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DYNAMICS IN BEHAVIORAL ADAPTATION TO A TRANSPORTATION INNOVATION: A CASE STUDY OF CARLINK—A SMART CARSHARING SYSTEM

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Abstract

Most trips in U.S. metropolitan regions are drive-alone car trips, an expensive and inefficient means of moving people. A more efficient system would allow drivers to share cars. Such a system is often less convenient for travelers, but convenience can be enhanced by deploying "smart" technologies in concert with shared-use vehicles and transit.

The motivation for this research is to determine how the use of information and communication technologies can enhance flexibility and mobility—and what value travelers will place on these new transportation means. My dissertation, using new survey research methods, examines CarLink, a smart carsharing service designed and deployed under my direction. This dissertation integrates social marketing and learning theories with human activity analysis approaches to explain the processes by which travelers can and might accept a transportation innovation. I focus on methods of presentation and learning to examine response dynamics. To explain the CarLink system to consumers, I developed several informational media: a brochure, video, and "trial" clinic.

My dissertation is based on a longitudinal survey of responses to informational media that I conducted with San Francisco Bay Area residents in the summer of 1998. The survey results provide the attitudinal and belief data needed to evaluate dynamics in an individual's learning and valuing response to an innovation. To assist in evaluation and interpretation, I also conducted four focus groups, which I moderated, in October 1998.

I found that willingness to use CarLink was influenced by the amount and type of exposure, as predicted by social marketing and learning theories. Informational media were used to teach targeted groups, and behavioral modeling (e.g., the video and drive clinic) was introduced to develop participants' confidence in adopting new behaviors. For instance, participants who only read the brochure lost interest over time, while a large majority of those who read the brochure, watched the video, and participated in the clinic, stated that they would use CarLink. I documented the process by which individuals moved through definable stages in the behavioral adoption model, from precontemplation to contemplation, and in many cases into action.

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In addition, I would like to express my deep gratitude to Daniel Sperling (my chair and advisor), Ryuichi Kitamura, and Richard Walters for reviewing my dissertation and in supporting me in its design and implementation. Thanks also go to Kenneth Kurani and Thomas Turrentine for their assistance with my research methodology and video development. Richard Katzev also provided valuable assistance in helping to manage the CarLink field test, while I focused on my dissertation.

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CHAPTER ONE: PROBLEM, OBJECTIVES, AND OVERVIEW

SECTION 1.0 INTRODUCTION

The vast majority of trips in U.S. metropolitan regions are drive-alone car trips. This form of transportation is expensive and requires large amounts of land. As automobiles gain market share, transit and ridesharing continue to lose market share. Today, commuters are more likely to spend a longer time commuting than they did in the past (Baldassare, 1991). Furthermore, attitudes toward commuting have become more negative. Despite these trends, transit now accounts for less than two percent of passenger travel, notwithstanding large subsidies (Vincent *et al.*, 1994). A more efficient, but often less convenient, alternative to private auto use would allow drivers to share cars. By deploying "smart" transportation technologies in concert with alternative vehicle-usage arrangements, the opportunity now exists to enhance transit services, thereby improving their competitiveness with private, individually owned cars. At present, several transportation providers are employing electronic and wireless communication systems to facilitate the use and deployment of mobility services.

One of the problems motivating this research is the apparent inability of transit services to satisfy the presumed high value placed on flexibility and mobility by urban and suburban residents. The success of a transportation innovation depends in part on an individual's attitude toward the traditional auto (Cullaine, 1992). This dissertation, using new survey research methods, examines one application of a smart transportation service: shared-use vehicles (or "carsharing"). Since carsharing is being deployed throughout Europe, Asia, and North America, it is important to develop an understanding of the response to this emerging alternative in the U.S.

