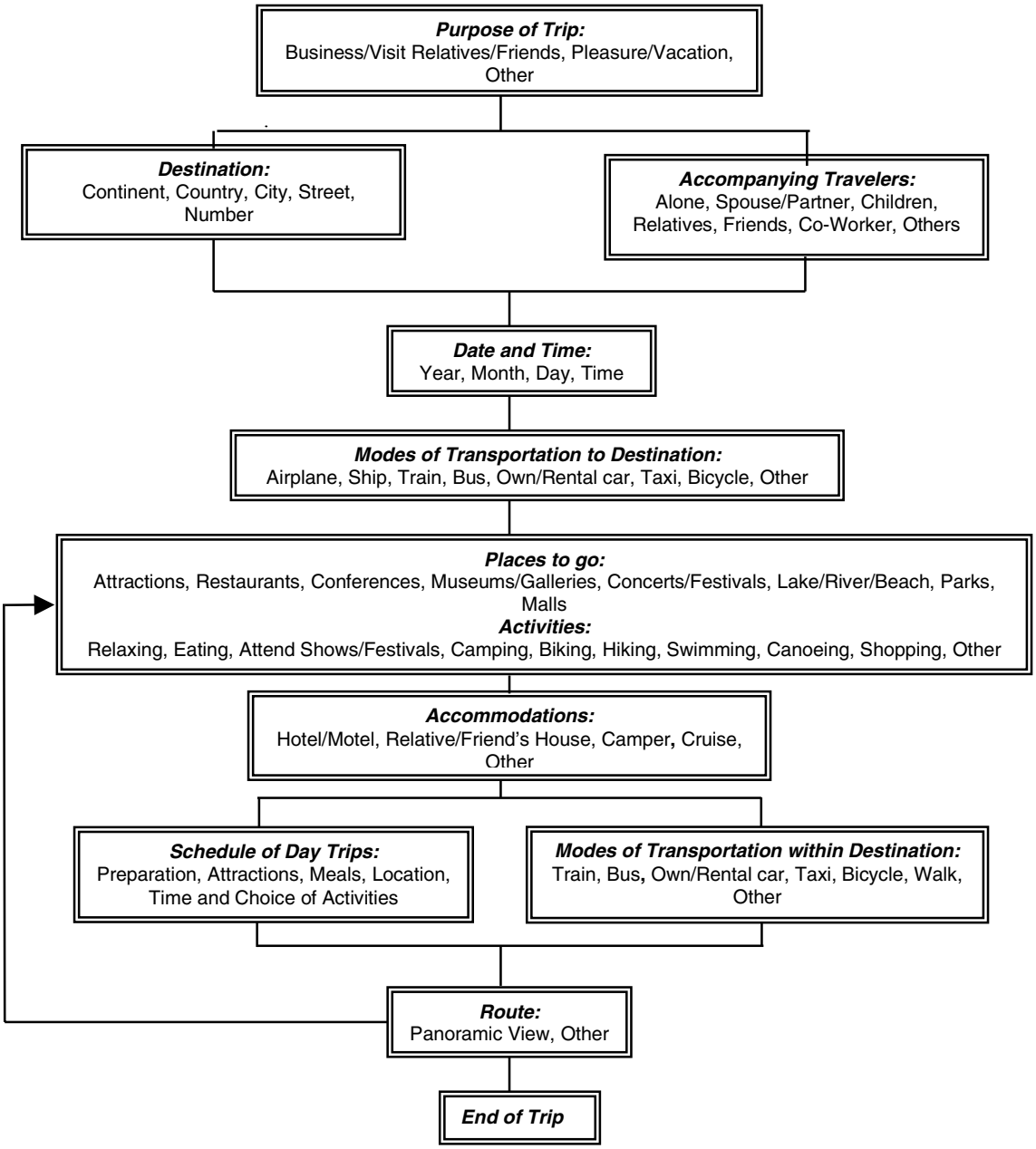

Figure 2.2: Trip-planning framework

Each of the steps in the above trip-planning framework involves several choice dimensions. Table 2.1 illustrates these choice dimensions and the associated choice alternatives.

Table 2.1: Trip-Planning Choices

Choice Dimension	Choice Alternatives
Purpose of Trip	Business, Recreation, Visit relatives/friends, Other
Destination	Within the country or out of the country
Accompanying Travelers	Alone, Spouse/Partner, Children, Relatives, Friends, Coworkers, Others
Date and Time	Date: Spring, Summer, Fall, Winter Time: Weekday, Weekend, Both
Modes of transportation to destination	Air, sea, ground; Car (private or rental), Trains, Buses, Other
Places to go/Activities	Attractions, Conferences, Restaurants, Other
Accommodations	Hotel, Motel, Relative/Friend's house, Other
Modes of transportation Within destination	Car (private or rental), Taxi, Buses, Train, Walk, Other
Schedule of Day Trips	Cost, Hours of operation, Dress code, Other
Route	Highways, Transit line (transfers), Other

Pretrip Planning

Pretrip planning usually takes place before departure to the destination, and includes decisions regarding trip purpose, travel objectives, destination, mode of travel, departure and arrival times, and initial route choice. Pretrip information can support itinerary planning, which pertains to the whole trip. Using touch-tone telephones, personal computers, pagers, personal communications devices (PCDs), kiosks, and/or voice synthesizers can increase the convenience of obtaining pretrip information and consequently facilitate the trip-planning process (Federal Transit Administration 1998).

EnRoute Planning

Enroute planning is performed during the trip to the destination. The enroute assessment and adjustment process affects the travel experience between origin and destination. Assessment refers to the process of perceiving travel conditions and evaluating travel progress. Adjustment describes the process of modifying the initial travel plan established during pretrip planning. Enroute adjustments may include route diversion, changes to activity patterns, and comparison with prior experiences. This updated perception will influence the pretrip planning decisions for future trips.

Enroute information includes dynamic information about traffic conditions, incidents, construction, and weather conditions, as well as static information regarding routes, directions, and travel services. Transit enroute information can include dynamic transit vehicle arrival and departure information, system disruptions, and carpooling opportunities, as well as static information on transit services, schedules, fares, routes, stop locations, and ride-matching registration. Information can also be provided through the integration of transit and highway information with a variety of media, such as kiosks, electronic signage, and personal computers (Federal Transit Administration 1998).

For long-distance tourist trips, the type of information, as well as the media through which it may be disseminated, will generally be different than for intraurban trips. The adjustments that tripmakers might be able to make in response to the information will also greatly depend on the mode of travel and other attributes of the trip.

On-Site Planning

On-site planning is the planning performed once at the destination. On-site information pertains to regional transportation and related services, such as park-and-ride lot availability (Federal Transit Administration 1998). This information can be provided via electronic signs, kiosks, or television monitors. Traditionally, this information has been disseminated manually in the form of paper schedules or static signs. Real-time information has not traditionally been available to travelers. Furthermore, for tourist trips, on-site planning involves primarily the generation and fine-tuning of an activity plan at the destination. This consists of the selection of the activities to be performed and the scheduling of these activities. This process requires a much broader range of information than simply travel-related attributes. Tourists need to consider the places they want to visit such as museums, parks, and rivers, and the activities they want to perform such as shopping, camping, and sightseeing. They may want to stay in different cities or different places in the same city. For instance, a traveler may want to stay a couple of days in a hotel and a couple of days at a friend's house. Travelers may select different routes to reach the same destination, such as a panoramic route at night and a more direct highway during the day. Once at the destination, the trip takes place for several days. Travelers need information on how to find their way across a city and its neighboring areas. On-site information is of considerable importance to travelers.

ADVANCED TRAVELER INFORMATION SYSTEMS

ATIS's are a component of ITS's. ATIS provide travelers with information on one or more modes of transportation to facilitate decision-making before and during their trip. These systems are especially targeted to assist travelers in trip planning and decision making on destination selection, departure time, mode choice, route choices, congestion avoidance, and navigation (Chen and Mahmassani 1994).

Traveler information systems provide both pretrip and enroute information to tripmakers at home, work, transportation centers, wayside stops, and on-board vehicles. Pretrip information is provided through television, radio, telephone inquiry, kiosks, displays at terminals and points of interest, and computer on-line services. Enroute information is provided through traffic information broadcasting services, cellular phones, radio, in-vehicle navigation systems, route guidance systems, and variable message signs.

Information to support travel decisions is acquired actively (by reading, asking, listening) or passively (through experience) from various sources, and it is used, along with stored knowledge, to make both long-term and short-term choices (Schoffer, Khattak, and Koppelman 1993). The development and evaluation of information systems requires investigating and understanding short- and long-term traveler responses to information. These responses are likely to be influenced by information content, type (static/dynamic/qualitative/quantitative), format (style of presentation), and attributes (reliability, accuracy, relevance).

One of the key aspects in the design of traveler information systems is to make certain that the system is providing the type of information travelers want and providing this information in a usable form. The style of presentation and message content is expected to have a large effect on travelers' willingness to use ATIS. Information display devices govern the type of information (static or dynamic and personal or general), the location where the information is supplied (at-origin or enroute), and the time when the information is provided (in-need, at specific times, or random broadcast). Information display devices can be classified, as Figure 2.3 shows, into out-of-vehicle devices, in-vehicle devices, and personal portable devices (Mahmassani, Kraan, and Abdelghany 1998).

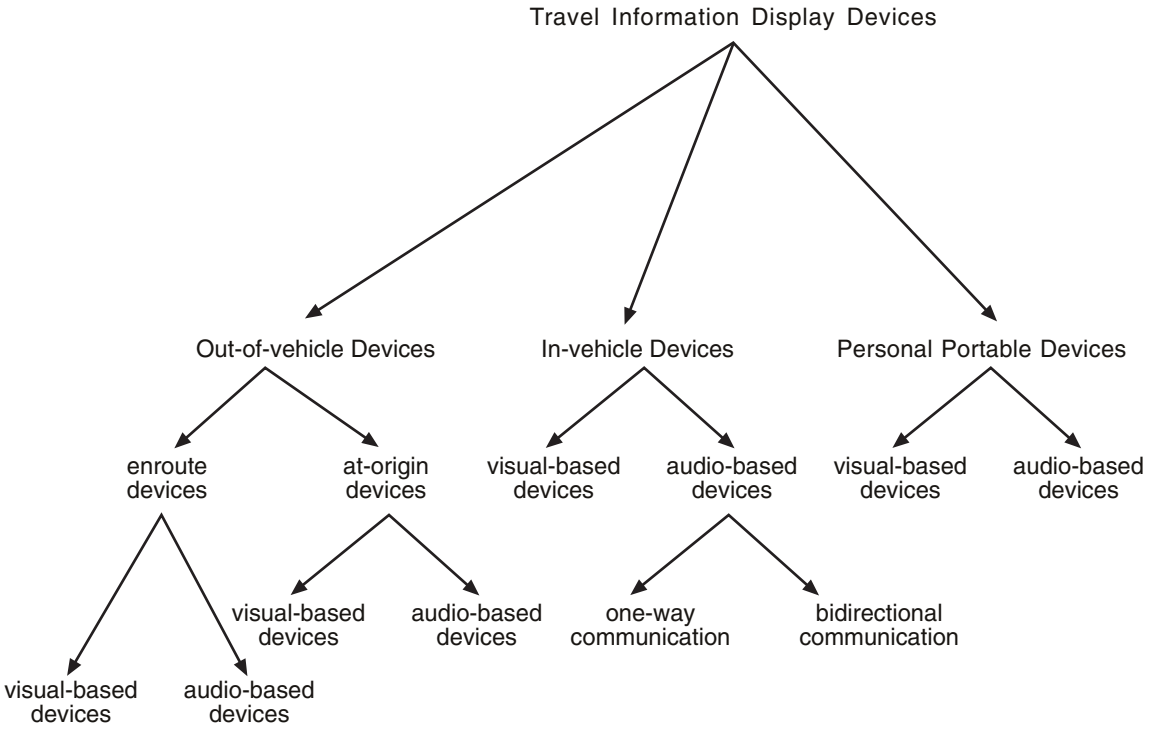

Figure 2.3: Classification of Existing Travel Information Display Devices

User Desires and Preferences for ATIS

Several investigators have suggested that the design of ATIS's should be based on information requirements obtained directly from the end users of the system (Barfield, Haselkorn, Spyridakis, and Conquest 1990; Mannering, Kim, Barfield, and Ng 1994). Such design will ensure that the information provided to ATIS users will have the greatest chance of influencing their driving behavior. Complex systems designed without the end user in mind usually gain little support and usage from the public (Davis 1993).

The majority of investigations conducted on ATIS information requirements have concentrated on automobile drivers and focused on the analysis of the drivers' perspective in relation to traffic information (Durnad-Raucher et al. 1993), the investigation of route diversion decisions (Vaughn et al. 1992; Khattak et al. 1993), or the identification of subgroups of potential drivers who would use ATIS (Barfield et al. 1990).

In order to assess driver attitudes regarding aspects of highway navigation, King (1986) studied 125 mail-back surveys administered in Connecticut and Wisconsin, which asked respondents to rate themselves on a seven-point scale with respect to five trip-planning and route-following skills. These skills were reading maps, planning routes, obtaining materials for trip planning, following self-planned routing, and following routes planned by others. Respondents had a fairly high opinion of

their route-planning and route-following skills. Males revealed they were more likely to read maps, while females were more likely to ask someone else for directions. Respondents were also asked to rate seventeen remedial measures related to enhancing the existing information sources on a six-point scale ranging from "not at all important" to "very important." Results indicated that highway-signing improvements and map contents and availability improvements were considered important. Assistance in trip-planning and route-following tasks were ranked as not important. Respondents considered themselves capable of handling these tasks if they had adequate information.

Mannering (1989) performed an investigation of the factors influencing commuters' route and departure time choices. The survey of commuters in the highly congested metropolitan area of Seattle found that quite a few respondents change departure time (45.3%) and/or route (48.7%) one or more times per month. Also, the findings suggest a promising future for more accurate real-time traffic information systems. The results underscore the importance of socioeconomic factors as well as traffic system conditions in determining commuters' willingness to change routes and departure times.

Barfield, Haselkorn, Spyridakis, and Conquest (1991) designed a survey to investigate the impact of traffic information on route choice, mode choice, and departure times of commuters in order to determine whether categorizing motorists according to their driving behavior and traffic information needs could provide functional requirements for the design of a real-time motorist information system. The survey was administered to 9,652 drivers who commuted to work from north of Seattle to downtown, as they exited a major freeway (I-5) and stopped at the first intersection. The return rate was 40% (n=3,893). A cluster analysis was performed based on the willingness of commuters to adjust their behavior in relation to motorist information. The analysis separated 3,893 respondents into four major groups. These groups were "route changers" (those willing to change routes on or before entering I-5, 20.6%); "non-changers" (those unwilling to change time, route, and mode, 23.4%); "route and time changers" (40.1%); and "pretrip changers" (those willing to make time, mode, or route changes before leaving home, 15.9%). These groups were further classified into "time changers" ("route and time changers" and "pretrip changers") and "non-time changers" ("non-changers" and "route changers"). The motorist information system in Seattle consisted of highway advisory radio (HAR), variable message signs (VMS), emergency telephone services, and commercial radio and TV services. Commercial radio was treated as the most useful and preferred medium from which to receive traffic information both before and while driving. Those groups whose behavior was most flexible were more likely to access and find helpful all forms of motorist information. The issues of departure time and pretrip route choices of the "time changers" were the commuter decisions most influenced by existing traffic information. Only a small, discrete group of Seattle's commuters was likely to be influenced to change transportation mode. Researchers concluded that a single, successful motorist information system could meet the needs of a wide range

of motorists under varying conditions and stages of travel, but this system must consist of carefully designed information modules targeted to address particular commuting decisions of carefully studied and defined subgroups of receptive commuters.

Hatcher and Mahmassani (1992) provided insight into the day-to-day variation of individual trip scheduling and route decisions for the evening commute on the basis of detailed 2-week diaries of actual commuting trips completed by a sample of automobile commuters in Austin, Texas. Surveys were conducted in two stages: an initial short screening survey (one-page questionnaire) sent to 3,000 randomly selected households and a detailed 2-week work-trip diary sent to 331 selected first-phase respondents. The analysis was limited to those trips that began and ended with the usual work and home locations resulting in 1,312 usable work-to-home trips. The majority of respondents were males between the ages of 30 and 60 who owned their places of residence. About 43% of respondents reported tolerance to lateness at the workplace in excess of 5 minutes, while on average, respondents preferred to arrive about 15 minutes before their official work start time. The average travel time from work to home on days with no intervening stops was 23.6 minutes. About 39% reported evening commutes contained at least one intermediate stop. Trips with stops were much more likely to involve route or joint switching than trips without stops. Trip-scheduling flexibility for the evening commute appeared to contribute to a substantial amount of departure time switching. In general, commuters tended to change departure times more frequently than routes, possibly a reflection of a limited route choice set in comparison with a broader set of available departure times. The analysis used both a “day-to-day” and a “deviation from normal” approach to switching behavior. The day-to-day approach captured a higher frequency of switching. The models of daily switching frequency related the characteristics of commuters, workplace, and transportation system to the switching behavior exhibited by the users. Workplace variables, such as lateness tolerance and work end time, dominated evening departure time, route, and joint switching behavior. Socioeconomic variables such as gender, age, home ownership, and interaction variables containing gender also displayed explanatory power, but their effect was not as clear. Route and departure time switching were shown to be already taking place in actual systems, implying that users may be willing to shift commuting patterns if they were to benefit from these changes. Multipurpose trips were shown to significantly influence the route and joint switching behavior of the commuters. The emerging picture of evening commuting habits clearly suggests high variability of the daily departure time from work, in part owing to the trip-scheduling flexibility associated with this trip.

Jou, Mahmassani, and Joseph (1992) reported results of a set of surveys of commuters conducted in the Dallas North Central Corridor area between June 1990 and May 1991. A survey diary approach, initially developed and tested in work performed by Hatcher and Mahmassani (1992), was adapted and used to observe actual commuter behavior. Research topics included: trip chaining, or the inclusion of stops to pursue activities for various purposes along the commute to or

from work; trip timing, for both morning and evening commutes, and its daily variability; and route choice, for which link-level descriptions of the path actually used by commuters were obtained. Results indicated that trip chaining was an essential feature of work-trip commuting and was more extensive in connection with the evening commute than with the morning commute. Trip chaining was also found to significantly influence the daily variability of departure time and route choice decisions of commuters. Commuters tended to switch departure time more frequently than route. Models relating the respective frequencies of trip chaining, departure time switching, and route switching to the characteristics of the commuter, their work environment, and the traffic system yielded useful insights for the design and marketing of various travel demand management strategies. Comparisons between Austin and Dallas indicated considerable similarity in commuting behavior and its determinants between the two cities. Differences in behavior between the two cities could be attributed principally to differences in size and associated network characteristics, rather than to socioeconomic and demographic variables. Comparisons between the two survey waves over time suggested an increase in congestion between the two periods, as well as a slight increase in daily variability and switching behavior. Furthermore, many commuters included in both surveys modified individual patterns during the interval. It was found that commuters were more sensitive to late arrivals than to early arrivals. Older commuters tended to tolerate greater schedule delays than did younger ones. Commuters were inclined to tolerate greater schedule delay if they had recently experienced a substantial increase in travel time resulting from a small adjustment in departure time. Commuters were reluctant to continue switching routes in response to greater experienced travel time fluctuation. When a commuter switched routes, he or she was very likely to switch departure time as well.

Wallace and Streff (1993) analyzed results from a mail-back survey focused on drivers' needs in support of route diversion decisions. A total of 2,764 responses from drivers in the state of Michigan indicated that no information item among thirty-three different items presented was ranked as "very important." There is no universal agreement among drivers on what constitutes essential information. The availability of directions on the alternate route was ranked as important. Also, it was found that information items like congestion levels and travel times are not sufficient for making diversion decisions for drivers in an unfamiliar area. However, availability of directions on the alternative route(s) may induce those drivers to change their route.

Mannering, Kim, Barfield, and Ng (1994) studied travelers' behavioral responses to traffic information using a previous survey (collected in 1988) of Seattle-area commuters that focused on commuter behavior and decision making. The survey of Interstate 5 (I-5) commuters was conducted by Barfield et al. in 1991. Results indicated that work-to-home route changes were more common than home-to-work changes, with 63.6% of commuters saying they rarely changed home-to-work routes and 42.6% rarely changed work-to-home routes. On home-to-work and work-to-home, more

than 26% of commuters sometimes or frequently changed routes. Ordered logit model results for the frequency of changing home-to-work routes showed both traffic network and socioeconomic characteristics affected the frequency of home-to-work route changes. Results for the frequency of changing work-to-home routes showed that the average length of traffic delay required to induce a route diversion was 16.2 and 25.1 minutes for familiar and unfamiliar routes, respectively. A duration model showed that men required shorter traffic durations to induce a route change and low-income commuters required longer durations. Logit estimation of the influence of pretrip traffic information on departure found that young travelers and travelers with longer commutes made more frequent use of traffic information, while men were found to use less traffic information. Results of the logit estimation of the effect of pretrip information on mode choice showed higher average commuting speed decreased the likelihood of having traffic information influence mode choice, whereas greater commuting time per day and greater length of delay causing a route diversion increased mode choice influence. Men and high-income commuters were less likely to have traffic information influence their mode choices. Both male and higher-income commuters were found to be less likely to be influenced by pretrip traffic information. Departure time flexibility not only increased the likelihood of changing departure times, but also of changing routes.

Adler and McNally (1994) administered surveys throughout the United States to study driving behavior and to determine user information requirements for the design and utilization of ATIS. Their research focused on user information requirements for the four subcomponents of ATIS and included characteristics associated with a motorist's decision to choose a route or travel mode. The four subcomponents of ATIS are in-vehicle routing and navigation systems (IRANS); in-vehicle safety advisory and warning systems (IVSAWS); in-vehicle motorist services and information systems (IMSIS); and in-vehicle signing information system (ISIS). Driving behavior and motorists' needs were analyzed. Findings showed that the success of ATIS depends on several factors, such as accuracy, cost of the system to the consumer, and type of information. These factors were important in all geographical areas throughout the nation. As expected, traffic information was very important to private and commercial drivers. Dispatchers had a greater need for personal communication, because the effectiveness of their job depends on interaction with commercial drivers.

Mannering, Kim, Ng, and Barfield (1996) studied travelers' preferences for in-vehicle information systems for the commute trips. Data were collected from eleven states and a number of sources, including the American Association of Retired Persons, American Automobile Association, commuters employed in private businesses, and a sample drawn from a number of states' departments of licensing. The survey was administered as a mail-back questionnaire and 938 surveys were returned. Respondents believed that it is more important for an in-vehicle unit to provide roadway/traffic information than it is to provide personal communication features. Ordered logit model results of the rankings of the importance of having roadway and traffic information and

personal communication provided in an in-vehicle information system showed that socioeconomic characteristics such as gender, age, number of vehicles in the household, annual income, habitual travel pattern, commute congestion levels, and attitudes toward in-vehicle technologies were significant determinants of travelers' importance ratings and the distance ahead travelers would like to receive the information.

Ng, Wessels, Do, Mannering, and Barfield (1996) conducted three surveys to help identify the information requirements of dispatchers and commercial drivers for the ATIS portion of CVO, to estimate what parts of the commercial driving population and dispatching population were more likely to use ATIS, and to determine what features of ATIS were more likely to be perceived as most beneficial by these groups. The study showed that commercial drivers' trip behavior and stress levels had a significant effect on their view of the importance of various ATIS characteristics. For dispatchers, their current communication medium and the type of organization in which the dispatcher was employed affected the importance of ATIS features. The results of the analysis indicated there were attributes of in-vehicle traffic information systems that were more likely to be of greater importance to different subgroups. In terms of whether a commercial driver would use ATIS, the study showed that drivers who valued trip safety and had more driving stress were more likely to use information systems. Drivers who were more comfortable with their routine schedule of multiple stops were less likely to use ATIS. In regard to the level of importance of ATIS features, commercial drivers who plan their work trip while on the highway were less likely to find ATIS features to be of very high importance. The models also showed that commercial drivers who currently use roadside services today value the importance of such information through ATIS.

Mahmassani, Moore, Kaysi, Srinivasan, and Hutton (1996) identified seven decision requirements from nine interviews of experts. These requirements represented two levels of traveler requirements for planning a route, prior to departure, and enroute. Interviewees were members of the ATIS Committee of ITS America representing private developers and consultants, researchers, public agency operators, value-added sellers of ITS products, and stakeholders involved in the development and deployment process. Important driver issues were identified, such as driver information needs, information delivery and customization, workload considerations, and repeated use considerations. Driver information needs identified were incident- and congestion-related information, travel time based information, and guidance information. Information delivery and customization included delivery mode, information-processing issues, system features, congestion-related information, trip characteristics, and driver attributes. Workload considerations were information overload, perceptual and decision-making skills, attention requirements, and training required to use ATIS, while repeated use considerations were quality of information, ease of use of the system, and provision of feedback on information and choice quality. This data enabled identification of important factors affecting the trip-planning process and directly contributed to the identification of research issues and information

requirements for ATIS. ATIS should support driver behavior with up-to-date database resources and real-time traffic condition information.

Hobeika et al. (1996) sought to identify the information needs of travelers in the I-95 corridor. Focus groups, phone surveys, and on-site surveys were performed with a total of 1,415 responses. Information on weather, construction, and traffic conditions was important for automobile travelers for pretrip planning. Construction, alternative route, weather, and traffic conditions were important while enroute. For transit travelers and intercity rail travelers, information on schedules and delays were desired for the pretrip phase. On the other hand, estimated arrival times and delays were important while enroute. Intercity air travelers desired confirmed schedules and flight delays prior to their trip and information on airline connections and destination information while on board. As for the technology preferences, auto travelers were generally satisfied with the existing sources of information such as radio, permanent road signs, and electronic road signs; they were willing to pay for pretrip information through new advanced technology like interactive touch screens and computers. About 40% to 50% of transit users and intercity rail travelers were satisfied with maps and schedules as sources of information. However, a significant percentage of travelers preferred other advanced technologies such as kiosks, computers, and home televisions. In contrast to automobile travelers, the majority of transit respondents were unwilling to pay for the transit information. Computers and telephones were the technologies preferred by respondents to receive most types of information for air travelers. However, a significant percentage showed satisfaction with travel agents and airline phone numbers and printed materials as sources of information. There is an increasing popularity of home-based information devices and, hence, the choices for dissemination of pretrip information will increase.

Existing Advanced Traveler Information Systems and Field Operational Tests

An understanding of the relationship between ATIS design and performance and traveler behavior can be achieved through experimentation, both in the laboratory and in the field. A key purpose of ATIS experiments is to understand traveler behavior implications well enough to build a basis for designing future systems and making decisions about their implementation.

Controlled “laboratory-like” experiments involving actual “real” commuters in a constructed simulated traffic system can provide a feasible and relatively affordable approach to study the behavior of user decisions in transportation systems. In work performed by Mahmassani and Herman (1990), participants independently supplied trip decisions to a computer simulation model of traffic flow. Feedback was supplied to the commuters on the consequences of their decisions, and new decisions were sought for the next day’s trip. Two experiments included nine 1-mile sectors adjoining a four-lane highway facility, and a third experiment consisted of a four-lane highway and a two-lane arterial street used by adjoining residents in their home-to-work commute to a common destination.

One hundred commuters participated in each of the first two experiments and 200 participated in the third experiment. All participants were staff members and actual commuters at The University of Texas at Austin. The information available in the first experiment was the commuter's own experience in the commuting system; in the second experiment was available information from exogenous sources; and the third experiment included both limited and full information (Mahmassani and Stephan 1988). Providing everyone with complete information would reduce overall switching activity relative to a situation under which users receive only limited information. The fraction of users in a given system who have access to complete information is a key parameter in determining the effect of this information on user behavior and system performance. The critical fraction of users beyond which additional information may become counterproductive in all likelihood depends on the characteristics of the particular system and its users. If only a fraction of all the users in a traffic network are equipped with advanced on-board information systems, then benefits can be expected for these individuals and possibly systemwide. On the other hand, when all the users are supplied the same descriptive information, these experiments illustrated that the effectiveness of information was jeopardized. The route switching and departure time switching decisions of individuals were interrelated. Users generally were more likely to adjust their departure time, especially in response to small deviations from their tolerable range of arrival times. Larger deviations were likely to trigger changes in both route and departure time. Furthermore, it appears that over time, users learned to adapt and adjust to the prevailing congestion levels by increasing the amount of schedule delay that they tolerated, particularly for departure time switching. Schedule delay (the difference between actual and preferred arrival times) was the primary performance measure governing departure time switching behavior.

Mahmassani (1997) presented a review of modeling commuter decisions, particularly departure time and route choice, day-to-day dynamics of these decisions in interaction with system performance, and the role of information. The review discussed several methodological approaches proposed for assessing the effectiveness of various possible forms of ATIS in reducing recurrent and nonrecurrent traffic congestion and examining the interactions among key parameters, such as nature and amount of information displayed, market penetration, and congestion severity. The accuracy of the information provided to drivers and the reliability of this information as a basis for route choice decisions are governed by the dynamic nature of the driver-decision environment as a result of the interactions of a large number of individual decisions. Driver decisions on the acquisition of the information system and compliance with its instructions are influenced by the user perceptions of the reliability and usefulness of the system, as well as reports by friends, colleagues, and popular media. This is a long-term process that depends on the type and nature of the information provided, in addition to the individual characteristics and preferences of the driver. The ideal way to study this long-term process is through observations of actual driver decisions in real-world systems. Various

human factors studies have been carried out concerning the attentional demand requirements of in-vehicle navigation devices and their effects on the safety of driver performance, using either a driving simulator or specially adapted vehicles in real urban environments. Mail-back surveys and telephone interviews on drivers' willingness to divert enroute in response to real-time traffic information and their preferences toward the different features of these systems have also been conducted. Several computer-based interactive simulators have been developed in the past decade to study commuter behavior through laboratory experiments as an alternative and precursor to real-world applications (e.g.,IGOR, and FASTCARS). A simulator developed at The University of Texas at Austin offers the capability for real-time interaction with and among multiple driver participants in a traffic network under ATIS strategies. The simulator allows investigation of the day-to-day evolution of individual decisions under such information strategies. These experiments are intended to investigate both the real-time and day-to-day dynamic properties of traffic networks under alternative information strategies, particularly issues of convergence to an equilibrium, stability ,and benefits following shifts in user trip-timing decisions. Understanding can be achieved through experimentation, both in the laboratory and in the field (Schoffer, Khattak, and Koppelman 1993). A key purpose of ATIS experiments is to understand traveler behavior implications well enough to build a basis for designing future systems and making decisions about their implementation.

The early focus of these experiments has been on testing and evaluating the feasibility and applicability of the technologies and on determining their potential for large-scale deployment. The outcome of ATIS demonstrations will depend on many factors, including ATIS design and performance, attributes of the test site, and public and private support, all of which ultimately affect the extent of individual and social benefits. Individual benefits may be tangible, such as travel-time savings, and intangible, such as anxiety reduction. Society may benefit from ATIS through reductions in congestion and pollution.

The MITRE Corporation (1997) sponsored by the Federal Highway Administration prepared a report on the expected and experienced benefits of the Intelligent Transportation Infrastructure (ITI). According to this report, surveys performed in the Seattle, Washington, and the Boston, Massachusetts, areas indicated that 30% - 40% of travelers frequently adjusted travel patterns based on travel information. Of those that changed travel patterns, about 45% changed route of travel and another 45% changed time of travel, an additional 5% - 10% changed travel mode. Studies also indicated interest in traffic information on the part of the traveler as well as willingness to react to avoid congestion and delay. In focus groups for the Atlanta Advanced Traveler Information Kiosk Project, 92% - 98% of participants found the current information on accidents, alternate routes, road closures, and traffic congestion to be useful and desirable. A pilot project in the Netherlands found a 40% increase in route diversions based on traffic information by the 300 vehicles equipped with FM side-band data receivers. Information for Motorists (INFORM) is an integrated corridor on Long

Island, New York, including information via variable message signs (VMS) and control using ramp meters on parallel expressways and some coordination on arterials. Estimates of delay savings owing to motorist information reached as high as 1,900 vehicle-hours for a peak period incident and 300,000 vehicle-hours in incident-related delay annually. Drivers diverted 5% - 10% of the time when passive (no recommended action) messages were displayed and twice that when messages included diversion messages. Drivers diverted starting on several ramps prior to an incident, with any one-exit ramp carrying 3% - 4% of total approaching volume. This higher volume represented an increase in ramp usage of 40% -n 70%. Accident frequency decreased slightly during the study, but data were insufficient to claim a significant trend.

Several traveler information projects appeared to be showing popularity and usage growth. The Los Angeles Smart Traveler project deployed seventy-eight information kiosks in locations such as office lobbies and shopping plazas. Daily access numbers ranged from twenty to one hundred in a 20-hour day, with the lowest volume in offices and the greatest in busy pedestrian areas. The most frequent request (83% of users) was for a freeway map. Over one-half of the users requested MTA bus and train information. Users, primarily upper-middle-class individuals in the test area, were overwhelmingly positive in response to a survey. An automated transit information system implemented by the Rochester-Genesse Regional Transportation Authority resulted in an increase in calling volume. A system installed by New Jersey Transit reduced caller wait time from an average of 85 seconds to 27 seconds, and reduced caller hang-up rate from 10% to 3% while increasing the total number of callers. The Boston Smart Traveler experienced 138% increase in usage from October 1994 to October 1995, totaling 244,182 calls per month, partly because of a partnership with a local cellular telephone service provider. The TRAVLINK test in the Minneapolis area distributed PC and videotext terminals to users and made available transit route and schedule information, including schedule adherence information, as well as traffic incidents and construction information. For the month of July 1995, users logged on to the system 1,660 times, an average of slightly more than one access per participant per week. One-third of those accessing the system requested bus schedule adherence; another 31% of those examined bus schedules. Additionally, three downtown kiosks offering similar information averaged a total of seventy-one accesses per weekday between January and July 1995; real-time traffic data were more frequently requested than bus schedule adherence (MITRE Corporation 1997).

Because ATIS brings new and different technology to travelers already facing relatively complex tasks, some amount of learning will be necessary before travelers become proficient and comfortable with these systems. One of the promising outcomes of all of these experiments will be an increased understanding of the learning process itself, which may be particularly helpful in supporting the design of both future ATIS and training programs for their users.

SUMMARY

This chapter has highlighted several aspects of individual travel behavior that are pertinent to travelers' needs for and responses to travel information, and reviewed previous studies necessary to perform a review and evaluation of the literature. Literature on transportation planning, economics, sociology, geography, and psychology was carefully examined. Relevant aspects of the theory of travel behavior, as well as the trip-planning process of travelers, have been reviewed. Also, studies conducted on travel behavior and trip planning from the perspective of new technologies such as Advanced Traveler Information Systems were reviewed.

Tourism occurs as a result of thousands of individual travelers making individual decisions on how, where, and when to travel. These individual decisions are affected by many factors as well as by the specific alternatives available for the trip. There has been an abundance of research that has attempted to understand drivers' information needs and the possible role that in-vehicle systems could play in fulfilling these needs. Many of these studies have focused on the type of information needed while other studies have dealt with the form needed. Interest in the tourist decision-making process has been steadily growing, but very little has been reported on tourist information needs and preferences. Traffic and traveler information are popular with consumers and systems that provide such information are producing data that can help anticipate systems benefit when wider deployment occurs. As Table 2.2 illustrates, studies have produced benefits in reducing travel delay and travel time, and predict benefits in reducing emissions and fuel consumption (MITRE Corporation 1997).

Table 2.2: Summary of traveler information system benefits

Benefit	Percent Decrease
Travel Time	20% in incident conditions; 8% - 20% for equipped vehicles
Delay	Up to 1,900 vehicle-hours per incident
Fuel Consumption	6% - 12%
Emissions	VOC emissions, 25% from affected vehicles HC emissions, 33% from affected vehicles NO_x emissions, 1.5% from affected vehicles

CHAPTER 3: SURVEY OF RECREATIONAL JOURNEYS

INTRODUCTION

In order to study the process through which travelers plan their trips to unfamiliar areas, the survey of recreational journeys conducted in the city of San Antonio, Texas, was analyzed. The survey was administered by the Center for Transportation Research at The University of Texas at Austin. The main purpose of the survey was to determine travelers' desires and preferences regarding sources and information for travel to and in unfamiliar areas. Questionnaires were distributed among visitors to the city of San Antonio during the summer of 1997. A response rate of 23.3% was obtained from a total of 1,600 questionnaires distributed. The survey asked respondents about their visit to San Antonio, the sources of information consulted and the information obtained to travel to San Antonio, their communication accessibility, and some of their demographic characteristics.

This chapter presents first a description of the survey and its distribution, followed by a description of the respondents' characteristics. Such characteristics include the respondents' visit to San Antonio, specific tour in San Antonio, preferences for information items and sources, communication accessibility, and demographics. Finally, the chapter presents an analysis of respondents' attitudes toward trip planning.

DISTRIBUTION AND DESCRIPTION OF THE SURVEY

Surveys were distributed among San Antonio visitors on 3 days during June and 1 day during July. During June 26-28, 1,100 questionnaires were distributed in the downtown area (Alamo Plaza and Market Square), at the airport, and at the San Antonio Zoo. On July 19, 500 questionnaires were distributed at Sea World.

The questionnaire was designed both in English and Spanish because of the significant portion of the population of San Antonio that speaks Spanish, and the likelihood of large numbers of Spanish-speaking visitors. However, only a handful of Spanish questionnaires were distributed. With the intention of increasing the response rate when administering the survey, potential respondents were asked whether they were visiting San Antonio and whether they were willing to participate in a survey about recreational journeys. Only visitors who indicated willingness to participate received a questionnaire. The survey was designed as a mail-back questionnaire in order to facilitate its administration. For the questionnaires distributed during June, a response rate of about 28% was obtained and for those distributed during July the response rate was 13%. The overall rate of response for both was 23.3%, with 373 questionnaires available for analysis.

The survey consisted of six parts:

Visit to San Antonio

The first part of the survey was intended to assess respondents' experiences in planning, preparing, and taking trips to unfamiliar areas such as San Antonio. This section included questions about the travelers' visit to San Antonio, their trip-planning behavior, and their frequency of recreational trips. The first question asked how often travelers went on recreational trips to unfamiliar out-of-town areas. The following questions asked about their visit to San Antonio. These questions included the primary purpose of their visit, the length of their visit, the number of prior visits to the city, the travel mode they used to get to the city, and whether they were staying at a hotel. Questions concerning their trip-planning behavior were also asked, including when hotel reservations were made, when decisions on specific destinations were made, how hotel reservations were made, and what information and information sources were used before traveling to San Antonio.

Specific day in San Antonio

The second part of the survey contained questions concerning the specific day in San Antonio when travelers received the questionnaire. These questions were intended to determine travelers' behavior once at the destination, and included the time at which travelers left their hotels/homes and the time they returned. Also, they were asked to list the destinations visited, the accompanying travelers, the decision makers, the information seekers, and the travel modes used within San Antonio. Other questions were concerned with the information items obtained about destinations, the sources of this information, and factors affecting the choice of transportation mode, planned and actual routes, and initial planned schedule.

Preferences for information items and sources

The third part asked respondents about their preferences for information items and information sources when traveling to unfamiliar areas. The questions included in this section applied to an ideal situation and did not necessarily reflect the respondent's situation at the moment of answering the questionnaire.

Attitudinal questions

This part of the survey consisted of ten attitudinal questions intended to examine respondents' reactions under predetermined imaginary situations. The answers were categorical in the form of a five-point Likert scale ranging from strongly disagree to strongly agree. Some of the

statements were intended to capture the traveler's fears of getting lost, attitudes toward congestion, and satisfaction with available information.

Communication accessibility

Three questions were included regarding respondents' ease of access to specific communication media. Respondents were asked whether they used mobile phones, whether they listened to radio traffic reports, and whether they had access to the Internet at home.

Demographics

In the last part of the survey, information about the respondents' demographic characteristics were obtained to study the sample distribution as well as to analyze the effect of these characteristics on the travelers' recreational trip behavior. This part contained questions about personal characteristics and household characteristics. Personal questions included the traveler's hometown, age, gender, education, and income. Household questions included household size, age of youngest in household, number of licensed drivers, and number of employed persons in the household.

CHARACTERISTICS OF RESPONDENTS

In this section the analysis of the survey is presented. The analysis is based on descriptive statistics of all of the survey questions. The presentation will follow the same order in which the questions are presented in the survey.

Visit to San Antonio

As mentioned previously, the first part of the survey was intended to assess respondents' experiences in planning, preparing, and undertaking trips to unfamiliar areas. This section includes questions about the travelers' visit to the city of San Antonio, their trip-planning behavior, and the frequency of their recreational trips.

The first question asked how often travelers went on recreational trips to unfamiliar out-of-town areas. The most frequent response was about two trips a year, indicated by 27.8% of respondents. Approximately 11.4% of respondents made less than one recreational trip in a year and 23.5% made exactly one a year. About 24.3% stated that they made three or four recreational trips to unfamiliar areas in a year while 13% mentioned that they made more than four trips a year. These results indicate that the sample is well distributed in terms of respondents' propensity for recreational trips to unfamiliar out-of-town areas.

In the second question, respondents were asked to indicate the primary purpose of their visit to San Antonio. Figure 3.1 presents the distribution of responses to this question. The majority of

respondents, 62.4%, were in San Antonio for pleasure and vacation. The remainder of the respondents were in San Antonio either for business, 17.5%, or to visit relatives and friends, 12.4%. Only one respondent stated he lived or worked in San Antonio.

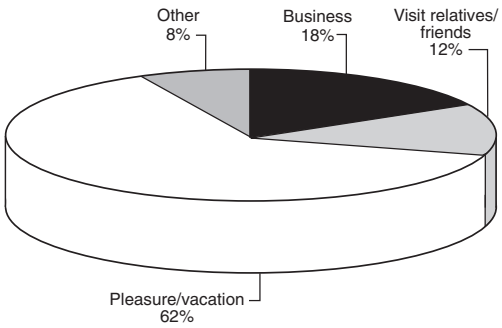

Figure 3.1: Respondents' distribution based on the primary purpose of visit

About 14.1% of respondents were in San Antonio only for a day trip and 85.9% stayed overnight. The average length of stay in San Antonio for respondents who stayed overnight was about 4.14 days, with a standard deviation of 5.58 days. Two of the respondents stated their length of stay was more than a month (respectively, 90 and 40 days).

About 65.1% of respondents had visited San Antonio at least once before; 13.7% of respondents indicated they had been in San Antonio only once before; 17.2% of respondents two to four times before, and 34.1% more than four times before. These responses provide a basis for examining whether there are significant differences in the responses of familiar trip-makers and unfamiliar trip-makers to San Antonio.