1.0.1 Smart Carsharing: Purpose and Goals

Through carsharing, individuals gain access to a shared fleet of vehicles for multiple uses throughout a day without the costs and responsibilities of ownership. Instead of owning one or more vehicles, a household accesses a fleet of vehicles on an as-needed basis. Shared-use vehicles provide a shared community resource at transit stations (i.e., smart station cars), neighborhoods, campuses, employment centers, resorts, etc. Travelers can rent or lease a shared-use vehicle to drive to and from their homes, offices, shopping centers, and transit stations. Carsharing can be thought of as organized short-term car rental. Shared-use cars provide instant and convenient access to destinations that are not conveniently accessible by transit.

The goal of carsharing is to help reduce traffic congestion, air pollution, and government spending. Sharing vehicles could mean less traffic and fewer cars overall. Carsharing could reduce congestion by cutting down on the number of vehicles needed by households and society as a whole, and by facilitating and encouraging transit usage, walking, and bicycling. For commuters especially, carsharing could offer an alternative to getting to and from their destinations. Carsharing fleets could also be made up of ultra-low-emission, energy-efficient cars. Because a carsharing organization would handle maintenance and repairs, these duties would be completed properly and on schedule, further reducing pollution and energy waste.

Carsharing could reduce government spending on arterial street systems and mass transit by increasing transit ridership through added reverse commuters and midday, evening, and weekend riders. Sharing vehicles might lessen the demand for parking spaces; by serving multiple users each day, vehicles would spend less time parked. Moreover, sharing could reduce the need for additional household vehicles to support a family's travel needs. Travelers could benefit by gaining the mobility of a car without having to carry the full costs of ownership; transit operators could benefit by being able to tap a much larger potential market; and society could benefit by diverting travelers from single-occupant vehicles to transit for part of their trips.

Carsharing provides the potential to reduce the costs of vehicle travel to the individual as well as society. When a person owns a car, much of the cost of owning and operating the vehicle is fixed. The variable cost of using the owned vehicle is relatively low, and thus the driver has an incentive to drive more than is economically rational. In contrast, payments by carsharing participants are closely tied to actual vehicle usage. A carsharing system in effect transforms the fixed cost of vehicle ownership into variable costs.

CarLink is the use of short-term rental vehicles and intelligent communication and reservation technologies to facilitate shared-vehicle access at transit stations or other activity centers for making local trips. Advances in smart system technologies have many benefits for both public transportation agencies and private firms managing fleets. Potential and existing users of these technologies range from smart paratransit to carsharing organizations.

There are several smart technologies bundled into such a smart system. The central technology is automatic vehicle location (AVL), which uses global positioning systems (GPS) to pinpoint a position (up to the nearest meter). Digital Geographic Databases are used with AVL to inform the driver/vehicle subscriber and the advanced traffic management system (ATMS) of the vehicle's location by street address (Casey and Labell, 1996; Hardin *et al.*, 1996). ATMS can employ state-of-the-art wireless communications to connect the smart components and potential users through such media as interactive kiosks and the Internet. Smart cards or keys, containing memory and a microprocessor, allow customer access to a reserved vehicle and relay the billing and reservation information to the vehicle and ATMS. Following my survey, a nine-month CarLink field test was deployed with 12 compressed natural gas (CNG) Honda Civic vehicles, which are linked to a smart system, to provide an intermodal transportation service.

1.0.2 Research Approach

This dissertation focuses on the results of a longitudinal survey, conducted with San Francisco Bay Area residents in the summer of 1998, which explored responses to the smart carsharing concept over time. Furthermore, my study included a set of four focus groups, which I moderated, with selected survey participants in October 1998.

As mentioned earlier, a field test of smart carsharing is being implemented through a partnership of the Institute of Transportation Studies (University of California, Davis), the Bay Area Rapid Transit (BART) District, American Honda, the California Department of Transportation, Lawrence Livermore National Laboratory (LLNL), Teletrac, and INVERS.