Of respondents who were in San Antonio for more than 1 day, the majority (76.3%) stayed at a hotel in San Antonio. Approximately 77% of these visitors made hotel reservations before they arrived in San Antonio. However, 12.3% of respondents did not make reservations and 10.7% made their reservations the same day they arrived in San Antonio. The highest percentage of respondents, 31%, made their hotel reservations more than 1 month before arriving in San Antonio, followed by 25% of respondents making reservations 1 to 4 weeks in advance.

Of the respondents who stayed at a hotel where they had made prior reservation, a significant portion (66.5%) contacted the hotel directly; approximately 14% depended on a travel agent for their hotel reservations; and an approximately equal percentage depended on a conference or organized group. Only a small portion, 2.8%, used the Internet to make their reservations. Other methods specified by respondents included relying on relatives/friends who live in San Antonio to make the reservations (comprising only 3.6% of those who stated how they made reservations).

Figure 3.2 presents the distribution of transportation modes used by respondents to travel to San Antonio. Cars, mentioned by 54.9% of the respondents, were the primary travel mode. Airplanes were the second most frequently used mode to travel to San Antonio, mentioned by 29.2% of respondents. Rental cars were used by about 11.5% of respondents. Respondents rarely used other modes such as trains, buses, and taxis.

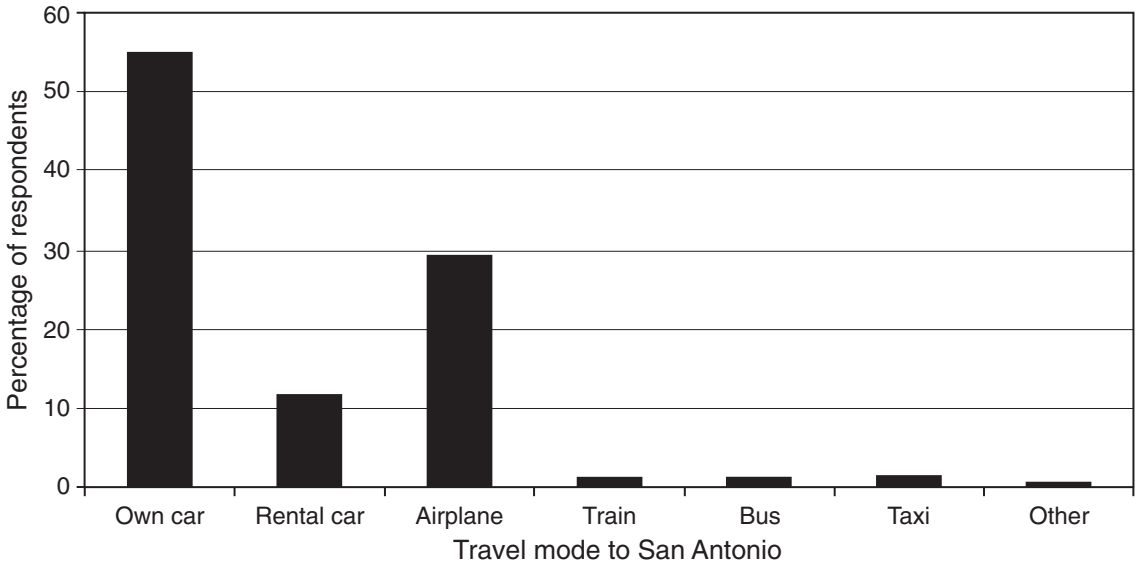

Figure 3.2: Respondents' distribution based on the mode of travel to San Antonio

Based on distance from their hometown and mode of transportation used to travel, researchers found that as the distance from home increases, so does the number of respondents who travel by airplane.

The airplane is the preferred mode of transportation among many pleasure travelers, because it minimizes the amount of time needed to reach a vacation destination (Mayo and Jarvis 1982). In the United States, nearly 10% of vacation travel is by air. Air travel dominates commercial carrier traffic for all the trips over 300 miles. However, the automobile is used for 85% of all the vacation travel out of a total of 240 billion miles traveled annually by more than 110 million Americans. Bus and rail traffic is far down the list of preferred modes for vacation travel (Rosenow and Pulsipher 1979).

Approximately 64.3% of visitors decided on specific destinations to visit in San Antonio before their arrival, with 24.6% deciding after arrival in San Antonio, and 11.1% deciding the same day they arrived. The decision on which destinations to visit was made 1 to 7 days before arriving in San Antonio by 21.1% of respondents, 1 to 4 weeks before arriving by 23.2% of respondents, and more than a month before arriving by 20% of respondents. This confirms that a significant percentage of the sample planned their recreational trips to unfamiliar areas in advance.

As mentioned previously, the first part of the survey intended to assess respondents' experiences in planning, preparing, and taking trips to unfamiliar areas. Figure 3.4 presents respondents' distribution according to the sources of information consulted in planning their trips. Asking friends and relatives to obtain travel information was the most frequent answer, 23%, to the question on information sources used to plan a trip to San Antonio. Respondents more frequently used the traditional sources of tourist information such as the visitor's bureau (16.8%), guidebooks (14.2%), advertisements (13.4%), and travel agents (6.3%). Travel agents, for example, book about 10% of the nation's travel business; they book some 40% of the domestic air travel in the United States and handle reservations for hotels, resorts, tours, and other organized travel packages. New information sources such as the Internet seem to be a good source of information used by about 10% of respondents. These results on traditional and new sources of information indicate people still prefer word of mouth as a source of information, perhaps because of the absence of reliable information systems to obtain the desired travel information, but more likely because of the particular attributes of this source (human interaction). Radio and television were not used frequently as sources of information, most likely because these media neither provide the specific information items that may be desired by tourists nor do they offer the ability to search for specific items. Other information sources indicated by respondents were the American Automobile Association (AAA), other guidebooks, and experience from previous trips.

When respondents were asked what kinds of information they obtained to plan their trips, 24.9% indicated information on attractions (locations, opening hours, and special events), while 22.5% obtained a map of the city. Other information such as hotel information, restaurant information, prices or costs of specific destinations, and weather information were mentioned by 16.6%, 12.3%, 11.1%, and 8.1% of respondents, respectively. On the other hand, travelers to San Antonio rarely obtained information on transit and parking. Most respondents depended on private or rental cars to travel to San Antonio and, hence, transit information was not important for them. Although these respondents might have needed information on parking conditions, it may have been too early to think about parking if they had not yet arrived in San Antonio. Figure 3.5 illustrates the distribution.

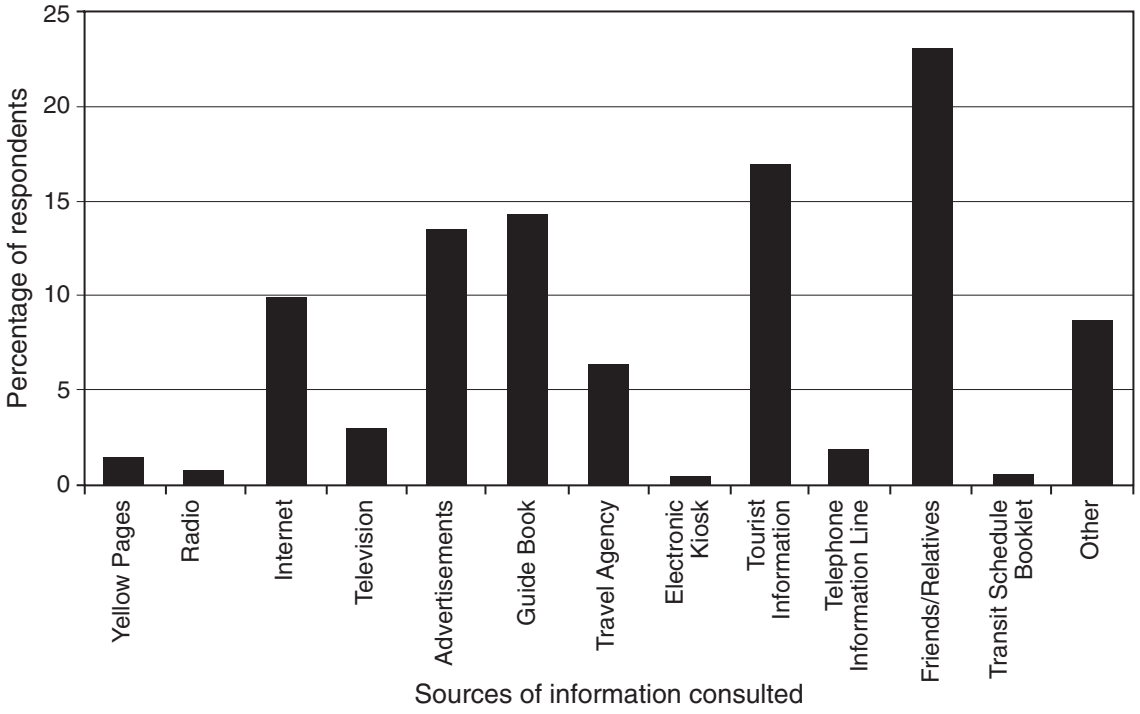

Figure 3.3: Respondents' distribution based on their consulted sources of information

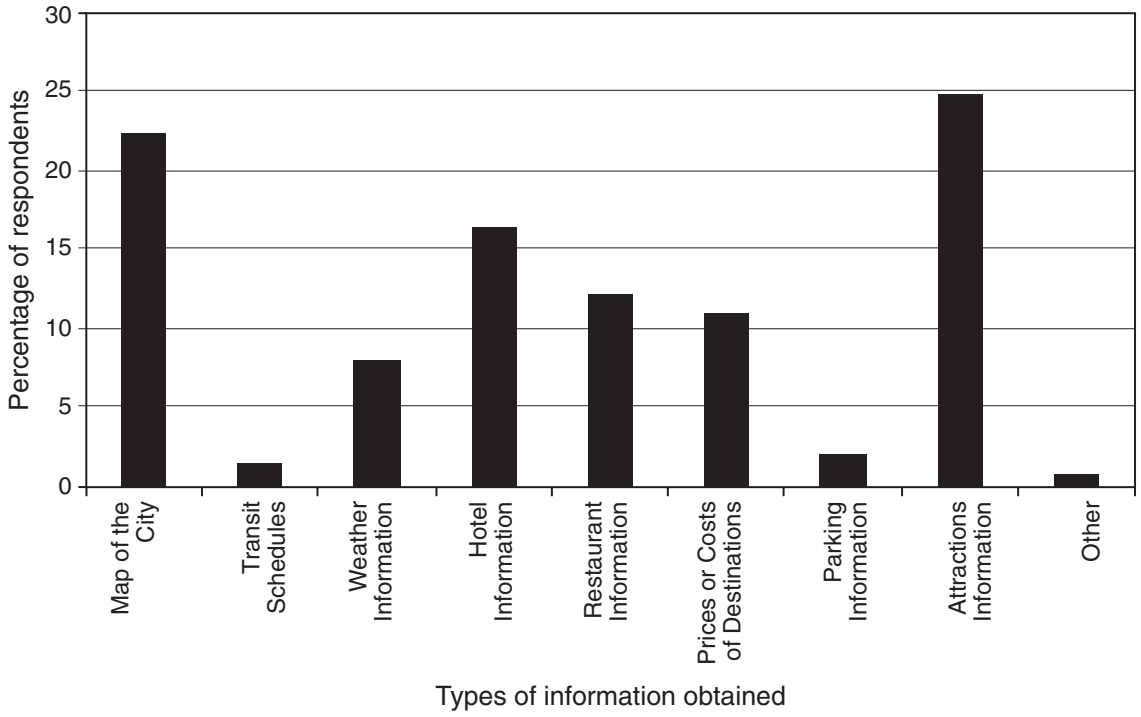

Figure 3.4: Respondents' distribution based on information items obtained

Specific Day in San Antonio

The second part of the survey contained questions concerning a specific day in San Antonio, namely, the day when travelers received the questionnaire. These questions were intended to determine travelers' behavior once at the destination.

The first question asked respondents who was traveling with them. About 48.6% of respondents were traveling with their spouses/partners; 27.2% of respondents were traveling with their children; about 37% were traveling with both spouses/partners and children; and 14.9% of respondents were traveling with other relatives and with other friends. Respondents who traveled alone constituted only 1.7% of the sample and were in San Antonio mainly for business or for a conference/convention.

The second question in this section asked respondents who in their traveling party made the decisions on where to go, when to go, and which route to take. About 25.3% of respondents made decisions by themselves while 25.8% of respondents depended on other people who were traveling with them. The majority of respondents, 48.6%, stated they depended both on themselves and on the people traveling with them to make decisions. In general, 53.4% of the survey respondents shared in the travel decision-making process. With respect to the information search process, 69.3% of the survey respondents worked with someone else to find the information desired while 39.7% looked for the information by themselves. In general, about 68.2% of the sample were information seekers.

Figure 3.6 presents the information items obtained by respondents about destinations before going to them, while Figure 3.7 presents the information sources consulted by respondents to obtain information on destinations. As shown in Figure 3.6, the most frequently sought information items about destinations were the location, opening hours, entrance fees/discounts, and directions to get there. Each of those items was mentioned by at least 15.7% of respondents. About 9% of the respondents sought information about special exhibitions or attractions. Other items, such as parking availability and parking cost were not obtained before going to the destination. In San Antonio, visitors apparently expect to find an affordable parking space near their destinations.

Figure 3.7 shows that the most commonly used information sources were brochures, guidebooks, and asking at the hotel. About 12% of respondents stated that they depended on friends/relatives to obtain information on destinations and about 10% called the destination directly to obtain such information. As expected, TV and radio were not frequently used as information sources. Other sources, such as electronic kiosks, were not used frequently either. Electronic kiosks are not fully deployed in San Antonio, so people are not aware of their capabilities.

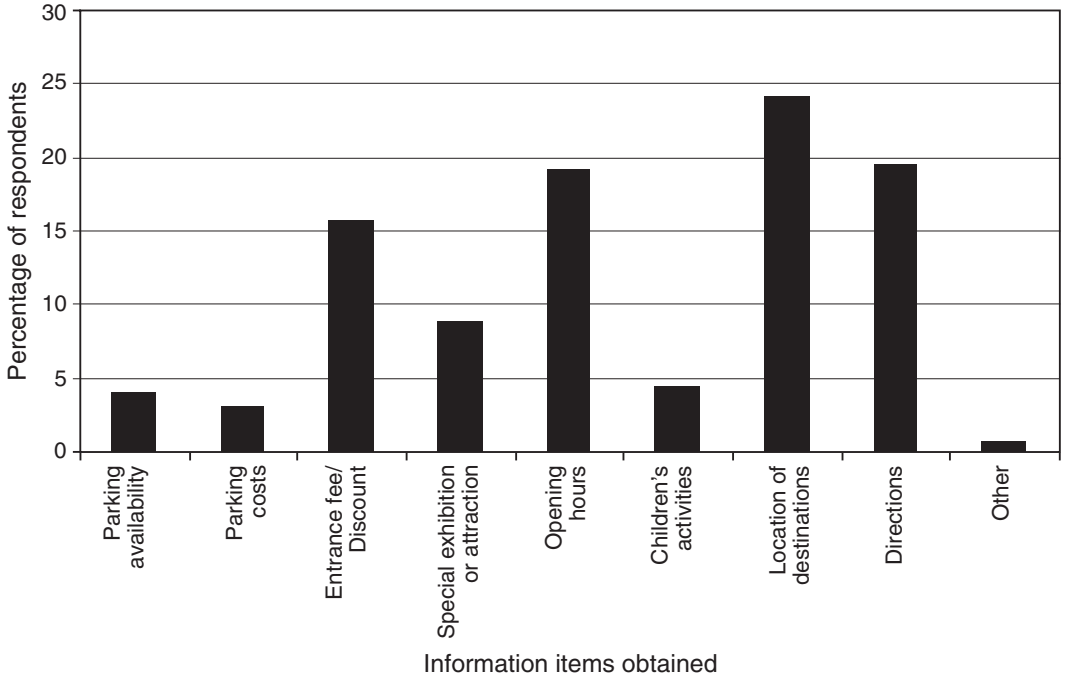

Figure 3.5: Respondents' distribution based on information items obtained before going to the destination

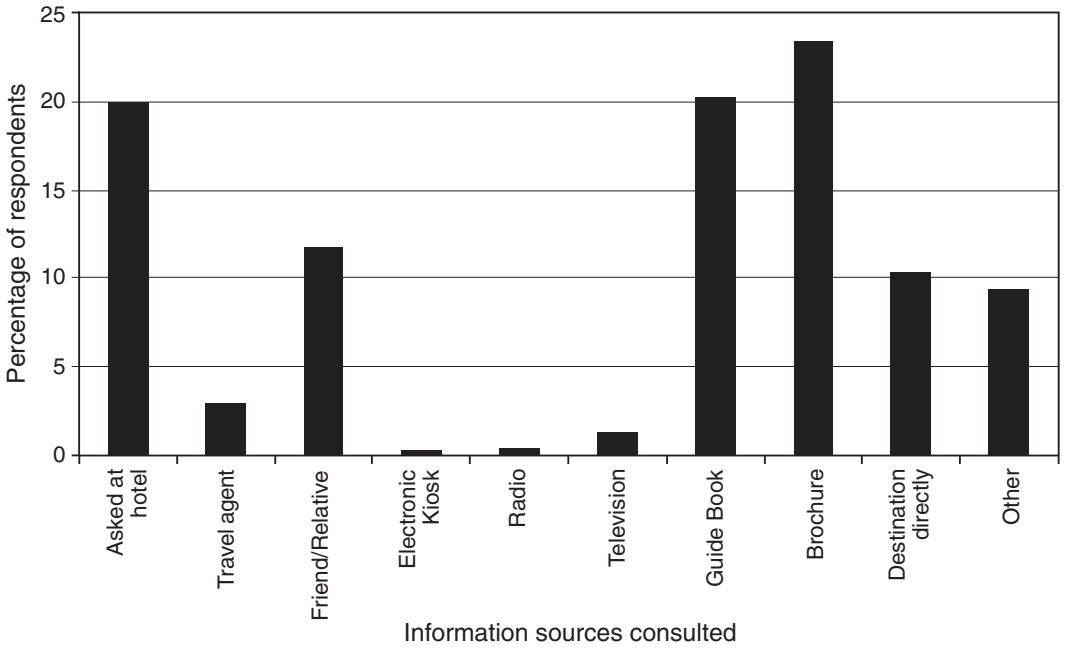

Figure 3.6: Respondents' distribution based on information sources consulted before going to the destination

Respondents were also asked what modes of transportation they used within San Antonio. Once again, the automobile was the mode of travel most frequently used by respondents. About 36% of respondents used their own cars, while about 13% used rental cars. Of those respondents who used their own cars to travel to San Antonio, about 20% did not use them to travel within San Antonio, while almost all of those who drove to San Antonio in rental cars also used them within the city. This likely reflects that travelers who rent a car may attempt to make the most of it, whereas those who drive their own cars do not feel as compelled to maximize its use; as such, they may use other modes of travel such as buses, taxis, or simply walking, especially if the vehicle is shared with other members of the household. Figure 3.8 illustrates the distribution of respondents according to the mode of transportation used within San Antonio.

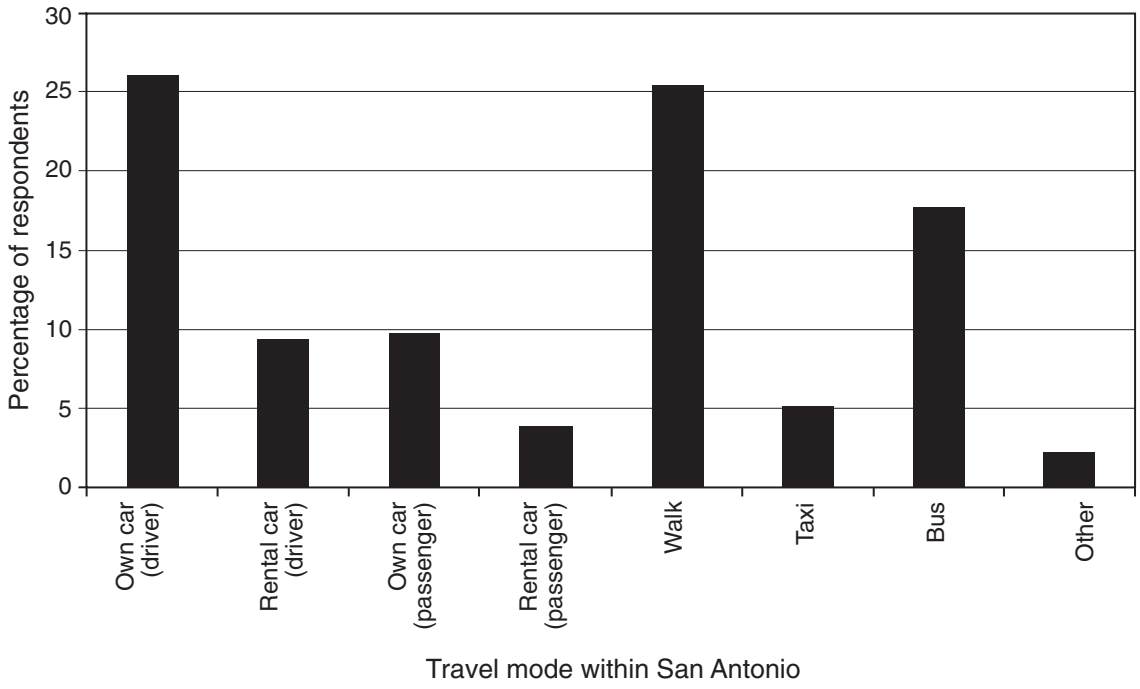

Figure 3.7: Respondents' distribution based on the mode of travel used within San Antonio

The availability of a car and the location of the destination were the two principal factors influencing travelers' choice of transportation mode within San Antonio. About 28% of respondents mentioned car availability and about 24% mentioned location of destinations. Travel costs and travel time were the third and the fourth most important factors affecting this choice (9.7% and 8.2%, respectively). Other influences, such as weather conditions and time of day, affected travel mode choice of only 6.9% and 5.2% of respondents, respectively. Public transit conditions were important for 6.6% of respondents wanting to know bus availability and for 5.2% of respondents wanting to know transit schedules. Other factors that were stated by 2.5% of respondents included safety, ease to walk, availability of group shuttles, and traffic congestion.