The carsharing model developed and explored in this dissertation is known as "CarLink." In the CarLink model, a fleet of vehicles is shared by three categories of participants: Homeside Users, Workside Commuters, and Day Users. To facilitate the exchange of vehicles and encourage transit ridership, BART serves as the principal access "hub." Homeside Users drive CarLink vehicles between home and the BART station daily and keep the car overnight and on weekends for personal use. Workside Commuters take BART to their workside station and drive a CarLink vehicle to and from BART and their employment center.[1] Day Users access CarLink vehicles at available "hubs" and use them for tripmaking throughout the day.

[1] In the CarLink field test, which launched in January 1999, the employment center is the Lawrence Livermore National Laboratory, and the BART "hub" is the Dublin/Pleasanton station.

SECTION 1.1 DISSERTATION OBJECTIVES

Social learning and social marketing theories were used in this dissertation to explain the processes by which travelers can and might accept or adapt to a transportation innovation. "An innovation is an idea perceived as new by those who are confronted with it as an option in choice…Reaction to an idea is quite different when one encounters it for the first time, than when it has become routine" (Rogers, 1972, p. 86). I focus on methods of presentation and learning to examine dynamics in target adopter response. Social learning methods and the behavioral adoption model, developed by social marketing theorists, were also tested.

To explain the CarLink system, I developed and examined several informational media, including a brochure, video, and "trial" clinic. According to Magill *et al.* (1981), a strategy should be established to accomplish the innovation communication (or diffusion) objectives. In my study, communication objectives emphasized the disadvantages of current modes, the advantages and disadvantages of smart carsharing, and how the system works.

I also integrated the human activity analysis approach into the design of study instruments, including the questionnaires, drive clinic, and focus groups. Activity analysis examines the daily patterns of households and their members to capture and explain travel behavior and choices. This methodology, integrating principles of sociology, focuses on understanding behavior and lifestyle choices of study participants and their households. Examples of the activity analysis approach in my study include survey questions, such as how do you accomplish your weekly activities; how many trips are taken by activity type per week; and how essential to your lifestyle is a household vehicle.

For this dissertation, I directed a team of researchers in administering a quasi-longitudinal survey over a four-month period. The longitudinal survey provides the attitudinal and belief data needed to evaluate the social learning methodologies and social marketing theory tested in my study. I use these data to assess dynamics in an individual's learning and valuing response to an innovation over time. Specifically, I test two "dynamic" innovation response hypotheses.

- ***Hypothesis One:*** An individual's response to an innovation will be positively altered by informational media (i.e., video, brochure, and drive clinic). Furthermore, individuals who are not exposed to additional information about the innovation will become increasingly negative toward it over time.
- ***Hypothesis Two:*** An individual's valuing response to an innovation's negative mobility attributes (e.g., limitations on instant mobility) will become more positive after learning more about the new technology. In contrast, an individual—unexposed to additional information about the innovation—will respond the same to the negative mobility attributes across the study (i.e., his or her response will remain unchanged).

These results are used to evaluate the validity of the social marketing framework as it relates to the early phases of innovation adoption. Please see Chapter 2, Literature Review, for a discussion of the theoretical and methodological areas relevant to this dissertation.

Second, I evaluate the impact of social influence from friends, family, and colleagues (i.e., during the contemplation phase of innovation adoption) on study participants' response to the CarLink system. According to social marketing theory, social influence plays a significant role in an individual's decision to adopt a new product or approach.

Third, I assess the usefulness and effectiveness of three social learning methods in explaining and demonstrating the CarLink system. The social learning methods tested include written informational material, a modeling video, and an interactive drive clinic. Furthermore, the drive clinic and longitudinal survey provide a practical test bed for evaluating the "social desirability effect." This is tendency of participants to overstate a socially desirable position, especially in the presence of researchers.

Finally, I use the survey results to identify target audience characteristics of potential CarLink adopters.

SECTION 1.2 DISSERTATION OVERVIEW

This dissertation is organized into ten chapters. The second chapter is a theoretical and methodological literature review relevant to this research. The third chapter, “Carsharing and New Mobility: An International Perspective,” reviews the past, present, and future of carsharing and transportation services related to carsharing (i.e., new mobility). This chapter provides an overview of carsharing experience, particularly in Europe; reviews shared-vehicle developments in Europe, North America, and Asia; and explores future prospects, including use of smart technologies, to facilitate shared-use deployment and use. The fourth chapter, “Study Approach,” includes an overview of the methodology employed in this dissertation. Chapter Five describes the “Data Collection” process. The sixth chapter provides a “Baseline Analysis of the Study Population,” examining potential differences between the experimental and control groups. The seventh chapter contains the “CarLink Longitudinal Survey Results.” Chapter Eight is the “CarLink Drive Clinic Summary.” The ninth chapter is the “CarLink Focus Group Summary.” The final chapter reviews the study “Conclusions” and recommendations for future research.

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CHAPTER TWO: LITERATURE REVIEW

SECTION 2.0 INTRODUCTION

This dissertation applies social learning and social marketing to the field of transportation innovation. My study approach also integrates social learning and social marketing methods with activity analysis. Human activity analysis is a travel behavior methodology focused on understanding the behavior and travel choices of households and their members. The integration of these approaches is a synergistic one because all three are interested in understanding behavioral dynamics (e.g., learning, technology adoption, and travel behavior). By monitoring change, researchers can better understand how lifestyle affects behavior and choices; how and why people might learn to change their behaviors; and why individuals might adopt a new system or product.

This literature review covers several key areas relevant to this dissertation. The first is a review of experimental research studies on carsharing and station cars (i.e., the empirical focus of this thesis). The second section reviews relevant literature on attitudinal response to a range of transportation policies. The third section discusses the role of travel behavior theory— specifically activity analysis—and experimental situations in the evaluation of a transportation innovation. The fourth and fifth sections address social learning and social marketing theory, respectively.

SECTION 2.1 CARSHARING AND STATION CAR EXPERIMENTAL RESEARCH

Very little recent experimental research has been published on the station car and carsharing concepts. This section discusses results from published experimental studies from Europe and the United States. A more detailed overview of international developments is included in this dissertation in Chapter 3, Carsharing and New Mobility: An International Perspective. The third chapter focuses mainly on actual programs and their social and environmental impacts (e.g., increased transit ridership, reductions in vehicle ownership) in contrast to controlled experimental research.

Carsharing organizations have conducted several studies in Europe. While most of the surveys have small samples, employ simple questionnaires, and do not use control groups, they do provide useful insights. Results from these studies are discussed in Chapter 3. Below is a summary of published experimental studies that have been prepared by researchers rather than by the implementing organizations themselves.

Recently, Steininger *et al.* (1996) published their survey results on a carsharing organization in Austria. Using travel diaries and attitudinal surveys, they examined the reasons why individuals became CSO members. They discovered that overall travel declined after drivers became members. However, this study did not evaluate dynamics in innovation response or the behavioral adoption process.

Massot *et al.* (1999) also published results from their demonstration of smart, electric shared-use vehicles outside of Paris, France. In October 1997, Praxitele launched a full-scale, 20-month demonstration of their advanced carsharing scheme. Praxitele, a 24-hour self-service operation, was deployed in a Paris suburb (St.-Quentin-Yvelines) with 50 electric Renault CLIO cars. Using real-time data, researchers report that approximately 50 percent of drivers made only one trip, whereas regular users (i.e., those who have made more than six trips since joining) comprised barely 10 percent of Praxitele's clientele, yet they made nearly half the trips. On average, 30 trips were made per day—approximately 35 minutes in length. At the end of the project, approximately 600 trips were made per week. This program employed smart technologies to facilitate vehicle usage and access. Results are based entirely on actual use rather than on travel diaries or survey results.

In the United States, there have been two formal carsharing demonstration research projects. The first was Mobility Enterprise, operated as a Purdue University research program from 1983 to 1986 in West Lafayette, Indiana (Doherty *et al.*, 1987; Muheim and Partner, 1996). Each household leased a very small "mini" car for short local trips and was given access to a shared fleet of "special purpose" vehicles (i.e., large sedans, trucks, and recreational vehicles). Mobility Enterprise created a hypothetical cash flow for its operations. They claimed economic viability, but only if the shared-use vehicle services were run through an existing organization, such as a large fleet operator.