Respondents who traveled within San Antonio in an automobile were asked questions related to their travel behavior and route planning. First, respondents were asked if they studied the route in detail before leaving their hotels/homes. Second, respondents were asked if they changed the originally planed route while driving. More than one-half of respondents, 55.7%, studied their routes before leaving while only 18.0% changed their originally planned routes. Visitors most likely have some fear of getting lost, which motivates them to plan their routes beforehand and avoid changing them afterwards.

The stronger influences on respondents' choice of route were directions and information from maps, which can be easily understood because the travelers' main objective is to reach their destinations. Travel time and opening hours also influenced a significant fraction of respondents.

On the other hand, the stronger influences on respondents' change in route while driving are fixed message signs and things they saw along the road. However, it should be mentioned that only fifty-nine respondents answered this question on factors influencing route changes.

Respondents were also asked if they changed their originally planned schedule through the course of the day. About 68% of respondents reported that they did not follow a rigid schedule, while 15% reported that they did not change their original schedule. Only 16% changed their original schedule during their tour in San Antonio. For those who changed their schedule, no dominant reason was provided for the change. Changes in weather conditions caused about 18% of respondents to change their schedules. Also, 18% of respondents changed their schedules because of experiencing disappointment, enjoyment, or boredom. Different travel times and different closing hours caused 15% and 14% of respondents, respectively, to change their schedules.

Preferences for Information Items and Sources

In the third part of the survey, respondents were asked about the primary types of information they would like to obtain when visiting an unfamiliar area and the primary sources from which they would like to obtain this information. Respondents were asked to check the three primary items from a provided list of information items and the three primary sources from a provided list. Figure 3.9 presents the information items preferred by respondents. Two items, information about destination and route guidance, were seen as important by a large fraction of travelers. About 34% of respondents stated destination information as important and 31.3% stated route guidance information as important. Information about modes of transportation was ranked third. Weather reports and traffic reports were stated as important by 10.7% and 6.4% of respondents, respectively. Approximately 3% of respondents stated attraction-related information to be important when visiting unfamiliar areas.

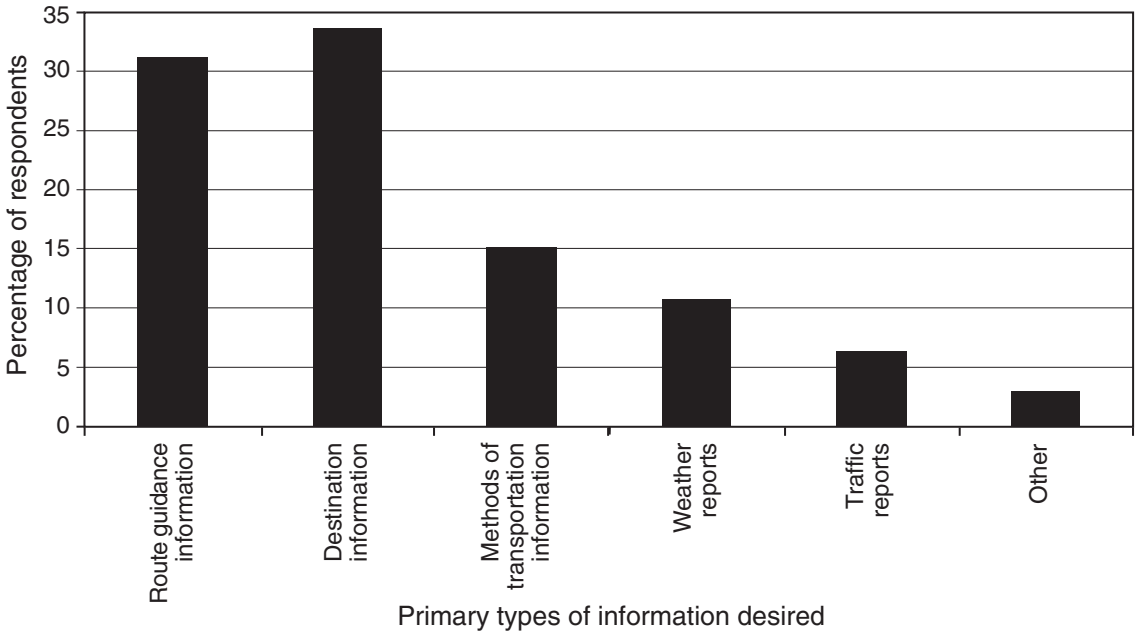

Figure 3.8: Respondents' preferred information items when visiting unfamiliar areas

Travelers preferred traditional information sources such as guidebooks and maps when obtaining travel information. Approximately 26% of respondents stated they preferred guidebooks and about 23% stated they preferred maps. Respondents who preferred obtaining travel information by word of mouth constituted about 12% of the sample. Telephone information lines and the Internet were selected by 11% and 9% of respondents, respectively. Travel agents, television, and radio were preferred by 6.1%, 5.5%, and 2.3% of respondents, respectively. Few respondents selected information sources such as personal electronic devices and electronic kiosks. Figure 3.10 presents the distribution of information sources preferred by respondents.

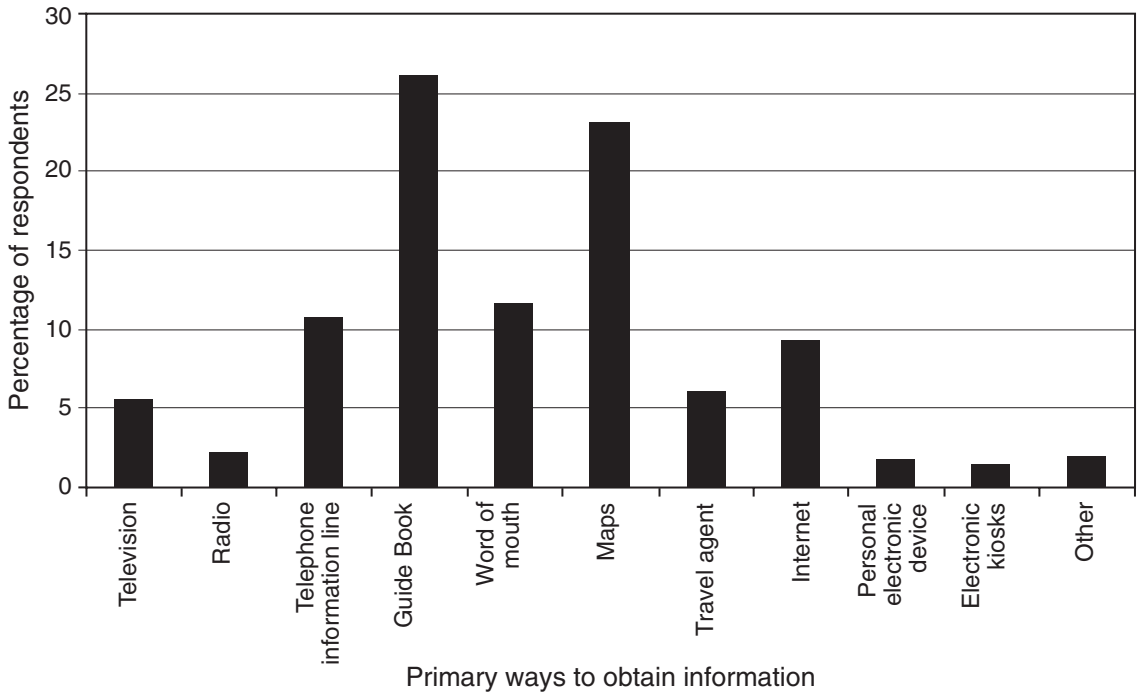

Figure 3.9: Respondents' preferred information sources when visiting unfamiliar areas

The fourth part of the survey included questions about travelers' attitudes toward recreational trips in unfamiliar areas. These questions asked respondents if they would agree or disagree with various statements about travel planning and recreational trips. The responses were in the form of a five-point Likert scale with "one" for "strongly disagree," "two" for "disagree," "three" for "neutral," "four" for "agree," and "five" for "strongly agree." Table 3.1 summarizes the responses of San Antonio visitors to the attitudinal questions, including the mean score and its standard deviation across all the respondents to each question.

Respondents in general (66.5%) preferred to stay on the same route when it is congested than to take an unknown route because of their fear of getting lost. Previous studies conducted by Wallace et al. (1993) analyzing drivers' route diversion decisions showed similar results. In these studies, travelers ranked condition of alternate routes as the most important information item and availability of directions for alternate routes as the second most important information item they would like to support their decision of diverting to another route. Most travelers, 81.2%, agreed or strongly agreed on preferring to know exactly the specific route to take before leaving home. Pretrip information is clearly important for these respondents.

A significant percentage of travelers, 64.6%, indicated they disagreed or strongly disagreed with the statement of not being concerned about congestion when traveling for recreational activities. Approximately 72.2% of respondents preferred to visit new and unfamiliar areas on their vacations.

Studying the behavior of travelers in unfamiliar areas and knowing their needs and preferences for information can help in the design of traveler information systems for tourists.

Table 3.1: Travelers' responses to the attitudinal questions

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Mean	Standard Deviation	Total Responses
- When driving in unfamiliar areas I would rather stay on the same route when it is congested than take an unknown route, with the risk of getting lost.	3.8%	15.7%	14.1%	42.2%	24.3%	3.65	1.16	370
- Before I leave home I like to know exactly the specific route I want to take.	1.3%	6.2%	11.3%	42.5%	38.7%	4.10	0.95	372
- I am not concerned about congestion when I am traveling for recreational activities.	20.8%	43.8%	18.6%	12.7%	4.1%	2.34	1.09	370
- I prefer to visit new and unfamiliar areas when going on vacation.	2.2%	3.2%	22.4%	45.8%	26.4%	3.89	0.94	371
- I usually plan the details of my vacations far in advance.	2.4%	19.2%	27.4%	38.8%	12.2%	3.35	1.06	369
- I always compare prices before I make any choice. (for example, for travel, restaurants, hotels).	1.6%	12.9%	20.7%	40.9%	23.9%	3.72	1.03	372
- When traveling in groups or with the household, I am the one who plans the journey.	2.2%	15.1%	36.8%	29.0%	16.9%	3.43	1.02	372
- I usually consider taking my pets with me on recreational trips.	46.1%	21.1%	4.6%	3.5%	9.5%	2.60	2.03	369
- In general, I am satisfied with the available information when traveling in unfamiliar areas.	2.2%	12.5%	22.8%	57.3%	5.2%	3.46	0.94	368
- When obtaining information, I prefer to speak with a person rather than using a computer or other electronic device.	1.4%	8.9%	27.6%	23.6%	38.5%	3.85	1.13	369

Fifty-one percent of respondents agreed with the statement that they usually plan the details of their vacations far in advance, while the remaining 49% were either neutral or disagreed. About 64.8% of respondents indicated that they compared prices before making any choice. This question was included to provide an indication of the price consciousness of the respondents. With regard to who plans the journey when traveling in a group or with the household, 29% of respondents agreed and 16.9% strongly agreed that they plan the journey by themselves. Respondents who depend on others when planning their journeys (respondents who stated disagree and strongly disagree) constituted 17.3% of respondents.

Results clearly show that respondents do not usually take their pets along on recreational trips, with 67% indicating disagreement with the statement of taking pets on recreational journeys; note that 23% selected the "not applicable" response, presumably because they do not own pets.

Another question addressed the respondents' level of satisfaction with available information when traveling in unfamiliar areas. Most respondents were satisfied with the current available information though it appears there may be a difference in degree of satisfaction as only 5.2% strongly agreed, while 57.3% merely agreed with the statement. This difference in degree suggests that there may be room for improvement in current information systems.

Finally, when respondents were asked whether they preferred to speak with a person or use a computer or electronic device when obtaining information, 62.1% clearly indicated their preference for speaking with a person.

Communication Accessibility

The section of the survey on communication accessibility consisted of three questions. Respondents were asked whether they used cellular phones and 53.5% replied affirmatively. By comparison, it is reported that about 20% of Americans subscribed to cellular services during 1997. Respondents were also asked if they had access to the Internet at home, and about one-half of the sample (49.2%) said they did. Finally, respondents were asked if they listened to radio traffic reports to which about 62% of respondents answered yes.

Demographics

The last part of the survey was intended to obtain insight on the sociodemographic characteristics of respondents. It included questions on the traveler's hometown, age, gender, education, and income. The survey also included questions on household characteristics, such as number of persons living in the household, age of youngest in the household, number of persons with a driver's license, and number of persons employed for more than 30 hours a week in the household. The responses to these questions are summarized in Table 3.2.

Table 3.2: Summary of sociodemographic characteristics

Characteristics		**Frequency (%)**
Hometown		
	Texas	46.7%
	Rest USA	50.3%
	Not USA	3.0%
Age		
	Under 18	0%
	18 - 29	15.3%
	30 - 39	25.8%
	40 - 49	28.0%
	50 - 59	16.7%
	60 or above	14.2%
Gender		
	Male	37.5%
	Female	62.5%
Age of youngest in household		
	1	18.9%
	2	21.0%
	3	6.6%
	4	4.1%
	5	4.9%
	6	44.5%
Education		
	Less than high school	1.1%
	Finished high school	11.6%
	Some college/university	30.3%
	Finished college/university	38.1%
	M.S.	15.1%
	Ph.D.	3.8%
Income		
	Less than $25,000	7.2%
	$25,000 - $49,999	35.5%
	$50,000 - $75,000	25.7%
	More than $75,000	31.5%

Respondents were asked which city and state or country they came from. If they came from the United States, they were asked the zip code of their hometown. The vast majority of the respondents, 97%, were originally from the United States, and only 3% of the sample were from out of the country. It is interesting to note that about one-half of the visitors from the United States (46.7%) were from the state of Texas. Only one respondent reported living or working in San Antonio.

Six age categories were provided for the respondents in the questionnaire. However, one of the categories ("Under 18") was not selected. This reflects the manner in which the survey was

administered, whereby adults were primarily approached to complete the questionnaire. People under 18 were usually accompanied by an adult who would be asked to complete the questionnaire. Most of the respondents fall into categories of ages 30 through 39, represented by 25.7% of the sample, and of ages 40 through 49, represented by 27.9% of the sample. A larger fraction of survey respondents was female, 62.2% of the total. This represents almost a 2:1 ratio of female respondents to male respondents.

Respondents were asked to report the age of the youngest person in the household. This question assessed the distribution of families with young children and those without. A total of 50.6% of respondents indicated a household member under 18 years old. This represents about one-half of the sample, with approximately 39.9% being less than 12 years old. On the other hand, 44.5% of the sample do not have children. These respondents reported having household members 21 years of age and older, who are not considered children but adults.

When asked about their educational background, 98.9% of the travelers surveyed indicated having completed high school and 87.3% having attended a college or university. This very high rate of well-educated respondents reflects the particular target population sampled, as well as a well-known response bias toward better-educated individuals. Another common bias is toward higher-income respondents. In this case, more than one-half of the sample, namely 57.2%, reported earning more than $50,000 per year per household.

Questions on the respondent's household characteristics included the number of persons living in the household, the number of persons with a driver's license, and the number of persons employed for more than 30 hours a week. The average household has three members, of whom approximately two are licensed drivers and two are employed for more than 30 hours a week. The results are illustrated in Table 3.3.

Table 3.3: Household characteristics

Variable	Mean	Standard Deviation	Total Responses
Household size	**3.01**	**1.37**	**368**
Number of people with driver's license	**2.14**	**0.81**	**367**
Employed persons in the household	**1.54**	**0.89**	**339**

INFORMATION USE AND PREFERENCES

An analysis of respondents' use of different information items and information sources before and during the trip to San Antonio is presented. In addition, their preferences toward certain information items and sources are discussed.

In order to study whether there is correspondence among the information items and the information sources respondents used before and during their trip, and among their stated preferences for various information items and sources, tests of independence of factors were performed. These tests assess the relationship between two different factors in a single population. Independence between the two factors is assumed (null hypothesis) and tested at a specified level of significance. If this hypothesis is rejected, it can be concluded that dependence exists between the two factors at the specified level of significance (Mahmassani, Kraan, and Abdelghany 1998).

In order to perform the tests, each of the two factors is considered to consist of a number of categories, *"I"* categories for the first factor and *"J"* categories for the second factor. Each individual in a sample of size *n* drawn from the population is assumed to belong to exactly one of the *"I"* categories associated with the first factor and exactly one of the *"J"* categories associated with the second factor. Accordingly, the number of individuals n_{ij} who fall in both category *i* of the first factor and category *j* of the second factor can be determined and displayed in a two-way contingency table with "*I*" rows and "*J*" columns.

Consider p_{ij} the probability that a randomly selected individual falls in both category *i* of the first factor and category *j* of the second factor. Also, consider p_i the probability that a randomly selected individual falls in category *i* of the first factor, *i = 1, ...,* I. Finally, consider p_j the probability that a randomly selected individual falls in category *j* of the second factor, *j = 1,..., J*. The expected number of individuals who fall in each cell (*i, j*) is $(n \times p_{ij})$. When the null hypothesis of independence between the two factors is true, the expected number of individuals who fall in each cell is equal to $(n \times p_i \times p_j)$ (DeGroot 1989).

The maximum likelihood estimates of the probabilities p_i and p_j are n_i/n and n_j/n, respectively. The number of individuals who fall in category *i* of the first factor is represented by n_i. The number of individuals who fall in category *j* of the second factor is represented by n_j. Therefore, the estimated expected cell count e_{ij} is equal to $(n_i \times n_j/n)$.

The estimated expected cell counts, $\underline{e_{ij}}$'s, are compared to the observed cell counts, n_{ij}'s, by calculating the test statistic, which is equal to the sum over all the cells of the value $(n_{ij} - e_{ij})^2 / e_{ij}$. Under the null hypothesis, this summation is distributed according to the χ^2 distribution. The null hypothesis of independence is rejected when the summation is greater than $\chi^2_{\alpha,(i-1)(j-1)}$, where α is the level of significance and *(i-1)(j-1)* is the number degrees of freedom of the χ^2 distribution (DeGroot 1989).

Information Items and Sources Consulted to Plan the Trip to San Antonio

This section addresses the information items and information sources consulted by respondents before their trip. Information use during the trip is discussed in the next section. To study the extent to which certain information items are acquired in combination with other items, a series of pairwise tests of independence of factors were performed on responses concerning the kinds of information obtained before traveling to San Antonio. Following the technique described above, Table 3.4 lists pairs of information items that were found to be dependent on each other.

Table 3.4: Correspondence between information items obtained pretrip

		Correlation Coefficient	χ^2	Sig. Level
Map of the city	Weather	0.175	10.431	0.001
	Hotel	0.153	8.628	0.003
	Restaurant	0.273	26.816	0.000
	Attractions	0.179	11.042	0.001
Transit schedules	Weather	0.222	18.556	0.000
Weather	Restaurant	0.248	19.932	0.000
	Parking	0.244	20.224	0.000
Hotel	Restaurant	0.202	14.923	0.000
	Prices of destinations	0.246	16.580	0.000
Restaurant	Attractions	0.213	17.094	0.000
Prices of destinations	Attractions	0.265	20.649	0.000

Pairwise tests of independence of factors were also conducted to investigate the association between the reported information items and characteristics of the trip and of the tripmakers. The pairs exhibiting significant dependence are summarized in Table 3.5.

Table 3.5: Correspondence between information items obtained pretrip and other characteristics

Information items	Other characteristics	Correlation Coefficient	χ^2	Sig. Level
Transit schedules	Age	0.192	18.513	0.002
Weather	Travel mode to S.A.: airplane	0.184	13.039	0.000
Hotel	Time when hotel reservations were made	0.347	61.416	0.000
Restaurant	Length of stay in S.A.	0.154	11.079	0.001
	Time when hotel reservations were made	0.240	12.086	0.001
	Travel mode to S.A.: own car	-0.161	34.348	0.017
	Travel mode to S.A.: airplane	0.179	24.167	0.000
Prices of destinations	Time when decisions on specific destinations were made	0.165	14.149	0.015
	Preference of visiting new and unfamiliar areas when going on vacations	-0.154	20.227	0.001
	Age of youngest in household	-0.222	14.549	0.024
Attraction	Time when decisions on specific destinations were made	0.161	15.136	0.010

It was found that older people were more likely to obtain transit information for their trip to San Antonio than younger people were. Older people are probably less inclined to drive in an unfamiliar area, and more likely to consider public transportation during their San Antonio tour. Respondents who traveled by airplane generally came from locations with different weather conditions than San Antonio's weather conditions; as such, they were more likely to seek weather information. Respondents who make hotel reservations far in advance were more likely to obtain hotel information because they have more experience with arranging accommodations and therefore know how the reservation systems operate.

Respondents who stayed in San Antonio for longer periods, made hotel reservations far in advance, and traveled to San Antonio by airplane were more likely to obtain restaurant information. Presumably, longer stays provide more opportunities for eating out and, hence, some incentive for advance planning. Respondents who traveled to San Antonio in their own cars were less likely to obtain restaurant information, possibly because of greater familiarity or greater reliance on highway-oriented restaurant choices found throughout Texas and the region. Respondents who made decisions on specific destinations to visit far in advance were more likely to inquire about the prices

charged at these attractions. However, respondents who preferred to visit new and unfamiliar areas while on vacation were less likely to obtain the prices for specific destinations.