In the Mobility Enterprise field test, the mini vehicles leased to participants were used for 75 percent of the households' vehicle miles of travel (VMT). In contrast, the shared-use vehicle fleet was only used 35 percent of the time that it was available to households throughout the experiment. (The Mobility Enterprise study findings did not provide the percentage of a household's total VMT that was made with special-purpose fleet vehicles.) Although this program was considered a success in promoting shared use, this service was discontinued because it was deployed as a research experiment.

Feinberg *et al.* (1986) conducted a survey with 83 undergraduate students of the Mobility Enterprise concept, 46 of whom had previously participated in focus group interviews. They found that a "…short description of the shared fleet concept produced the same perceptions of success, feasibility, willingness to try, interest in joining, etc. as did extended discussion of the concept [in focus groups]" (p. 16). Interestingly, this finding is antithetical to this dissertation's first hypothesis, i.e., an individual's response to an innovation will be positively altered by increasing the number of informational media (i.e., brochure, video, and drive clinic).

Furthermore, Feinberg *et al.* (1986) claim that the focus group interviews demonstrated that financial savings would not define the success of Mobility Enterprise. Group discussions demonstrated that potential consumers are not fully knowledgeable of full vehicle ownership costs. Consequently, target adopters may not perceive a financial advantage to Mobility Enterprise over private ownership. Feinberg *et al*. also argue that "[b]y assuming a completely economically rational consumer, classical theory fails to account for the psychological aspects of consumption. Perception is subjective and price perception is no exception" (p. 4). Nevertheless, the issue of perceived vehicle ownership costs is still a significant one for any transportation alternative. Although pricing is not the focus of this dissertation, cost perceptions were addressed in my study and are discussed in Chapters 5 through 9.

A second major U.S. carsharing project was the Short-Term Auto Rental (STAR) demonstration in San Francisco (Doherty *et al.*, 1987). The STAR company operated as a private enterprise from December 1983 to March 1985, providing individuals in an apartment complex use of a short-term rental vehicle (for a few minutes up to several days). Feasibility study funds were made available from the Urban Mass Transportation Administration and the California Department of Transportation.

STAR was operated from the parking garage of a 9,000-resident apartment complex located near San Francisco State University. Users paid on a per-minute and per-mile basis until a maximum daily rate was reached. This rate was kept low to discourage auto ownership and encourage transit use. The maximum daily rate for subcompact, mid-, and full-sized vehicles ranged between $8 to $9 per day with an additional mileage charge of 10 cents a mile. The members shared a fleet of 51 vehicles (44 cars, five wagons, and two light-duty trucks), with 10 additional vehicles available as backups during periods of peak demand. The fleet size was maintained until January 1985, when it shrank to 35 vehicles. Membership peaked at approximately 350 participants (Walb and Loudon, 1986).

This project failed halfway through the planned three-year program. The primary problem was the low and erratic income of many of the tenants. Many were later discovered not to be credit-worthy for car ownership; many were students who shared an apartment and were not actually listed on the lease. Another failing was the pricing structure of STAR: it encouraged long-term, as well as short-term rentals. Long rentals sometimes resulted in long-distance towing charges when the old, often poor-quality cars broke down several hundred miles from San Francisco. STAR's management tried to cut costs by purchasing used, economy-class vehicles, but this resulted in high repair costs.

Also, STAR apparently offered too many models in each vehicle class, leaving members dissatisfied when a particular car was unavailable (Russell, 1998).

One of the most recent demonstration projects in the U.S. was a two-year study of station car rentals at Bay Area Rapid Transit (BART) District stations (Bernard and Collins, 1998). For this BART project, Cervero *et al.* (1994; 1996) conducted an early market assessment of station cars using stated-preference survey methods. However, it is questionable whether stated-preference methods accurately capture response to new technologies (Kurani and Kitamura, 1996), with limited learning and time.

In 1999, two new demonstrations were launched, both involving smart carsharing. The first is the CarLink field test, which started in January, and the second is Intellishare, which launched in southern California in March. CarLink focuses on behavioral and attitudinal response to shared use. In contrast, Intellishare examines user demand and potential vehicle wait times at shared-use lots.

Chapter 3 of this dissertation provides a detailed overview of research and operations in the areas of carsharing, station cars, and new mobility. New Mobility is a new transportation approach that focuses on pairing clusters of smart technologies with existing transportation options (e.g., rail, autos) to create a coordinated, intermodal transportation system that could substitute for the traditional auto (Wagner and Shaheen, 1998; Salon *et al.*, 1999).

SECTION 2.2 ATTITUDINAL STUDIES ON TRANSPORT POLICY

Recently, a few transportation attitudinal studies have been published of direct relevance to this dissertation. A few of these papers examine the response of individuals to transportation policies or alternatives. For instance, Baldassare (1991) conducted a study in a southern California suburb (i.e., a rapidly growing industrialized region, similar to the one in which this study was conducted) that examined whether or not traffic attitudes affect commuting behavior and policy preferences (e.g., ridesharing). Baldassare found that “[t]here is substantial opposition to transportation policies that involve financial or lifestyle sacrifices, despite the experience of worsening commutes and the growing perception of traffic problems” (Baldassare, 1991, p. 216). Further, transportation attitudes did not appear to impact policy preferences. Those who perceived traffic as a serious concern and rated freeways as unsatisfactory are no more in support of carpooling than others who did not perceive transportation to be a problem.

In another study of attitudes toward alternative transportation and environmental policies in the United Kingdom, Cullaine (1992) found the proposed policy success to be highly dependent on autos and attitudes toward the environment and congestion. Cullaine found that 69 percent of households that owned an auto thought that a vehicle was essential to their lifestyle and did not want to sell it. While 19 percent stated that a car was not essential to their lifestyle, they still did not want to sell their vehicle. Two percent responded that their car was useful, but they had considered selling it. An additional 3% thought that cars are useful, but they would consider selling theirs if public transportation better suited their lifestyle. Finally, two percent of participants stated that it would not take much to make them sell their car (Cullaine, 1992, p. 292). Furthermore, most participants recognized that there are many traffic problems. For example, 85 percent of respondents agreed that existing roads would not be able to handle increased traffic projections. Seventy-nine percent also agreed that auto emissions were a major cause of environmental problems. Thus, most participants seemed to recognize that autos cause several problems.

Despite the recognition of these problems, the results showed that very few participants were willing to adopt policies that restrict driving, particularly ones that impose pricing penalities (Cullaine, 1992, p. 301). Indeed, the solution that received the greatest support was improved bus and rail transportation. Interestingly, this dissertation offers participants an alternative transportation system that could improve access to transit and potentially reduce auto ownership, in contrast to pricing policies (e.g., road pricing). Nevertheless, this dissertation's methodology faces the same challenge of both these studies, i.e., attitudes are not necessarily reflective of action. This dissertation builds on these two studies by developing longitudinal survey methods (i.e., questions and scales) for measuring individuals' responses to an innovation relative to their current travel modes. Each of the previous studies was based on a single-phase survey conducted in 1989, which did not examine how an individual's attitudes toward a transport alternative might change over time.

SECTION 2.3 TRAVEL BEHAVIOR THEORY AND METHODS

Travel behavior theory is relevant to this literature review because it offers a framework for understanding transportation behavior and choices. In studying innovation response, it is important to select a behavioral methodology that best captures individuals' reactions to the new concept as it becomes more familiar. In my study, I integrate the human activity analysis approach with social learning and social marketing theories.