Survey respondents used different sources to obtain pretrip information. Results of independence tests revealed that respondents who used yellow pages were more likely to consult transit schedules; those who listened to the radio to obtain information also watched the television for that purpose; and some of the respondents receiving information from television also accepted information from advertisements. However, people who consulted travel agencies did not pay attention to advertisements.

A common characteristic of current information provision through television and radio is that respondents receive the information passively, without a priori intention of obtaining this information. Accordingly, the association between using television and radio as information sources may reflect a propensity or receptiveness toward passive information.

Tests were also conducted to investigate the pairwise association between the information sources consulted and individual characteristics of the trip and of the respondents. Table 3.6 presents the factors found to be significantly interdependent with each of the information sources.

Table 3.6: Correspondence between information sources consulted pretrip and other characteristics

Information sources	Other characteristics	Correlation Coefficient	χ^2	Sig. Level
Radio	Travel mode to SA: train	0.188	13.342	0.000
Internet	Preference of speaking with a person rather than using a computer or electronic device	-0.295	22.344	0.000
	Education	0.164	14.202	0.027
	Income	0.198	42.251	0.000
Advertisements	Distance from hometown to SA	-0.154	8.312	0.004
Travel agency	Distance from hometown to SA	0.236	24.051	0.000
	Travel mode to SA: own cars	-0.253	20.264	0.000
	Travel mode to SA: airplane	0.215	270.765	0.034
Kiosk	Satisfied with available information	-0.159	24.130	0.000
Tourist info. Center	Time when hotel reservations were made	0.157	15.269	0.009
Transit schedules	Travel mode within SA: bus	0.214	4.239	0.039

One unusual association revealed by the analysis is that respondents who listen to the radio to obtain information for their trip are more likely to travel to San Antonio by train. Less surprising is that respondents who prefer to speak with a person rather than using a computer or electronic

device to obtain travel information are less likely to use the Internet as a source of travel information. Furthermore, respondents who were more likely to use the Internet as a source were found to be better educated and wealthier.

Residents of the state of Texas were found to be more responsive to advertisements as a source of travel information, whereas travelers from other states or other countries were more likely to depend on travel agencies to obtain such information. This may be a natural reflection of the supply side of advertising: special offers and opportunities in San Antonio are more likely to be advertised in Texas than in far-flung places from which San Antonio draws a relatively small number of visitors. Respondents who claimed to be satisfied with available travel information were found less likely to use kiosks. Kiosks are a relatively novel source of information and many tripmakers may not be aware of their availability or capabilities.

The interdependence between the information items obtained and the information sources consulted was also investigated. As shown in Table 3.7, there is a significant relationship between using the Internet and obtaining weather and restaurant information. There is also a relationship between advertisements and information on hotels, ticket prices at destinations, and attractions. Guidebooks and tourist information centers showed dependence on maps as well as on information on attractions and restaurants.

Table 3.7: Correspondence between information items obtained and sources consulted pretrip

Information source	**Information item**	**Correlation Coefficient**	χ^2	**Sig. Level**
Internet	Weather	0.238	19.439	0.000
	Restaurant	0.188	10.493	0.001
Advertisements	Hotel	0.150	7.169	0.007
	Ticket Prices at destinations	0.254	21.244	0.000
	Attraction	0.219	13.968	0.000
Guidebooks	Map of the city	0.289	26.366	0.000
	Attraction	0.230	19.232	0.000
Tourist info. centers	Map of the city	0.243	22.314	0.000
	Restaurant	0.215	16.513	0.000
	Attraction	0.211	17.417	0.000

Information Items and Sources Consulted While Touring in San Antonio

This section addresses the information items and information sources respondents consulted during their visit to San Antonio. Table 3.8 summarizes the pairwise interdependence between the information items used within San Antonio.

Table 3.8: Correspondence between information items obtained during the trip

		Correlation Coefficient	χ^2	Sig. Level
Parking availability	Parking costs	0.426	76.573	0.000
Parking costs	Entrance fees/discounts	0.211	15.662	0.000
	Opening hours	0.183	15.393	0.000
Entrance fees/discounts	Opening hours	0.439	70.343	0.000
	Children's activities	0.218	19.775	0.000
Special exhibitions	Opening hours	0.184	2.443	0.118
Opening hours	Children's activities	0.158	11.465	0.001
	Location of destinations	0.220	17.248	0.000
Location of destinations	Directions to destination	0.174	15.241	0.000

Table 3.9 presents the significant pairwise associations between the information items obtained during the trip and characteristics of the trip and of tripmakers themselves. Respondents who made decisions on specific destinations far in advance were more likely to obtain information on entrance fees. However, respondents who are older or respondents who have young household members were less likely to do so. As expected, previous visitors to San Antonio were less likely to desire information on the locations of activity destinations. Less evident is why previous visitors were more likely to seek information on children's activities.

Table 3.9: Correspondence between information items obtained during the trip and other characteristics

Information items	**Other characteristics**	**Correlation Coefficient**	χ^2	**Sig. Level**
Entrance fees/discounts	Time when decisions on destinations were made	0.237	20.517	0.001
	Age	-0.234	39.486	0.000
	Age of youngest in household	-0.287	22.501	0.000
	Travel mode within S.A.: own car (driver)	0.160	8.429	0.004
Children's activities	Number of prior visits to S.A.	0.152	7.125	0.129
	Age of youngest in household	-0.301	40.206	0.000
	Travel mode to S.A.: airplane	-0.152	9.197	0.002
	Travel mode within S.A.: own car (driver)	0.197	14.954	0.000
Location of destinations	Number of prior visits	-0.201	19.838	0.001
Directions to locations	Not concerned about congestion when traveling on recreational trips	-0.203	18.096	0.003
	Travel mode within S.A.: rental car (passenger)	0.163	9.038	0.003

Travelers who expressed concern about congestion were found to be more likely to obtain directions to their destination. The presence of young children traveling with the household increases the likelihood of obtaining information about the destination, such as availability of children's activities, and cost of attractions. As the number of young members in the household increases, so does the likelihood of information need.

Travelers who used their own cars or rental cars were found to be more likely to seek information on entrance fees, children's activities, and directions to locations. Table 3.10 presents the correspondence between the information obtained before traveling to San Antonio and the information obtained while there.

Table 3.10: Correspondence between information items obtained before and during the trip

Information pretrip	**Information during the trip**	**Correlation Coefficient**	χ^2	**Sig. Level**
Map of the city	Special exhibitions	0.195	10.946	0.001
	Directions to destinations	0.156	9.237	0.002
Restaurant	Special exhibitions	0.202	10.658	0.001
Prices of destinations	Entrance fees/discounts	0.318	36.866	0.000
	Special exhibitions	0.201	12.703	0.000
	Opening hours	0.308	31.198	0.000
	Children's activities	0.254	23.787	0.000
Parking	Parking availability	0.270	30.513	0.000
	Parking costs	0.259	25.905	0.000
	Opening hours	0.155	8.454	0.004
Attractions	Entrance fees/discounts	0.235	9.650	0.002
	Opening hours	0.218	15.530	0.000
	Location of destinations	0.202	14.999	0.000

Very few information sources used during the visit to San Antonio were mutually dependent on each other. For instance, respondents who obtained information through travel agencies were dependent on those who used the radio. At the same time, respondents who asked at hotels were dependent on those who used brochures and the ones who asked friends and relatives were dependent on those who watched television. Some association was found between information sources and characteristics of the trip and of the tripmakers, summarized in Table 3.11.

Table 3.11: Correspondence between information sources consulted and other responses

Information source	Other responses	Correlation Coefficient	χ^2	Sig. Level
Asked at hotel	Time when hotel reservations were made	-0.319	44.806	0.000
	Travel mode within S.A.: rental car (passenger)	0.150	8.012	0.005
Friends/relatives	Time when hotel reservations were made	0.257	25.241	0.000
Called destinations directly	Age	-0.200	14.823	0.000
	Age of youngest in household	-0.241	6.717	0.010
	Travel mode within S.A.: own car (driver)	0.225	19.612	0.001
	Travel mode within S.A.: Walk	-0.155	22.344	0.001

As shown in this table, travelers who made their hotel reservations far in advance were more likely to obtain information by asking at the hotel. Also, travelers who used rental cars during their trips in San Antonio were more likely to ask for information at a hotel.

Table 3.12 illustrates the correspondence between information sources travelers used pretrip and enroute. As shown in the table, travelers who used the radio before arriving in San Antonio were more likely to call an information line during the trip. Travelers who saw a brochure before the trip were more likely to rely on advertisements and tourist information centers. On the other hand, travelers who called the destination directly were more likely to use the yellow pages and television.

Table 3.12: Correspondence between information items found pretrip and enroute

Sources pretrip	Sources enroute	Correlation Coefficient	χ^2	Sig. Level
Radio	Telephone info. line	0.204	8.010	0.005
Brochure	Advertisements	0.250	20.092	0.000
	Tourist info. centers	0.215	19.537	0.000
Called destination directly	Yellow pages	0.170	5.045	0.025
	TV	0.152	6.216	0.013

Preferred Information Items and Sources

Respondents were asked to check the three primary types of information they would like to obtain when visiting an unfamiliar area, as well as the three primary sources from which they would like to obtain this information. A list of information items and sources was provided.

Independence tests were again used to study the stated preference and the revealed preference responses regarding the travel information items. Table 3.13 illustrates the findings of these tests. Respondents who asked for information on destinations and transportation modes were more likely to ask for route guidance, whereas those who asked for information on weather reports and traffic reports were more likely to ask for information on the different transportation modes.

Table 3.13: Correspondence between information items preferred by respondents

		Correlation Coefficient	χ^2	Sig. Level
Route guidance	Destination	0.232	22.443	0.000
	Transportation modes	0.151	8.984	0.003
Transportation modes	Weather reports	-0.263	25.332	0.000
	Traffic reports	-0.188	13.366	0.000

As Table 3.14 shows, respondents who preferred to obtain information about transportation modes were more likely to live out of the state of Texas. Also, respondents who traveled to San Antonio by air were more likely to prefer information on transportation modes. On the other hand, respondents who traveled using their own cars were found not to request transportation mode information. In addition, respondents who depended either on walking or transit bus during their tour in San Antonio were more likely to prefer information about transportation modes than respondents who depended on their own cars. Respondents who are well educated were more likely to prefer destination information.

Table 3.14: Correspondence between information items preferred and other responses

Preferred Information items	Other responses	Correlation Coefficient	χ^2	Sig. Level
Transportation modes	Education	0.163	15.814	0.015
	Time when decisions on destinations were made	-0.154	14.044	0.015
	Hometown	0.206	17.128	0.001
	Travel mode to SA: airplane	0.205	15.665	0.000
	Travel mode to SA: own car	-0.259	23.564	0.000
	Travel mode within SA: own car	-0.270	27.044	0.000
	Travel mode within SA: walk	0.211	15.246	0.000
	Travel mode within SA: bus	0.281	29.712	0.000
Destination	Education	0.177	27.340	0.000

Table 3.15 presents the correspondence between the information sources preferred by respondents. In general, respondents preferred to use the travel information sources that they already used while planning or taking their trip. Respondents who used information sources such as guidebooks, travel agencies, word of mouth, and the Internet for pretrip planning and during their trip were found to be more likely to prefer the same travel information sources.

Table 3.15: Correspondence between information sources preferred by respondents

		Correlation Coefficient	χ^2	Sig. Level
TV	Guidebooks	-0.253	12.671	0.000
	Maps	-0.187	21.026	0.000
Radio	Guidebooks	-0.222	10.975	0.001
	Maps	-0.154	17.378	0.000
Telephone info. lines	Word of mouth	-0.157	9.426	0.002
	Travel agency	-0.187	12.960	0.000
Guidebooks	Maps	0.285	32.915	0.000
	Personal electronic device	-0.213	12.410	0.000
Maps	Travel agency	-0.158	9.855	0.002
	Internet	-0.192	13.468	0.000

In order to study the correspondence between the preferred information devices and other survey responses, tests of independence of factors were performed. Table 3.16 illustrates the results of these tests. It was found that respondents who live outside of Texas were more likely to prefer travel agencies. Respondents who preferred to use the Internet were found to have a high income and a good education. Also, they were more likely to use computers or other electronic devices rather than speaking to a person.

Table 3.16: Correspondence between information sources preferred and other responses

Preferred Information sources	Other responses	Correlation Coefficient	χ^2	Sig. Level
TV	Length of stay	0.202	10.014	0.018
	Hometown	0.206	36.007	0.011
Travel agency	Number of prior visits	-0.160	15.196	0.002
	Hometown	0.190	10.606	0.031
	Own car	-0.206	14.437	0.000
	Airplane	0.241	19.978	0.000
	Own car (driver)	-0.188	11.987	0.001
Internet	Speak with a person	-0.162	53.408	0.000
	Education	0.190	27.290	0.000
	Income	0.264	13.052	0.042

Unlike the revealed preference case, no correspondence is found between the travel information items that were stated to be important and the preferred travel information sources.

SUMMARY

In order to determine travelers' desires and preferences regarding sources and information for travel to and in unfamiliar areas, the survey of recreational journeys conducted in the city of San Antonio, Texas, was analyzed. A description of the survey and its distribution, as well as a description of respondents' characteristics, was presented. Such characteristics included the respondents' visit to San Antonio, the specific tour in San Antonio, the preferences for information items and sources, communication accessibility, and demographics. The chapter also presented an analysis of the respondents' use of information items and sources in pretrip as well as on-site planning, and compared reported use to the respondents' stated preferences for different information items and sources.

CHAPTER 4: EXPLORATORY ANALYSIS AND MODELING

INTRODUCTION

Travel behavior is the result of individual decision making about what trips to make, where to visit, when to depart, what mode of travel to utilize, and what route to follow. Trip planning is the process by which travelers select one or more destinations and associated times, routes and modes of travel; the trip-planning process also includes obtaining the requisite information to make these decisions. In order to determine whether unique information requirements exist for tourists, it is necessary to understand tourists' needs and preferences for information when planning their trips. It is important to know the information items that travelers like to obtain, their preferences regarding information display devices, and the capabilities of Advanced Traveler Information Systems to satisfy the desires and preferences of travelers.

This chapter examines travelers' behavior when planning their recreational trips, specifically the level of detail in their plans. The next two sections are concerned with the propensity of travelers for trip planning, and the main differences across travelers with regard to the extent to which they plan their recreational trips. Travelers are broadly categorized into "planners" and "nonplanners" and the desires and preferences of the two groups are compared.

Two questions in the survey were selected for in-depth analysis of two key aspects in the trip-planning behavior of visitors to San Antonio. These two questions address the time at which hotel reservations were made and the time at which decisions on specific destinations to visit were made. Section 4.4 presents the model specifications and estimation results for the ordered probit model developed to study these two aspects of travelers' trip planning.

FACTOR ANALYSIS

Responses to selected questions from the survey were used to perform a factor analysis to gain insight into the behavior of visitors to San Antonio. The questions selected were related to travelers' experiences with recreational trips, familiarity with San Antonio, and demographic characteristics. Other questions selected for the analysis directly addressed aspects of trip-planning behavior, namely, the time at which travelers made their hotel reservations and the time they decided on destinations to visit in San Antonio. The attitudinal questions of Part four of the survey were also included in the analysis. These questions captured travelers' attitudes toward visiting unfamiliar areas, going on vacation, planning vacations in advance, and using available sources of information.

Confirmatory factor analysis (CFA) provides a procedure by which responses to the survey questions can be used to identify respondents' underlying characteristics that may not be directly observable, but are reflected through the responses. The basic assumption of factor analysis is that

underlying dimensions, or factors, can be used to explain complex phenomena, as reflected in this case through the survey responses. Observed correlation between variables results from their sharing of these factors (SPSS for Windows 1997). This section presents the CFA modeling framework and results.

First, the correlation matrix for all the variables is computed; one of the goals of factor analysis is to obtain underlying "factors" that help explain these correlations. Table 4.1 shows the correlation matrix for the analysis and Table 4.2 details the definition of each of the variables included.

Table 4.1: Correlation matrix

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y
A	1.000	0.025	0.102	-0.119	-0.036	-0.103	-0.125	-0.010	0.226	0.041	-0.034	0.099	0.073	0.044	0.011	-0.007	-0.096	-0.077	0.011	-0.025	0.140	-0.036	0.057	0.004	0.074
B	0.025	1.000	-0.118	0.100	-0.172	0.086	0.099	0.022	0.075	-0.003	0.026	-0.031	0.023	0.060	-0.058	0.004	0.014	-0.097	0.100	-0.057	0.012	-0.037	-0.050	0.229	0.188
C	0.102	-0.118	1.000	-0.112	0.106	-0.072	-0.003	0.055	-0.113	0.021	0.042	0.110	0.050	-0.091	-0.032	-0.006	-0.009	0.114	-0.179	0.001	0.001	-0.033	0.066	-0.519	-0.273
D	-0.119	0.100	-0.112	1.000	0.001	0.072	0.155	-0.114	-0.012	0.200	0.033	0.009	-0.056	0.030	0.007	0.134	-0.014	-0.008	-0.005	0.053	0.120	0.056	0.206	0.069	-0.022
E	-0.036	-0.172	0.106	0.001	1.000	-0.046	-0.055	0.013	0.000	0.173	0.035	0.047	0.025	-0.020	0.019	-0.022	-0.029	0.042	-0.104	-0.083	-0.074	-0.125	-0.040	-0.103	-0.128
F	-0.103	0.086	-0.072	0.072	-0.046	1.000	0.420	0.091	-0.021	0.164	0.085	0.052	0.043	-0.037	0.233	0.076	0.034	0.043	0.001	0.024	-0.092	0.041	-0.078	-0.004	-0.002
G	-0.125	0.099	-0.003	0.155	-0.055	0.420	1.000	-0.077	0.020	0.350	0.146	0.076	-0.037	-0.041	0.202	0.075	-0.038	0.048	0.014	0.066	-0.060	0.038	-0.131	-0.032	-0.021
H	-0.010	0.022	0.055	-0.114	0.013	0.091	-0.077	1.000	0.035	-0.136	-0.117	0.045	0.094	0.017	-0.022	-0.047	0.037	-0.008	0.036	-0.015	-0.088	-0.012	-0.038	-0.082	0.010
I	0.226	0.075	-0.113	-0.012	0.000	-0.021	0.020	0.035	1.000	0.005	0.075	0.121	0.091	0.191	0.042	-0.002	0.029	-0.096	0.103	0.019	0.045	0.079	0.035	0.149	0.121
J	0.041	-0.003	0.021	0.200	0.173	0.164	0.350	-0.136	0.005	1.000	0.217	0.093	0.006	0.065	0.146	0.139	0.003	0.001	-0.051	-0.039	-0.060	-0.065	-0.029	0.019	0.030
K	-0.034	0.026	0.042	0.033	0.035	0.085	0.146	-0.117	0.075	0.217	1.000	0.159	0.030	0.007	0.136	-0.017	0.000	0.037	0.015	0.048	0.015	0.055	-0.130	0.002	0.019
L	0.099	-0.031	0.110	0.009	0.047	0.052	0.076	0.045	0.121	0.093	0.159	1.000	0.088	0.102	0.068	0.000	0.089	-0.073	0.069	0.028	-0.009	0.046	-0.038	-0.039	0.007
M	0.073	0.023	0.050	-0.056	0.025	0.043	-0.037	0.094	0.091	0.006	0.030	0.088	1.000	-0.002	0.038	-0.007	0.064	-0.136	0.084	-0.095	-0.101	-0.084	-0.180	0.057	0.097
N	0.044	0.060	-0.091	0.030	-0.020	-0.037	-0.041	0.017	0.191	0.065	0.007	0.102	-0.002	1.000	0.028	0.012	0.101	-0.027	0.052	-0.001	0.024	0.036	0.021	0.061	0.068
O	0.011	-0.058	-0.032	0.007	0.019	0.233	0.202	-0.022	0.042	0.146	0.136	0.068	0.038	0.028	1.000	0.141	0.103	0.038	-0.013	0.044	-0.174	-0.033	-0.130	0.008	0.015
P	-0.007	0.004	-0.006	0.134	-0.022	0.076	0.075	-0.047	-0.002	0.139	-0.017	0.000	-0.007	0.012	0.141	1.000	-0.149	-0.218	0.429	0.122	0.004	-0.142	0.091	0.224	0.141
Q	-0.096	0.014	-0.009	-0.014	-0.029	0.034	-0.038	0.037	0.029	0.003	0.000	0.089	0.064	0.101	0.103	-0.149	1.000	-0.022	-0.046	-0.090	-0.149	-0.026	-0.137	-0.072	-0.072
R	-0.077	-0.097	0.114	-0.008	0.042	0.043	0.048	-0.008	-0.096	0.001	0.037	-0.073	-0.136	-0.027	0.038	-0.218	-0.022	1.000	-0.630	0.555	0.059	0.456	0.146	-0.123	-0.079
S	0.011	0.100	-0.179	-0.005	-0.104	0.001	0.014	0.036	0.103	-0.051	0.015	0.069	0.084	0.052	-0.013	0.429	-0.046	-0.630	1.000	-0.011	-0.023	-0.152	-0.084	0.222	0.111
T	-0.025	-0.057	0.001	0.053	-0.083	0.024	0.066	-0.015	0.019	-0.039	0.048	0.028	-0.095	-0.001	0.044	0.122	-0.090	0.555	-0.011	1.000	0.093	0.506	0.184	0.029	0.044
U	0.140	0.012	0.001	0.120	-0.074	-0.092	-0.060	-0.088	0.045	-0.060	0.015	-0.009	-0.101	0.024	-0.174	0.004	-0.149	0.059	-0.023	0.093	1.000	0.087	0.392	0.049	-0.072
V	-0.036	-0.037	-0.033	0.056	-0.125	0.041	0.038	-0.012	0.079	-0.065	0.055	0.046	-0.084	0.036	-0.033	-0.142	-0.026	0.456	-0.152	0.506	0.087	1.000	0.160	-0.012	-0.007
W	0.057	-0.050	0.066	0.206	-0.040	-0.078	-0.131	-0.038	0.035	-0.029	-0.130	-0.038	-0.180	0.021	-0.130	0.091	-0.137	0.146	-0.084	0.184	0.392	0.160	1.000	-0.024	-0.035
X	0.004	0.229	-0.519	0.069	-0.103	-0.004	-0.032	-0.082	0.149	0.019	0.002	-0.039	0.057	0.061	0.008	0.224	-0.072	-0.123	0.222	0.029	0.049	-0.012	-0.024	1.000	0.645
Y	0.074	0.188	-0.273	-0.022	-0.128	-0.002	-0.021	0.010	0.121	0.030	0.019	0.007	0.097	0.068	0.015	0.141	-0.072	-0.079	0.111	0.044	-0.072	-0.007	-0.035	0.645	1.000

Table 4.2: Meaning of variables

	Variable
A	Frequency of recreational trips
B	Length of total visit to San Antonio
C	Number of prior visits to San Antonio
D	When hotel reservations were made
E	When decided on destinations
F	Rather stay on the same route when it is congested than take an unknown route
G	Like to know specific route
H	Not concerned about congestion when traveling for recreational activities
I	Prefer to visit new and unfamiliar areas when going on vacation
J	Plan vacations far in advance
K	Compare prices before making any choice
L	Plan the journey for accompanying group
M	Take pets on recreational trips
N	Satisfied with available information
O	Prefer to speak with a person
P	Age
Q	Gender
R	Number of persons in household
S	Age of youngest person in household
T	Licensed drivers in household
U	Level of education
V	Employed in household for more than 30 hours a week
W	Household's income per year
X	Hometown
Y	Distance from hometown

Because the correlation between variables is small, less than 0.3 in absolute value, it is unlikely that they share common factors. The correlation matrix needs to be tested against an identity matrix of similar dimensions, where all the diagonal terms are 1 and all the off-diagonal terms are 0. According to Bartlett's test of sphericity (SPSS for Windows 1997), it appears unlikely that the correlation matrix is an identity. This hypothesis can be rejected because the value of the test statistic for sphericity is large, 1707.962, and the associated significance level is small.