Traditionally, travel behavior methodology has been dominated by engineers and economists who were motivated by the need to develop standard travel forecasting tools. Indeed, the primary goal of the early travel demand models was to determine where freeways should be built. There was little concern whether these models accurately explained phenomena or were a reasonable representation of the underlying processes. However, in the mid-1970s, a new phase in transportation demand modeling began to develop—human activity analysis—integrating the insights of sociology. Jones *et al.* (1990) define activity analysis as a framework in which travel patterns are analyzed at the day or multi-day level. This type of analysis better reflects differences in behavior, lifestyle choices, and activity patterns of the population.

In the activity analysis framework, travel is recognized as a derived demand, which is based on an individual's needs and desires to participate in activities that are spatially separated (Pas, 1990). The focus of this approach is on understanding behavior rather than on prediction. Typically, the household and its members are considered to be the source of activity participation. Hence, the activity choices of household members are mediated by a system of constraints, such as structure, resources, and relationships (Kurani *et al.*, 1996).

Kitamura (1988) states that the tools of more traditional travel-demand approaches—especially, discrete-choice models and stated preference techniques—are fundamentally different from those motivating the development of activity analysis. Garling *et al.* (1993) argue that discrete-choice models cannot model interactions between individuals (e.g., within a household) or their choices. Further, the utility maximizing frameworks that are central to discrete-choice models often reduce items into a single scale, even when some items should not be combined (Kurani and Kitamura, 1996, p. 14). Consequently, other approaches, such as activity analysis and social marketing, may provide more suitable frameworks for understanding behavioral choices and change, particularly in response to an innovation.

The most important theoretical and methodological trend in travel analysis over the last 20 years has been the development of activity analysis concepts and their increased application. The federal Travel Model Improvement Program (TMIP) is premised on bringing these concepts and methods into everyday, practical application. Activity analysis inherently requires dynamic approaches to travel behavior—the study of household activity and travel over time (Kitamura, 1988; Jones *et al.*, 1990; Kurani and Kitamura, 1996; Kurani and Lee-Gosselin, 1996). Furthermore, "Slovic *et al.* (1990) argue that preferences are often constructed—not merely revealed—in responding to a choice" (Kurani *et al.*, 1996). This dissertation examines the longitudinal response to a transportation innovation, based on several types and lengths of exposure to the CarLink system. This is achieved by studying household response (and one to two individuals from each household) over several months. At present, activity analysis is most often studied for periods of just one day. Hence, behavioral adjustments and the methodologies for studying these activity dynamics are weakly developed.

Many researchers are studying individuals' reactions to unfamiliar, alternative technologies. Indeed, they must rely on participant response to experimental situations in order to understand the probable or even possible impacts they may have. This is especially true of more innovative solutions (Kurani *et al.*, 1996; Turrentine and Kurani, 1998). Kurani *et al.* (1996) claim that a cross-sectional study of current preferences is not a sufficient method for assessing innovations. Several advanced survey designs have been developed to help compensate for the limited understanding and experience that participants have with a new technology (Golob and Gould, 1998). My dissertation contributes to this body of knowledge by evaluating the impacts of informational materials and an interactive clinic on participant response.

In evaluating a new technology, it is critical to document the processes of attitudinal response, preference formation, and lifestyle evaluation relative to a household's exposure to an innovation. Kurani *et al.* (1996) have concluded that an experimental situation will often elicit and engage the decision processes of its participants, often revealing the participants' lifestyle goals. These processes are often initiated by the presence of a new technology. Since research into consumer responsiveness to innovations (especially those embodying new values and performance attributes) must be attentive to "processes" (Kurani *et al.*, 1996), a longitudinal approach to evaluation is used throughout my study.