An indicator of the strength of association among variables is the partial correlation coefficient. If variables share common factors, the partial correlation coefficients between pairs of variables should be small when the linear effects of the other variables are eliminated (SPSS for Windows 1997). The proportion of large coefficients in the anti-image correlation matrix (negative of the partial correlation coefficient) is low, as shown in Table 4.3, so the use of the factor analysis model is appropriate.

Table 4.3: Anti-image correlation matrix

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y
A	0.481	-0.043	-0.097	0.119	0.067	0.036	0.134	0.032	-0.220	-0.128	0.084	-0.080	-0.042	0.007	-0.074	0.030	0.112	0.062	0.037	-0.031	-0.144	0.024	0.006	0.039	-0.070
B	-0.043	0.681	-0.043	-0.112	0.136	-0.065	-0.084	-0.040	-0.031	0.032	-0.030	0.049	0.011	-0.048	0.084	0.069	-0.023	-0.007	-0.045	0.037	0.000	0.036	0.038	-0.137	-0.047
C	-0.097	-0.043	0.594	0.109	-0.050	0.100	-0.039	-0.024	0.065	0.002	-0.067	-0.114	-0.105	0.070	0.055	-0.192	0.004	-0.038	0.089	0.015	-0.009	0.036	-0.070	0.446	-0.068
D	0.119	-0.112	0.109	0.579	-0.019	0.005	-0.088	0.059	0.023	-0.145	-0.008	-0.019	-0.016	-0.012	0.014	-0.110	-0.024	0.096	0.101	-0.047	-0.056	-0.053	-0.187	-0.016	0.069
E	0.067	0.136	-0.050	-0.019	0.555	0.026	0.108	-0.030	-0.066	-0.188	-0.004	-0.051	-0.016	0.018	0.001	0.014	0.074	-0.067	0.014	0.045	0.056	0.118	0.030	-0.029	0.096
F	0.036	-0.065	0.100	0.005	0.026	0.625	-0.349	-0.138	0.042	-0.023	-0.027	-0.027	-0.064	0.039	-0.148	-0.069	-0.026	-0.032	0.009	0.045	0.029	-0.046	-0.024	0.032	0.011
G	0.134	-0.084	-0.039	-0.088	0.108	-0.349	0.583	0.078	-0.085	-0.301	0.006	-0.050	0.067	0.064	-0.096	0.021	0.096	-0.034	-0.047	-0.031	-0.034	0.001	0.150	0.058	-0.003
H	0.032	-0.040	-0.024	0.059	-0.030	-0.138	0.078	0.524	-0.051	0.086	0.112	-0.052	-0.067	-0.016	0.020	0.030	-0.003	-0.049	-0.071	0.019	0.047	0.016	0.002	0.095	-0.072
I	-0.220	-0.031	0.065	0.023	-0.066	0.042	-0.085	-0.051	0.587	0.049	-0.082	-0.055	-0.070	-0.160	-0.033	0.033	-0.044	0.081	0.002	-0.027	0.003	-0.098	-0.073	-0.072	-0.002
J	-0.128	0.032	0.002	-0.145	-0.188	-0.023	-0.301	0.086	0.049	0.586	-0.179	-0.029	-0.011	-0.089	-0.013	-0.129	-0.037	0.010	0.083	0.040	0.067	0.031	-0.034	-0.011	-0.033
K	0.084	-0.030	-0.067	-0.008	-0.004	-0.027	0.006	0.112	-0.082	-0.179	0.554	-0.127	-0.003	0.028	-0.103	0.071	0.037	-0.046	-0.069	-0.004	-0.095	-0.033	0.142	0.012	-0.034
L	-0.080	0.049	-0.114	-0.019	-0.051	-0.027	-0.050	-0.052	-0.055	-0.029	-0.127	0.602	-0.045	-0.085	-0.023	0.037	-0.088	0.093	-0.007	-0.063	-0.008	-0.064	0.008	-0.008	-0.017
M	-0.042	0.011	-0.105	-0.016	-0.016	-0.064	0.067	-0.067	-0.070	-0.011	-0.003	-0.045	0.694	0.025	-0.014	0.038	-0.034	0.043	-0.020	0.005	0.023	0.013	0.136	-0.045	-0.055
N	0.007	-0.048	0.070	-0.012	0.018	0.039	0.064	-0.016	-0.160	-0.089	0.028	-0.085	0.025	0.560	-0.027	-0.013	-0.090	-0.037	-0.043	0.034	-0.030	-0.026	-0.007	0.040	-0.043
O	-0.074	0.084	0.055	0.014	0.001	-0.148	-0.096	0.020	-0.033	-0.013	-0.103	-0.023	-0.014	-0.027	0.656	-0.155	-0.104	-0.019	0.059	-0.034	0.127	0.051	0.049	0.003	0.012
P	0.030	0.069	-0.192	-0.110	0.014	-0.069	0.021	0.030	0.033	-0.129	0.071	0.037	0.038	-0.013	-0.155	0.585	0.122	0.009	-0.309	-0.144	0.032	0.165	-0.102	-0.177	-0.003
Q	0.112	-0.023	0.004	-0.024	0.074	-0.026	0.096	-0.003	-0.044	-0.037	0.037	-0.088	-0.034	-0.090	-0.104	0.122	0.590	0.002	0.005	0.027	0.084	0.015	0.070	0.015	0.055
R	0.062	-0.007	-0.038	0.096	-0.067	-0.032	-0.034	-0.049	0.081	0.010	-0.046	0.093	0.043	-0.037	-0.019	0.009	0.002	0.536	0.687	-0.607	-0.001	-0.192	-0.008	-0.072	0.073
S	0.037	-0.045	0.089	0.101	0.014	0.009	-0.047	-0.071	0.002	0.083	-0.069	-0.007	-0.020	-0.043	0.059	-0.309	0.005	0.687	0.483	-0.417	0.008	-0.062	0.054	-0.081	0.097
T	-0.031	0.037	0.015	-0.047	0.045	0.045	-0.031	0.019	-0.027	0.040	-0.004	-0.063	0.005	0.034	-0.034	-0.144	0.027	-0.607	-0.417	0.498	-0.018	-0.275	-0.066	0.053	-0.081
U	-0.144	0.000	-0.009	-0.056	0.056	0.029	-0.034	0.047	0.003	0.067	-0.095	-0.008	0.023	-0.030	0.127	0.032	0.084	-0.001	0.008	-0.018	0.582	0.009	-0.335	-0.127	0.153
V	0.024	0.036	0.036	-0.053	0.118	-0.046	0.001	0.016	-0.098	0.031	-0.033	-0.064	0.013	-0.026	0.051	0.165	0.015	-0.192	-0.062	-0.275	0.009	0.758	-0.067	-0.003	0.010
W	0.006	0.038	-0.070	-0.187	0.030	-0.024	0.150	0.002	-0.073	-0.034	0.142	0.008	0.136	-0.007	0.049	-0.102	0.070	-0.008	0.054	-0.066	-0.335	-0.067	0.622	0.042	-0.035
X	0.039	-0.137	0.446	-0.016	-0.029	0.032	0.058	0.095	-0.072	-0.011	0.012	-0.008	-0.045	0.040	0.003	-0.177	0.015	-0.072	-0.081	0.053	-0.127	-0.003	0.042	0.583	-0.589
Y	-0.070	-0.047	-0.068	0.069	0.096	0.011	-0.003	-0.072	-0.002	-0.033	-0.034	-0.017	-0.055	-0.043	0.012	-0.003	0.055	0.073	0.097	-0.081	0.153	0.010	-0.035	-0.589	0.592

The second step of the factor analysis is the factor extraction, which seeks to determine the factors. Several procedures have been proposed for determining the number of factors to use in a model. One suggested criterion is the percentage of the total variance explained by each. Only factors that account for variances greater than 1 (the Eigenvalue is greater than 1) should be included (SPSS for Windows 1997). Table 4.4 presents the variance explained by each factor and the cumulative variance explained by the factors as a whole. As shown in this table, the nine factors together explain 39.736% of the variation.

Table 4.4: Total variance explained

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	2.671	10.686	10.686	1.918	7.672	7.672	1.846
2	2.212	8.848	19.534	1.973	7.891	15.563	1.646
3	2.100	8.400	27.933	1.258	5.033	20.597	1.322
4	1.643	6.573	34.507	1.514	6.054	26.651	1.231
5	1.523	6.090	40.597	1.001	4.005	30.656	1.100
6	1.314	5.256	45.853	.651	2.603	33.260	.802
7	1.236	4.946	50.799	.772	3.089	36.349	.753
8	1.146	4.583	55.382	.460	1.840	38.189	.740
9	1.060	4.241	59.623	.387	1.547	39.736	.495

The factor matrix contains the coefficients that relate the variables to the factors. Each row contains the coefficients used to express each standardized variable in terms of the values of each factor. These coefficients are called factor loadings because they indicate how much weight is assigned to each factor. Factors with large coefficients (in absolute value) for a variable are closely related to the variable.

In general, the model for the *i*th-standardized variable is written as

$$X_i = A_{i1}F_1 + A_{i2}F_2 + \ldots + A_{ik}F_k + U_i$$

where the *F's* are the common factors, *U* is the unique factor, and the *A's* are the coefficients used to combine the *k* factors. The unique factors are assumed to be uncorrelated with each other and with the common factors.

To judge how well the model describes the original variables, one can compute the proportion of the variance of each variable explained by the model. The proportion of variance explained by the common factors is called the communality of the variable. More than one-half the communalities are greater than 0.3, indicating that the common factors explain at least one- third of the variance. The variance that is not explained by the common factors is attributed to the unique factor and is called the uniqueness of the variable (Kim and Mueller 1978).

Although the factor matrix obtained in the extraction phase indicates the relationship between the factors and the individual variables, it is usually difficult to identify meaningful factors based on this matrix. Often the variables and factors do not appear correlated in any interpretable pattern. The third step of the analysis is the factor rotation, to transform complicated matrices into simpler ones. Rotation does not affect the goodness of fit of a factor solution. A variety of methods are used for rotation to a simple structure. The most commonly used method is the varimax method, which attempts to minimize the number of variables that have high loadings on a factor (SPSS for Windows 1997).

The rotated factor matrix is presented in Table 4.5. As shown in this table, nine factors were obtained. The higher components for each variable on each factor are highlighted. The first factor has high loadings for length of total visit to San Antonio, number of prior visits to San Antonio, hometown, and distance to hometown. This factor may capture those travelers who came from far places and stayed in San Antonio for relatively long periods. People who travel long distances to a vacation destination tend to spend a longer time at the destination to amortize the travel cost. The second factor is composed of household characteristics, such as number of persons, number of licensed drivers and number of persons employed at least 30 hours a week, all the correlates of household size, as larger households tend to have more workers and more licensed drivers.

The third factor captures households with older members. It includes high loadings for age, number of persons in the household, and age of youngest in the household. As members of a household grow old, the number of members generally decreases as grown children move out to establish their own households.

Factor 4 indicates those respondents who plan their trips far in advance. These respondents apparently prefer to stay on a congested route than take an unknown alternative with some risk of getting lost. They also like to know the route to follow before leaving the origin and prefer speaking with a person to using an information device. Clearly, these persons plan in advance to feel confident during their trips.

The fifth factor captures well-educated and wealthy people, who prefer to plan their trips in advance, as evidenced by their high positive loadings for the time at which they made their hotel reservations. Probably these people have preferences for services at specific hotels and know they need to reserve ahead because of these hotels' long customer lists. Factor 6 clearly refers to

recreational travelers. This factor has high loadings for frequency of recreational trips and attitudes toward visiting new areas and toward satisfaction with available travel information.

Table 4.5: Rotated factor matrix

Variable	***Component***								
	1	**Factor 2**	**Factor 3**	**Factor 4**	**Factor 5**	**Factor 6**	**Factor 7**	**Factor 8**	**Factor 9**
Frequency of recreational trips	-0.0276	-0.06365	-0.0578	-0.133	0.01914	0.495	0.01017	-0.0371	-0.228
Length of total visit to San Antonio	0.26	-0.0586	0.06813	0.156	0.02422	0.06259	-0.09359	-0.07333	-0.0229
Number of prior visits to San Antonio	-0.553	-0.02207	-0.148	-0.0279	-0.04672	0.103	0.09024	-0.007703	-0.216
When hotel reservations were made	0.05807	-0.003286	0.03371	0.17	0.386	-0.08304	0.09112	0.205	0.162
When destinations were chosen	-0.142	-0.08793	-0.12	-0.127	-0.07895	-0.03066	0.107	0.263	0.06078
Rather stay on the same route when it is congested than take an unknown route	0.03855	0.02509	-0.01836	0.583	-0.04961	-0.03066	0.06936	-0.0404	0.06944
Like to know specific route	0.0007412	0.05255	0.05294	0.756	-0.01431	-0.02978	-0.04501	0.257	-0.106
Not concerned about congestion when traveling for recreational activities	-0.05588	0.004817	-0.002893	0.02739	-0.135	0.06327	0.02829	-0.311	0.06763
Prefer to visit new and unfamiliar areas when going on vacation	0.154	0.03569	0.05889	0.0221	0.03588	0.465	-0.04382	-0.01351	0.108
Plan vacations far in advance	-0.02782	-0.08623	-0.07634	0.301	0.04273	0.118	0.179	0.541	0.03301
Compare prices before making any choice	-0.01354	0.08541	0.03616	0.115	-0.102	0.136	-0.04678	0.337	0.01693
Plan the journey for accompanying group	-0.05186	0.02953	0.0612	0.07061	-0.06505	0.324	0.01567	0.115	0.0842
Take pets on recreational trips.	0.05406	-0.1	0.02537	-0.002506	-0.244	0.19	0.03414	-0.03908	0.02102
Satisfied with available information	0.0621	0.02898	0.02518	-0.02327	0.05704	0.238	0.02756	0.02343	0.252
Prefer to speak with a live person	-0.001791	0.02993	-0.06971	0.28	-0.181	0.07704	0.242	0.0797	0.143
Hometown	0.98	0.00142	0.04385	-0.07303	0.01075	0.02372	0.145	0.08199	-0.05764
Factor									
Age	0.108	-0.03011	0.317	0.08699	0.09965	-0.0231	0.666	0.04999	-0.151
Gender	-0.03448	-0.038	-0.03895	0.02198	-0.156	0.03015	-0.07068	-0.03034	0.374
Number of persons in household	-0.09561	0.677	-0.591	0.02997	0.04965	-0.15	-0.03189	0.04286	-0.03911
Age of youngest person in household	0.158	-0.09481	0.886	-0.00729	-0.06142	0.09921	0.203	-0.06059	-0.03162
Licensed drivers in household	-0.003314	0.853	0.04198	0.0223	0.08751	0.007988	0.168	-0.0008104	-0.09106
Level of education	0.03724	0.06353	0.01431	-0.111	0.524	0.108	-0.117	0.006262	-0.214
Employed in household for more than 30 hours a week	0.01983	0.619	-0.07049	0.04047	0.136	0.06002	-0.153	-0.03718	0.06786
Household's income per year	-0.05111	0.123	-0.07379	-0.119	0.675	0.0602	0.117	-0.11	-0.0711

The next factor, Factor 7, captures age, age of youngest in household, and attitudes toward preferring to speak with a person; Factor 8 on the other hand reflects the level or extent of planning by San Antonio visitors. This factor has the highest amount of significant loadings. A total of six variables are included in this factor. These variables are the time at which hotel reservations were made and the time at which decisions on specific destinations were made. It also includes various attitudinal variables such as preference for knowing exactly the route to take, concern about congestion when traveling in unfamiliar areas, and the attitudes toward planning in advance and comparing prices.

The last factor indicates those respondents who are not frequent travelers but have been in San Antonio a few times. These respondents tend to have less education and are satisfied with the available information. Probably because of their lack of travel experience, they tend to be less demanding and are satisfied with the existing information.

The last step of the factor analysis is to estimate factor scores. The factor scores can be used in subsequent analysis to represent the values of the factors. The regression of factor scores has a variance equal to the squared multiple correlation between the estimated factor scores and the true factor values. For each factor, F_j, the factor scores are obtained by multiplying the standardized values, X_i, by the corresponding factor score coefficients W_{ji}. The general expression for the estimate of the jth factor F_j is

$$F_j = \sum_{i=1}^{p} W_{ji}X_i = W_{j1}X_1 + W_{j2}X_2 + \ldots + W_{jp}X_p$$

With the factor score coefficients, the expressions for the factors can be written as linear expressions of the variables (Kim and Mueller 1978). For example, Factor 8, which represented the level of planning of San Antonio respondents, can be expressed as:

*Factor 8 = -0.02*Frequency of recreational trips + -0.71*Length of visit + …+ -0.092*Distance from hometown*.

CLUSTER ANALYSIS

Cluster analysis is a procedure for grouping together entities on the basis of their similarities and differences (Tryon and Bailey 1970). This procedure empirically forms clusters or groups of highly similar entities. The same questions from the survey used for the factor analysis also formed the basis for a cluster analysis intended to group respondents into planners and non-planners. These questions were related to travelers' experience with recreational trips, familiarity with San Antonio, and demographic characteristics. Other questions selected for the analysis pertained to the time at

which travelers made their hotel reservations and decided on destinations to visit in San Antonio. The attitudinal questions of Part four of the survey were also included in the analysis. In general, these questions captured travelers' attitudes toward visiting unfamiliar areas, going on vacation, planning vacations in advance, and using available information and sources of information.

More specifically, a clustering method is a multivariate statistical procedure that starts with a data set containing information about a sample of entities and attempts to reorganize these entities into relatively homogeneous groups. Let the set $I = \{I_1, I_2, \ldots, I_n\}$ denote n individuals from a conceptual population π_i. It is assumed that there exists a set of features or characteristics $C = (C_1, C_2, \ldots, C_p)^T$ that are observable, quantitative, and qualitative, and are possessed by each individual in I. The value of the measurement on the i^{th} characteristic of the individual $\underline{I}_j$ is denoted by the symbol x_{ij}, and $X_j = [x_{ij}]$ denotes the $p \times 1$ vector of such measurements. Hence, for a set of individuals I, there is a set of $p \times 1$ measurement vectors $X = \{X_1, X_2, \ldots, X_n\}$ that describes the set I. Let k be an integer less than n. Based on the data contained in the set X, the clustering problem is to determine k clusters (subsets) of individuals in I, for example, $\pi_1, \pi_2, \ldots, \pi_k$, such that each $I_j \in I$ belongs to one and only one subset and those individuals who are assigned to the same cluster are similar, yet individuals from different clusters are different (not similar) (Duran and Odell 1974).

Our main interest is to partition the set of respondents into a particular number of clusters, e.g., k. First, we need to find k points, which will act as initial estimates of the cluster center. The first k points in the sample are chosen as the initial k cluster mean vectors. The k starting points are used as initial estimates of cluster centers. Entities are allocated to the cluster to whose center they are nearest (usually according to the Euclidean metric), and the estimate of the center may be updated after the addition of each entity to the cluster, or only after all the entities have been allocated (Everitt 1974).

In the case of the survey respondents, we want to partition the set of 373 respondents into two groups or two clusters. These two groups represent those travelers who plan their trips and those who do not. A third group was eventually uncovered, consisting of these respondents not living in the United States, who exhibited responses that set them apart from the other two groups.

The initial estimates of the cluster centers are presented in Table 4.6. These estimates are based on the survey questions selected for the analysis.

Table 4.6: Initial cluster centers

Survey questions	Cluster Mean Vectors		
	Cluster 1	Cluster 2	Cluster 3
Frequency of recreational trips	2.00	4.00	4.00
Length of stay	9.00	4.00	21.00
Number of prior visits	4.00	1.00	2.00
Time when hotel reservations were made	4.00	4.00	.00
Time when decisions on destinations were made	3.00	4.00	1.00
Stay on the same route when it is congested	.00	2.00	4.00
Prefer to know the route beforehand	.00	2.00	4.00
Not concerned about congestion	.00	4.00	4.00
Prefer to visit new and unfamiliar areas	.00	4.00	4.00
Plan vacations far in advance	.00	2.00	3.00
Compare prices before making choices	.00	2.00	4.00
Plan the journey for accompanying group	.00	3.00	4.00
Consider taking pets on recreational trips	.00	1.00	6.00
Satisfied with available information	.00	3.00	4.00
Prefer speaking with a person	.00	.00	5.00
Age	.00	5.00	5.00
Gender	.00	1.00	1.00
Number of persons in household	.00	3.00	2.00
Age of youngest in household	.00	5.00	6.00
Number of licensed drivers in household	.00	3.00	2.00
Education	.00	4.00	2.00
Number of employed in household	.00	1.00	2.00
Income	.00	4.00	2.00
Hometown	.00	2.00	.00
Distance from hometown	.00	2212.00	10000.00

Once an initial classification has been found, a search is made for entities that should be reallocated to another group. This reallocation takes place in an attempt to optimize the criterion value, the Euclidean distance (Everitt 1974). The Euclidean distance is the square root of the sum of the squared differences between values (SPSS for Windows 1997). In general, reallocation proceeds by considering each entity in turn for reassignment to another cluster; reassignment takes place if it causes an increase (or decrease in the case of minimization) in the criterion value (Everitt 1974). Table 4.7 illustrates the changes in cluster centers during the reallocation procedure. The procedure is continued until no further move of a single entity causes an improvement. Hence, a local optimum of the criterion value is reached (Everitt 1974). Cluster 1 reached its local optimum during iteration 7, whereas Cluster 3 reached its optimum during the second iteration. Table 4.8 presents the final cluster centers.

Table 4.7: Iteration history

	Change in Cluster Centers		
Iteration	Cluster 1	Cluster 2	Cluster 3
1	411.441	801.533	13.144
2	89.202	97.785	.000
3	14.513	20.046	.000
4	16.617	23.267	.000
5	19.747	24.838	.000
6	4.975	6.079	.000
7	.000	.000	.000

Table 4.8: Final cluster centers

Survey questions	**Cluster**	**Cluster**	**Cluster**
	1	2	3
Frequency of recreational trips	3.01	3.01	3.56
Length of stay	3.14	5.24	8.56
Number of prior visits	3.06	1.83	1.56
Time when hotel reservations were made	2.64	2.94	1.89
Time when decisions on destinations were made	3.11	2.93	2.00
Stay on the same route when it is congested	3.66	3.63	3.67
Prefer to know the route beforehand	4.13	4.05	4.11
Not concerned about congestion	2.40	2.24	2.67
Prefer to visit new and unfamiliar areas	3.74	4.10	4.22
Plan vacations far in advance	3.30	3.38	3.56
Compare prices before making choices	3.70	3.72	3.78
Plan the journey for accompanying group	3.48	3.37	3.67
Consider taking pets on recreational trips	2.56	2.61	3.89
Satisfied with available information	3.43	3.47	3.89
Prefer speaking with a person	3.83	3.84	4.00
Age	3.71	4.08	4.56
Gender	1.63	1.61	1.44
Number of persons in household	3.14	2.81	2.56
Age of youngest in household	3.43	4.35	4.44
Number of licensed drivers in household	2.12	2.15	2.33
Education	3.51	3.84	2.78
Number of employed in household	1.51	1.55	1.44
Income	2.59	2.64	2.33
Hometown	.99	.86	.89
Distance from hometown	266.12	1238.48	10000.0

According to Table 4.9, which contains the final grouping of respondents into clusters, there are three groups or clusters in the data. The first of these clusters corresponds to the planners, while the second group corresponds to the nonplanners. A third group was created and corresponds to those survey respondents not living in the United States.

Table 4.9: Number of cases in each cluster

Cluster	Respondents
1	202
2	155
3	9

Total Respondents	366
Missing Respondents	7

ORDERED PROBIT MODELS

The trip-planning model formulation is based on the ordered-response theory. The ordered-response model maps the range of a continuous latent variable onto a set of discrete outcomes. For a given decision situation, the latent variable represents the decision maker's perceived utility propensity, or attractiveness toward the decision object of interest. A set of ordered thresholds for the latent variable associated with each decision maker defines ranges corresponding to each discrete decision outcome. The decision maker's choice then depends on the corresponding interval within which the perceived utility or attractiveness lies. This study employs the ordinal probit model with constant thresholds to formulate the travelers' trip-planning process and calibrate it with the available survey data.

The specific dimensions of the trip-planning process that are modeled are the time at which hotel reservations were made and the time at which decisions on specific destinations to visit were made. The ordered probit model is used for this purpose. This model approach can be used to model polytomous dependent variables that have a natural order. Ordered responses can be translated into an integer form and are ideally suited to ordered probability models. The continuous latent variables are specified to be a linear function of explanatory variables.

Models and Specifications

Of the 373 surveys included in the exploratory analysis, 245 could be used for the estimation of the first model (the time when hotel reservations were made), and 277 for the estimation of the second model (the time when decisions on specific destinations were made).

In the first model, the time when hotel reservations were made, is a continuous latent variable (Y) whose outcome is measured by a discrete ordered variable, y, ($y \in$ {same day arrived, one to seven days before arriving, one to four weeks before arriving, more than a month before arriving in San Antonio}). The transformation from the observed ordinal indicator variable to the underlying continuous latent variable is given in terms of an unknown threshold vector, μ, given by Equation 4.1.

$$Y = \left\{ \begin{array}{ll} \text{same day arrived} & \text{if } \mu_3 \le Y \\ \text{1-7 days before arriving} & \text{if } \mu_2 \le Y < \mu_3 \\ \text{1-4 weeks before arriving} & \text{if } \mu_1 \le Y < \mu_2 \\ \text{more than a month before arriving} & \text{if } \mu_1 > Y \end{array} \right\} \qquad \textit{Eq. 4.1}$$

Let Y_n be a latent random variable, which is a measure of the utility or attractiveness of the time in advance of making hotel reservations, for individual *n, n* = 1 to *N*, *N* = 245. Each individual is faced with *J* ordered choice alternatives (*J = 4*; same day arrived, 1 - 7 days before arriving, 1 - 4 weeks before arriving, and more than a month before arriving). Assume that Y_n has a measurable systematic component V_n and an unobservable random disturbance u_n. The systematic component V_n is a function of a vector of known attributes ($X_1, X_2, \ldots, X_m$) to be specified according to hypothesized relations, and a vector of unknown parameters ($\beta_0, \beta_1, \ldots, \beta_m$) to be estimated. Also, let $\mu_{0n}, \mu_{1n}, \ldots, \mu_{Jn}$ be a set of utility thresholds constant across individuals. We assume then, that the latent variable, Y_n, and associated thresholds are specified as:

$$Y_n = V_n + u_n \qquad \textit{Eq. 4.2}$$

$$\mu_{jn} = a_j \qquad \textit{Eq. 4.3}$$

where

$$V_n = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_m X_m \qquad \textit{Eq. 4.4}$$

and a_j, *j = 1, 2, …, J* are constant thresholds to be estimated. It is assumed that the error terms are independently and identically normally distributed as follows:

$$u_n \sim N(0, \sigma^2) \qquad \textit{Eq. 4.5}$$

The term σ^2 is the variance of the disturbance term. Equation 4.5 suggests that the error terms u_n are independently and identically distributed.

Because Y_n is unobservable and only discrete choices made by individuals are revealed, let Z_{jn} be an observed variable with value 1 or 0 such that for a given (*j=1, 2,…, J*):

$$Z_{jn} = \left\{ \begin{array}{l} \text{1 if individual n chose alternative i} \\ \text{0 otherwise} \end{array} \right\} \qquad \textit{Eq. 4.6}$$

The assumption of ordered response implies that $Z_{jn} = 1$ if and only if $\mu_{j-1,n} \leq Y_n < \mu_{jn}$ and that $Z_{jn} = 0$, otherwise, where μ_j is the upper threshold associated with alternative *j* and μ_{j-1} is the lower threshold associated with alternative j. As the utility thresholds are constant across individuals, the subscript *n* is not required for the thresholds and thus is removed henceforth. Then, for $1 < j < J$, the probability function of the observed dependent variable, *Z*, can be written as:

$$Pr[Z_{jn} = 1] = \Phi[(\mu_j - V_n)/\sigma] - \Phi[(\mu_{j-1} - V_n)/\sigma] \Leftrightarrow$$

$$(\mu_{j-1} - V_n)/\sigma \leq u_n/\sigma < (\mu_j - V_n)/\sigma \Leftrightarrow \mu_{j-1} \leq V_n + u_n < \mu_{jn} \qquad \text{Eq. 4.7}$$

where $\Phi(x)$ is the standard normal cumulative distribution function evaluated at *x*. To remove the problem of under-identification in equation 4.6, it is assumed, without loss of generality, that $\mu_1 = 0$ and $\sigma = 1$. The corresponding log likelihood function is presented in equation 4.8:

$$L^* = \log L = \sum_{n=1}^{N} \sum_{j=1}^{J} Z_{jn} \log (\Phi[\mu_j - V_n] - \Phi[\mu_{j-1} - V_n]) \qquad \text{Eq. 4.8}$$

The second model, for the time when decisions on specific destinations to visit are made, follows the same theoretical logic of the first model. The outcome of the continuous latent variable (Y) is measured by a discrete ordered variable, *y, (y* $\in$ { after arrived, same day arrived, one to seven days before arriving, one to four weeks before arriving, more than a month before arriving San Antonio}). The transformation from the observed ordinal indicator variable to the underlying continuous latent variable is given in terms of:

$$Y = \begin{cases} \text{after arrived} & \text{if } \mu_4 \leq Y \\ \text{same day arrived} & \text{if } \mu_3 \leq Y < \mu_4 \\ \text{1-7 days before arriving} & \text{if } \mu_2 \leq Y < \mu_3 \\ \text{1-4 weeks before arriving} & \text{if } \mu_1 \leq Y < \mu_2 \\ \text{more than a month before arriving} & \text{if } \mu_1 > Y \end{cases} \qquad \text{Eq. 4.9}$$

The ordinal probit model shown assumes that for a particular decision situation the utility thresholds are constant and identical across the population and that the disturbance of the latent variables is assumed to be independently and identically distributed.

Estimation Results

This section presents the results of parameter estimation of the models specified in Section 4.4.1 using the survey data described in Chapter 3. Tables 4.7 and 4.8 present the estimation results of the ordinal probit models. Estimation results of both models are discussed in the following sections.

Time when hotel reservations were made. The SST-ordered probit estimation procedure (Dubin and Rivers 1988) was applied to obtain maximum likelihood estimates of the parameters values. Several of the variables intended to capture the time in advance of trip planning are statistically significant, as seen in Table 4.10. More than one-half of the variables are significant at the 5% level. As expected, a frequency of recreational trips of once a year has a positive effect on the time when hotel reservations were made, but a frequency of more than four times a year has a negative effect. The more often people go on recreational trips, the more familiarity they probably have with the trip-planning process, which includes making hotel reservations, and the less advance planning they require.

The business purpose of a trip has a negative effect on the time when hotel reservations are made. Usually business trips are not scheduled far in advance. However, when these trips are in conjunction with a conference or organized group, they involve longer advance planning, as evidenced by the statistical significance of the coefficient of the variable corresponding to the way reservations were made (Table 4.7). Conferences are organized far in advance and participants must generally register in advance. These types of business travelers make their hotel reservations far in advance.

As expected, when the travel mode to San Antonio is the airplane, the probability of travelers making their hotel reservations far in advance increases. Air tickets are usually scheduled in advance to avoid higher fares. Once they schedule their transportation, there is greater probability of also arranging for lodging.

Regarding the sources of information consulted before traveling to San Antonio, television exerts a negative effect on time of reservation. At the same time, print advertisements exert a greater positive effect than the Internet on time of reservation as suggested by the corresponding parameter estimates of 0.590 and 0.401, respectively. Although the Internet can serve both purposes, planning in advance as well as last minute planning, it is interesting to see that by using the Internet there is a greater probability of making hotel reservations in advance. As for the types of information obtained before traveling to San Antonio, both restaurant information and prices or costs of destinations have a positive effect on the time of reservations, while hotel information has a negative effect. The coefficient value of –0.254 indicates that an increase in the use of hotel information reduces the probability of making hotel reservations far in advance. Perhaps some of those who look for hotel

information on the Internet are trying to find special deals and are willing to wait for last minute specials.

Table 4.10: Time when hotel reservations were made

Independent Variable	Estimated Coefficient	Standard Error	t-Statistic
Constant	1.299	0.868	1.495
Frequency of recreational trips: Once a year	0.468	0.312	1.502
Frequency of recreational trips: More than 4 times a year	-0.644	0.396	-1.625
Purpose of trip: Business	-0.970	0.406	-2.391
How hotel reservations were made: Through a conference or organized group	1.298	0.408	3.180
Travel mode to San Antonio: Airplane	1.000	0.323	3.097
Sources of information consulted: Internet	0.401	0.269	1.500
Sources of information consulted: Television	-0.909	0.459	-1.981
Sources of information consulted: Advertisements	0.590	0.221	2.668
Types of information obtained: Hotel information	-0.254	0.200	-1.268
Types of information obtained: Restaurant information	0.358	0.208	1.724
Types of information obtained: Prices or costs of destinations	0.388	0.216	1.800
Accompanying travelers: Relatives	0.576	0.331	1.740
Information obtainer: Children	-0.567	0.502	-1.129
Information obtainer: One of the friends	1.258	0.586	2.148
Information obtainer: Colleagues from work	1.596	1.025	1.557
Travel mode within S.A.: Rental car (passenger)	-0.520	0.427	-1.219
Travel mode within S.A.: Taxi	-0.843	0.384	-2.193
Change originally planned schedule: Left destination early	-0.874	0.540	-1.617
Use cellular phone	0.575	0.216	2.662
Listen to radio traffic reports	0.391	0.204	1.913
Distance from home city to San Antonio	0.0002	0.0001	1.921
Threshold 1	1.462	0.109	13.366
Threshold 2	2.607	0.124	20.965

Auxiliary Statistics	At convergence	Initial
Log likelihood	-231.9	-444.4
Number of observations	245	

When the traveler is accompanied by relatives, hotel reservations tend to be made further in advance. Travelers who obtain information from colleagues at work and friends also tend to make reservations further in advance.

When the traveler is a passenger in a rental car within San Antonio, he or she is less likely to make hotel reservations in advance, probably because the driver takes care of all the trip arrangements. Also, when the travel mode within San Antonio is a taxi, there appears to be a lower probability of making hotel reservations in advance.

A group of respondents left their destinations early as illustrated by the fact that this was the reason for changing originally planned schedules. It is statistically significant with a negative coefficient of –0.874. When asked about their communication accessibility, a significant number of travelers stated they used cellular phones and listened to radio traffic reports. Both relationships were statistically significant with a t-statistic of 2.662 and 1.913, respectively. Finally, the distance from the home city to San Antonio had a positive influence on the time when hotel reservations were made. Usually, the farther the city, the greater the unknowns.

Some of the variables that were not retained in the final specification because they were not found to be significant include the number of prior visits to San Antonio. We would think that the time when hotel reservations were made would correlate to some degree with the prior experience of travelers at the destination, captured through the number of prior visits to San Antonio; however, it was not supported in the estimation results. Most of the demographic characteristics were also found not significant. Those variables included age, gender, education, and income as well as household characteristics such as number of persons, number of licensed drivers, number of employed, and age of youngest. This may be due to the relatively small number of observations or the specially targeted nature of the survey (visitors), but may also reveal that travelers' planning behavior for recreation does not vary systematically with sociodemographic characteristics.

Time when decisions on destinations to visit were made. The SST-ordered probit estimation procedure was also applied to obtain maximum likelihood estimates of the parameter values in the model for the time when decisions on specific destinations to visit are made. Table 4.11 presents the final specification with those variables found to be statistically significant. A trip to visit friends and relatives has a positive effect on the time when decisions on destinations to visit are made. The number of prior visits to San Antonio also has a positive effect on the time when decisions on destinations to visit are made. In fact, when the number of prior visits is more than four, there is a positive effect on the advance decision time. Probably travelers who have visited San Antonio on various occasions are more aware of the various destinations available and have favorite destinations that they like to return to.

One would expect that people who plan their trips through travel agencies would decide on destinations to visit far in advance, but the model estimation results indicate that these travelers do not decide on destinations far in advance. The relationship between the Internet as a source of information and decisions on destinations is also significant, as expected. When travelers used the

Internet, they decided on destinations to visit with less advance planning. The Internet provides information rather quickly so travelers with Internet access during their trips can rely on this source to obtain such information.

As expected, when the travel mode to San Antonio is the airplane, the probability of travelers making their decisions on destinations to visit far in advance increases. The previous model estimation showed similar results for the time when hotel reservations were made. It can be expected that travelers who traveled by air and made hotel reservations in advance also made decisions on destinations far in advance. When the travel mode to San Antonio is the train, decisions on destinations are also made in advance.

Regarding the sources of information consulted before traveling to San Antonio, the yellow pages and the radio exert a negative effect on time of decisions. On the other hand, television and travel agencies exert a greater positive effect than tourist information centers on the time of decision, as suggested by the corresponding parameter estimates of 0.676 and 0.581, versus 0.350, respectively. As for the types of information obtained before traveling to San Antonio, both a map of the city and transit schedules appear to have a negative association with the decision time, while prices or costs of destinations have a positive effect, because both of these items reflect an interest in evaluating specific destination alternatives. The coefficient value of 0.370 indicates that use of hotel information increases the probability of selecting specific destinations in advance.

Children and relatives who accompany travelers influence positively the time in advance for deciding on destinations to visit, but the company of colleagues from work exerts a negative influence on advance decision time. For the information obtainers, colleagues from work and friends influence positively the time in advance for selecting destinations.

When the travel mode within San Antonio is other than walking, there is less probability of making decisions on destinations in advance, probably because the availability of an automobile reduces the search cost. Respondents who indicated that they did not change their originally planned schedules were more likely to select destinations far in advance.

Travelers who indicated they listened to radio traffic reports were less likely to select destinations far in advance. Respondents in their forties and fifties are less likely to decide on destinations far in advance. It is also significant that in households where the youngest member is 18 years or older, there is high probability of deciding on destinations in advance than in households with younger members.

Finally, people who finished high school and completed some college or university education are more likely to decide in advance on places to visit, as revealed by the coefficient values 1.138 and 0.739, respectively. People living in the United States, but in a state other than Texas are more likely to make decisions in advance.

Table 4.11: Time when decisions were made on specific destinations to visit

Independent Variable	Estimated Coefficient	Standard Error	t-Statistic
Constant	-0.111	0.809	-0.137
Purpose of trip: Visit relatives/friends	0.900	0.263	3.425
Length of visit	-0.071	0.028	-2.481
Number of prior visits: More than 4 times before	0.486	0.238	2.042
How hotel reservations were made: Travel agent	-1.281	0.453	-2.828
How hotel reservations were made: Internet	0.831	0.506	1.644
Travel mode to San Antonio: Airplane	0.720	0.296	2.434
Travel mode to San Antonio: Train	1.675	0.962	1.741
Sources of information consulted: Yellow pages	-1.003	0.490	-2.047
Sources of information consulted: Radio	-1.121	0.738	-1.520
Sources of information consulted: Television	0.676	0.379	1.783
Sources of information consulted: Travel agency	0.581	0.340	1.706
Sources of information consulted: Tourist information center	0.350	0.187	1.864
Types of information obtained: map of the city	-0.313	0.175	-1.795
Types of information obtained: Transit schedules	-1.305	0.671	-1.946
Types of information obtained: Prices or costs of destinations	0.370	0.186	1.984
Accompanying travelers: Children	1.023	0.258	3.964
Accompanying travelers: Relatives	0.564	0.264	2.137
Accompanying travelers: Colleagues from work	-1.633	0.883	-1.849
Decision maker: Colleagues from work	2.448	0.969	2.525
Information obtainers: Relatives	-0.939	0.338	-2.776
Information obtainers: Colleagues from work	0.838	0.551	1.522
Travel mode within S.A.: Own car (driver)	-0.576	0.237	-2.433
Travel mode within S.A.: Own car (passenger)	-0.637	0.363	-1.757
Travel mode within S.A.: Rental car (driver)	-1.004	0.241	-4.156
Travel mode within S.A.: Rental car (passenger)	-0.794	0.389	-2.039
Travel mode within San Antonio: Bus	-0.346	0.220	-1.575
No change in originally planned schedule	0.360	0.237	1.517
Listen to radio traffic reports	-0.377	0.170	-2.218
Age: 40-49	-0.430	0.265	-1.620
Age: 50-59	-0.579	0.322	-1.795
Age of youngest in household: 18 and above	0.666	0.300	2.216
Education: Finished high school	1.138	0.490	2.324
Education: Some college or university	0.739	0.431	1.714
Live in USA not in Texas	0.402	0.212	1.893
Threshold 1	0.466	0.068	6.843
Threshold 2	1.357	0.075	18.048
Threshold 3	2.210	0.097	22.810

Auxiliary Statistics	At convergence	Initial
Log likelihood	-350.39	-501.28
Number of observations	277	

Some of the variables not included in the final model specification because they were not found to be significant include the frequency of recreational trips, which reflects travelers' experience with recreational destinations. Additionally, responses to questions about staying in hotels, studying the route to follow in detail, and changing their originally planned schedule were not found to be significant. This was surprising because we would think these travelers would make decisions on destinations far in advance. On the other hand, unlike the model estimated for the time when hotel reservations were made, some of the demographic characteristics were found to be significant. This reflects some systematic difference between travelers when deciding on specific destinations to visit. The variables found not to be significant include gender, income, and distance from hometown, as well as household characteristics such as number of persons, number of licensed drivers, and number of employed.

SUMMARY

This chapter presented a study of travelers' behavior when planning their recreational trips, specifically with respect to the level of detail in their plans. It presented an analysis of travelers' preferences for trip planning and the main differences between travelers who are concerned with advance planning of their recreational trip and those who are not.

A factor analysis conducted for this purpose identified nine different factors that helped explain the differences in recreational travel behavior. A cluster analysis resulted in a grouping of respondents into planners and non planners, with a very small third group of nine respondents who are not originally from the United States. Responses from this third group set them apart from the other two, but the small number precluded further inference.

Two ordered probit models were estimated to gain insight into travelers' level of detail when planning their trips. The first is a model of the time when hotel reservations were made. The estimation results revealed that frequent recreational travelers have less advance planning than infrequent travelers.

The following variables influenced positively the time in advance to make a hotel reservation: information on restaurants or prices of destinations; people such as relatives, colleagues from work, or friends; hotel reservations made through a conference or organized group; and travel to San Antonio by airplane. On the other hand, several variables appeared to reduce this advance reservation time, including information on hotels and travel within San Antonio made as a passenger in a rental car or a taxi. A significant number of travelers stated they used cellular phones and listened to radio traffic reports.

The second model addressed the time when decisions on specific destinations to visit in San Antonio were made. The following variables influenced positively the time in advance to make a

decision on specific destinations to visit: several prior visits to San Antonio; travel to San Antonio by airplane; households where the youngest member is 18 years or older; and travelers who finished high school and completed some college or university, or were living in the United States in a state other than Texas. On the other hand, several variables appeared to reduce this advance decision time, including hotel reservations made through travel agencies or the Internet, travel within San Antonio other than walking, and travelers in their forties and fifties.

CHAPTER 5: CONCLUSIONS

With the increased deployment of Intelligent Transportation Systems (ITS), especially Advanced Traveler Information Systems (ATIS), there is a need to determine how this advanced technology can help unfamiliar travelers, such as tourists, plan and conduct their trips. In order to do so, we need to understand how these travelers plan and conduct their trips. This research attempted to study what motivates unfamiliar travelers, especially tourists, and what influences the various travel-related decisions they make. The principal focus is on travelers' behavior when planning their recreational trips, specifically with respect to the level of detail in formulating their plans.

Travelers' behavior is affected by individual attributes (demographic, psychological, and social) that interact with physical and social features of the environment to produce specific activity-travel behavior. According to the analysis, older people are less inclined to drive in an unfamiliar area and, therefore, they considered public transportation during their visit to San Antonio. Households with more young members appear to require more information than other households. Wealthy and educated people are more likely to use the Internet as a source of information. Texans visiting San Antonio are more likely to have seen and responded to advertisements related to their trip, whereas travelers from other states and other countries relied to a larger extent on travel agencies.

Travelers preferred to use travel information sources they had already used or known while planning or taking their trip. Travelers to San Antonio did not make frequent use of kiosks. Previous visitors to San Antonio were not likely to seek information on the locations of activity destinations. People who were traveling to San Antonio in cars looked for information on entrance fees, children's activities, and directions to locations. Travelers who called the destination directly also were more likely to consult the yellow pages and to watch television. Travelers who expressed concern about congestion actually looked for directions to their destinations.

The factor analysis and related cluster analysis clearly distinguished between planners and nonplanners among San Antonio visitors. The two ordered probit models captured travelers' level of detail when planning their trips. One of them captured the factors that influence the time when hotel reservations are made. The second captured the time when decisions on specific destinations to visit are made.

In order for tourists and unfamiliar travelers to plan and conduct their trips, they need to know what information to look for and how to look for it. Each traveler requires a specific information set because each traveler has different plans and expectations for his or her trip. For any trip purpose and for any travel mode, the information required before the beginning of a trip can differ from the information required enroute. Travel information desires for female, young persons, and low-income groups may differ from those of male, aged persons, and high-income groups. Information should be provided through a variety of services and sources. Travelers need information on destinations,

attractions, modes of transportation, lodging, and especially on costs of all these services. They know about these services from their own past experience and from the experience of friends and family members. They also know about these services through different information sources such as advertisements on the radio, television, Internet, yellow pages, travel agencies, etc. Sometimes travelers can receive information passively without actively looking for it, for example, advertisements along the highway or on the streets. Information providers can be public agencies or private entities.

More than one-half of the respondents were classified in the cluster analysis as trip planners. These survey respondents appeared to be travelers who planned their trips far in advance but did not travel frequently. Because these travelers do not travel very often, they prefer to use travel information sources they have already used or known. They are not especially aware of new technologies such as Advanced Traveler Information Systems. Agencies and service providers need to increase the awareness of these travelers about the different options available to them. For example, the City of San Antonio can orient residents and visitors about their deployment of kiosks throughout the city. Existing sources of information should include information about kiosks because most people are not aware of their existence or of the way they work.

At present, it does not appear that there is a large market willing to rely on new technology to avoid congestion or simply drive through unfamiliar areas, though this may be a result of lack of availability and lack of familiarity with the technologies. Because market acceptance and traveler utilization of ATIS services will determine their success or failure, ATIS must be promoted based on its benefits, ease of use, and the costs of acquisition and operation to be borne by users.

The challenge for ATIS is to influence travelers' behavioral processes by providing incremental information that is useful, used, and contributes to improving the travel experience for individuals and their community. Perceived attributes of the information are likely to influence the extent to which individuals accept and use it. Information is more likely to influence decision making if it is perceived as credible, reliable, accurate, timely, and relevant (Barfield and Mannering 1993). Furthermore, clarity of organization and ease of retrieval and acquisition increase travelers' comfort levels with the information and the delivery medium.

It is clear that real-world implementation of ATIS involves multiple media formats, audible and visual, as well as varied message contents, route guidance, and traffic condition information. Furthermore, some information may be posted roadside and be passively available to all travelers with limited effort (i.e., variable message signs [VMS]). Other information may be available to most travelers, but require active acquisition (i.e., highway advisory radio [HAR]). Most autos are equipped with radios, but drivers actively have to tune in to stations carrying traffic information. Still other information may be available to a subset of travelers who pay extra for this service, but will also actively decide when to acquire it (i.e., in-vehicle navigation systems [IVNS]). The style of

presentation and message content is expected to have a large effect on travelers' willingness to use ATIS (Barfield and Mannering 1993).

There are particular circumstances that promote or discourage ATIS use. These circumstances might be defined in terms of availability of routing options, travel conditions, weather, and situational factors (trip purpose, time of day, destination), moderated by travelers' characteristics as described above. The consequences of using ATIS will first be observable at the level of the individual traveler, in terms of objective outcomes such as travel-time reductions relative to unassisted navigation, as well as psychological impacts such as changes in stress levels. Travelers who use ATIS may feel reduced anxiety because of the presence of the system, but may not make use of its information. Others may review the information on a regular basis but make only limited use of route guidance advice. Still others may accept advice without question. Utilization patterns can be expected to vary with traveler characteristics, including demographics (age, gender, education) and personality (Ergun 1979; Khattak 1991). Individual travelers may mix these various patterns of ATIS use.

Limited real-world implementation of ATIS technologies has made it difficult to directly observe travelers' responses to real-time information and evaluate changes in their behavior (Adler and McNally 1994). To anticipate future market response to these emerging technologies, it will be necessary to go beyond measures of observed behavior to explore how users feel about ATIS. Levels of user satisfaction, comfort, and traffic-related anxiety can be expected to be correlated with observable ATIS utilization, but they may also vary substantially across individuals as a function of demographics and personality (Barfield and Mannering 1993).

Future research should focus more on unfamiliar travelers such as tourists. Most of the research conducted so far has been targeted to commuters. Commuters probably are the most concerned with congestion because they travel frequently along the same routes. However, noncommuters are also concerned with congestion and travel information because they are not frequent travelers and are not used to traffic incidents. Noncommuters are less familiar with the transportation system.

Research should also focus on unfamiliar travelers from abroad. Because of the limited number of respondents in our sample from outside the United States, the analysis focused more on travelers who lived in the U.S. Joint research with universities from other countries such as Mexico, England, and Japan, all of which generate meaningful numbers of tourists to the U.S., can provide further insight on visitors from those countries. More specific results can be obtained, for example, on how they planned their trip to the U.S. and how they found their way around the U.S. Such studies would help us understand the determinants of the travel behavior processes of tourists and support the design of ATIS services targeted at these needs.

APPENDIX A: ACCOMPANYING LETTER WITH QUESTIONNAIRE

June 25, 1997

Dear survey participant,

Thank you very much for your willingness to participate in our survey of San Antonio visitors.

The Center for Transportation Research at UT is actively engaged in advanced research to investigate the potential of new technologies to improve mobility and facilitate travel. We are seeking your assistance for an ongoing study of travelers' use of information systems for recreational travel in unfamiliar areas. For this study we have developed a questionnaire. Your participation in this study would provide valuable input for the deployment of information systems.

The questions in the questionnaire relate to your visit to San Antonio and the tour you made on the day you received this questionnaire. It has been designed to be completed in fifteen minutes. Most questions only require checking off an answer. We would appreciate your filling out the questionnaire at the end of the day.

For your convenience, a postpaid return envelope has been included. All information provided will be kept strictly confidential and will be used only for statistical purposes. Should you have any questions, please feel free to contact Mariëtte Kraan, the research scholar who will be administering this survey, at phone number (512) 475-6361, by fax at (512) 475-8744, or by e-mail: mariette@mail.utexas.edu.

Thank you in advance for your time and effort. Your prompt reply is greatly appreciated.

Sincerely,

Hani S. Mahmassani
L. B. Meaders Professor of Civil Engineering and Professor of Management Science and Information Systems
Director, Advanced Institute of Transportation Infrastructure Engineering and Management

Mariëtte Kraan, Ph.D.
Research Scholar,
Center for Transportation Research

APPENDIX B: SURVEY OF RECREATIONAL JOURNEYS

SURVEY OF RECREATIONAL JOURNEYS

Thank you for participating in our survey about your visit to San Antonio. This research is being conducted by the Center for Transportation Research at The University of Texas at Austin. Please answer all questions to the best of your knowledge. All answers, of course, will be kept strictly confidential.

1. How often do you go on recreational trips to unfamiliar areas out of town?

1 Less than once a year
2 Once a year
3 Twice a year
4 3 - 4 times a year
5 More than 4 times a year

2. What is the primary purpose of your visit to San Antonio?

1 I live or work in San Antonio (Go to 10a)
2 Business
3 Visit relatives/friends
4 Pleasure/ Vacation
5 Other (please specify): _____

3. How long do you plan to stay in San Antonio? (The length of your *total* visit)

_____ day(s)

4. How many times have you been in San Antonio?

1 This is the first time
2 I have been in San Antonio once before
3 I have been in San Antonio two to four times before
4 I have been in San Antonio more than four times

5.a. Are you staying at a hotel in San Antonio? 1 Yes 2 No (Go to 6)

5.b. When did you make the hotel reservations?

1 I did not make reservations (Go to 6)
2 The same day I arrived in San Antonio
3 The day before I arrived in San Antonio
4 One to seven days before I arrived in San Antonio
5 One to four weeks before I arrived in San Antonio
6 More than a month before I arrived in San Antonio

5.c. How did you make your hotel reservation?

1 Through a travel agent
2 On the internet
3 Through a conference or organized group
4 I contacted the hotel directly
5 Other (please specify): _____

6. When did you decide which specific destinations to visit in San Antonio?

1 After I arrived in San Antonio
2 The same day I arrived in San Antonio
3 The day before I arrived in San Antonio
4 One to seven days before I arrived in San Antonio
5 One to four weeks before I arrived in San Antonio
6 More than a month before I arrived in San Antonio

7. How did you travel *to* San Antonio? (check all that apply)

1 Own car
2 Rental Car
3 Airplane
4 Train
5 Bus
6 Taxi
7 Other (Please specify): _____

8. Which resource(s) did you use to obtain information for your trip before traveling to San Antonio? (check all that apply)

1 Yellow pages
2 Radio
3 Internet
4 Television
5 Advertisements
6 Guidebook
7 Travel agency
8 Electronic kiosk
9 Tourist information (Visitors Bureau)
10 Telephone information line
11 Friends/relatives
12 Transit schedule booklet
13 Other (please specify): _____

9. What kinds of information did you obtain? (check all that apply)

1 Map of the city
2 Transit schedules
3 Weather information
4 Hotel information
5 Restaurant information
6 Prices or costs of a specific destination
7 Parking information (location, costs, etc.)
8 Information on attractions (location, opening hours, special events, etc.)
9 Other (please specify): _____

The next questions are about how you spent your day in San Antonio on June _____, 1997 (the day you received the questionnaire) starting with leaving your hotel or home and ending with returning to your hotel or home.

10.a. What time did you leave your hotel/home? _____ AM / PM

10.b. Please list all your destinations in order for the entire day. You can use the codes from the table on the left. (You do not have to fill in all the blanks.)

A	The Alamo
B	Botanical Gardens
C	A bar, cafe, or nightclub
D	The Alamodome
F	Fiesta Texas
H	Return to Hotel
I	IMAX Theatre
L	La Villita
M	The Mission Trail
Q	Market Square
R	A Restaurant
S	Sea World
T	The Tower of the Americas
U	A Museum (please specify)
V	Visit relatives/friends
W	River Walk
Z	The Zoo & Japanese Tea Garden
O	Other (please specify)

	Destination:
First destination	
Second destination	
Third destination	
Fourth destination	
Fifth destination	
Sixth destination	
Seventh destination	
Eighth destination	
Ninth destination	
Tenth destination	

10.c. What time did you reach your hotel/home on your return? _____ AM / PM

11. Who was traveling with you? (check all that apply)

1 I traveled alone
2 My spouse/partner
3 My children
4 Other relatives
5 One or more friends
6 Colleagues from work
7 Other (Please specify): _____

12.
1 I did
2 My spouse/partner
3 (One of) my children
4 Other relatives
5 (One of) my friends
6 Colleagues from work
7 Someone else (Please specify): _____

13. Who in your traveling party obtained information regarding this visit to San Antonio? (check all that apply)

1 I did
2 My spouse/partner
3 (One of) my children
4 Other relatives
5 (One of) my friends
6 Colleagues from work
7 Someone else (Please specify): _____

14.a. Which information items about the destinations did you obtain before going to them? (check all that apply)

1 Parking availability
2 Parking costs
3 Entrance fee/Discount
4 Special exhibition or attraction
5 Opening hours
6 Children's activities
7 Location of the destinations
8 Directions to get there
9 Other (please specify): _____

14.b. How did you obtain this information? (check all that apply)

1 Asked at the hotel
2 Travel agent
3 A friend/relative told me
4 From an electronic kiosk
5 Radio
6 Television
7 Guidebook
8 Brochure
9 Called the destination directly
10 Other (please specify): _____

15.a. How did you travel *within* San Antonio? (check all that apply)

1 Own car (driver)
2 Rental car (driver)
3 Own car (passenger)
4 Rental car (passenger)
5 Walk
6 River taxi
7 Bus
8 Other (Please specify): _____

15.b. What influenced your choice of method of transportation for travel *within* San Antonio? (please check all that apply)

1 Availability of car
2 Travel time
3 Availability of bus
4 Time of day
5 Public transport time schedules
6 Travel costs (such as toll, fares, etc.)
7 Weather
8 Parking costs
9 Location of the destinations
10 Other (please specify): _____

If you did not travel by car, go to 17a.

16.a. Before you left your hotel/home today, did you study in detail the route to follow to get to your destinations?

1 Yes
2 No

16.b. What influenced your *choice of route* to the specific destinations in San Antonio, *before* traveling? (please check all that apply)

1 Directions (which roads to take)
2 Map(s)
3 Travel costs (toll, for example)
4 Parking costs
5 Accidents or congestion on specific roads
6 Construction on specific roads
7 Travel time
8 Weather
9 Need for services (gas station, ATM, post office, etc.)
10 Opening hours (of destinations, shops, etc.)
11 Other (please specify): _____

16.c. Did you change your originally planned route while driving?

1 Yes
2 No (Go to 17a)

16.d. If yes: What influenced your change? (please check all that apply)

1 Something I/we saw (please specify:) _____

Information given on/through:
2 Radio
3 Telephone
4 Electronic kiosk
5 Asking people
6 Regular, fixed message signs (Roadside)
7 Changeable message signs (Roadside)
8 Other (please specify): _____

17.a. Through the course of the day in San Antonio, did you change your originally planned schedule? (check all that apply)

1 I/We did not have a rigid schedule (Go to 18)
2 I/We did not change the original plan (Go to 18)
3 I/We left earlier from a destination
4 I/We stayed longer at a destination
5 I/W did not go to _____
6 I/We visited also _____ (not planned)
7 Other (please specify): _____

17.b. What made you change your original plan or schedule? (check all that apply)

1 Changes in the weather (better/worse)
2 Different travel times than expected (longer/shorter)
3 Different closing hours than expected (earlier/later)
4 Different costs than expected (higher/lower)
5 Food / drinks (available/non-available)
6 Disappointment / Enjoyment / Boredom
7 Other (please specify): _____

18. Was there any information about destinations, transport methods, routes, or services you would have liked to have for your visit to San Antonio? (Please specify:)

_____

_____

The next questions are related to recreational trips in unfamiliar areas in general. (They do not necessarily reflect your current situation.)

19.a. Please check the *three primary* types of information which you would like to obtain when visiting an unfamiliar area.

1 Route Guidance information (how to get to the destination, turn by turn)
2 Information about the destinations (opening hours, parking availability, costs, etc.)
3 Information about methods of transportation (rental cars, public transport, etc.)
4 Weather reports
5 Traffic reports (average actual speed on the route, locations of congestion, accidents, etc.)
6 Other (please specify): _____

19.b. Please check the *three primary* ways from which you would like to obtain information when visiting an unfamiliar area.

1 Television
2 Radio
3 Telephone information line
4 Guidebooks
5 By word of mouth (friends, relatives, colleagues, etc.)
6 Map(s)
7 Travel agent
8 Internet
9 Personal device (portable or in a car)
10 Electronic kiosks
11 Other (please specify): _____

In the following questions, please check your response to each statement . Numbers 1 to 5 represent your feelings about each item from strongly disagree (1) to strongly agree (5): All questions are related to recreational trips in unfamiliar areas.

	1 strongly disagree	2 disagree	3 neutral	4 strongly agree	5 agree	
20. When driving in unfamiliar areas I would rather stay on the same route when it is congested than take an unknown route, with the risk of getting lost.	1	2	3	4	5	
21. Before I leave home I like to know exactly the specific route I want to take.	1	2	3	4	5	
22. I am not concerned about congestion when I am traveling for recreational activities.	1	2	3	4	5	
23. I prefer to visit new and unfamiliar areas when going on vacation.	1	2	3	4	5	
24. I usually plan the details of my vacations far in advance.	1	2	3	4	5	
25. I always compare prices before I make any choice (for travel, restaurants, and hotels).	1	2	3	4	5	
26. When traveling in groups or with the household, I am the one who plans the journey.	1	2	3	4	5	
27. I usually consider taking my pets with me on recreational trips.	1	2	3	4	5	N/A 6
28. In general I am satisfied with available information when traveling in unfamiliar areas.	1	2	3	4	5	
29. When obtaining information, I prefer to speak with a person rather than using a computer or other electronic device.	1	2	3	4	5	

The next questions are related to your communication accessibilities.

30. **Do you use a mobile (cellular) phone?** 1 Yes 2 No

31. **Do you listen to radio traffic reports?** 1 Yes 2 No

32. **Do you have access to the internet at home?** 1 Yes 2 No

The following questions will be used only in determining our sample demographics.

33.a. **In which city and state (or country if not in the USA) do you live?** (City:) _____

(State or Country:) _____

33.b. **Please also indicate your Zip code (if in the USA)** (Zip code:) _____

34. **What is your age?**
1 Under 18 3 30 - 39 5 50 - 59
2 18 - 29 4 40 - 49 6 60 and above

35. **What is your gender?** 1 Male 2 Female

36. **How many persons (including yourself) presently live in your household?** _____ persons

37. **What is the age of the youngest person in your household?**
1 0 - 4 3 12 - 15 5 18 - 20
2 5 – 11 4 16 - 17 6 21 and above

38. **How many people have a driver's license in your household?** _____

39. **What is the highest level of education you have attained?**
1 Less than high school 2 Finished high school
3 Some college or university 4 Finished college or university
5 Master's degree 6 Ph.D.

40. **How many people in your household are presently employed for more than 30 hours a week?** _____

41. **Which best represents your *household's* income per year?**
1 Less than $25,000 2 $25,000 - 50,000
3 $50,000 - 75,000 4 More than $75,000

42. Do you have any suggestions or remarks concerning this survey? _____

_____

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