As mentioned earlier, discrete-choice methods have often been applied to stated-preference data in travel demand analysis. Kurani *et al.* (1996) have found that many stated-preference studies of electric vehicle (EV) markets estimate huge price penalties for limited-range vehicles (e.g., Beggs and Cardell, 1980; Morton et al., 1978). In general, these studies rely on data from hypothetical-choice experiments in which participants are presented with choice sets of the vehicle. Then, participants are asked to identify the one vehicle, from each of the choice sets, they would be willing to purchase. All vehicles are described by attributes that are common to all of the study vehicles, e.g., range. The attribute levels are varied over several trials to elicit different choices. With these data, econometric models are run to estimate the partial utility values for consumer preference of each attribute.

Kurani *et al.* (1996) argue that the underlying assumptions of consumer behavior in many EV stated-preference studies are flawed. For example, these attitudinal studies assume that the survey respondents have well-formed preferences for driving range. Second, they assume that these preferences remain stable (or there must be enough longitudinal data) to forecast changes in preferences. Third, oversimplified surveys often are designed to encourage large sample sizes. Finally, these studies evaluate several vehicle attributes that study participants have not yet experienced. For this dissertation, I designed an attitudinal survey, which integrates social learning, social marketing, and activity analysis approaches to address these concerns.

SECTION 2.4 SOCIAL LEARNING THEORY

Social learning theory emphasizes a continuous interaction among behavior, personal factors, and environmental determinants. The relative influence of each factor is different for various settings and behaviors. Social learning theory bridges the gap between cognitively oriented rational decisionmaking models and behavioral theory. In this framework, individuals are "…neither driven by inner forces nor buffeted by environmental stimuli" (Bandura, 1977, p. 11). Rather, psychological processes are explained in terms of a dynamic and continuous interaction of personal, behavioral, and environmental factors. The environment can influence behavior by making it easier for individuals to act. For instance, situational factors in the environment can influence behavior (e.g., the close proximity of carsharing vehicles to a transit station could make it easier for users to select this transportation option). A distinguishing feature of social learning theory is that "symbolic, vicarious, and self-regulatory processes assume a prominent role" (Bandura, 1977, p. 12). For instance, an individual might observe another person's behavior, reproduce it, and in replicating it, reinforce the modeled behavior.

More traditional behavioral theorists have advocated a different learning framework. From the behavioral perspective, learning can only occur after an individual performs an activity and experiences its effects (i.e., trial-and-error learning) (Polley and Ven, 1996).

Cognitive theorists offer still another approach. They focus on rational processes and how individuals' preferences change as they undertake a course of action. For instance, once an individual has decided to adopt an innovation they often reinforce this decision and, in turn, become even more positive about this choice (Polley and Ven, 1996). Social learning integrates these perspectives and advocates that "the capacity to learn by observation enables people to acquire large, integrated patterns of behaviors without having to form them gradually by tedious trial and error" (Bandura, 1977, p. 12). Furthermore, social learning theory argues that as individuals gradually decide to adopt a new behavior, they do not implement it instantly. "Among other effects, this slow adaptation allows individuals to manage their anxiety in dealing with the newness of the new behavior" (Andreasen, 1995, p. 268). This dissertation tests the validity of social learning theory and the dynamics in the behavioral adoption process in response to a social innovation (i.e., smart carsharing).

2.4.1 Use of Written Materials in Social Learning Theory

During the 1970s and 80s, social learning theory was applied to several social problems (e.g., energy conservation and smoking). Perhaps most applicable is the experience of energy conservation programs. According to Katzev and Johnson (1987), several types of written informational materials, including brochures, posters, and labels, have been developed to increase social learning to promote energy conservation measures. Many studies have shown, however, that informational materials alone have little impact on reduced energy consumption (e.g., Kohlenberg *et al.*, 1976; Hayes and D.Cone, 1977; Winett and Neale, 1979; Ester and Winett, 1981-1982; Anderson and Claxton, 1982; Winett, 1986).

In contrast, one project claimed positive impacts resulting from an informational campaign. Katzev and Johnson cite a two-year study of Heberlein and Baumgartner (1985) in which researchers provided varying amounts of information to residential consumers of a new electricity rate structure. This plan allowed consumers to reduce energy costs by using electricity during off-peak times. Subjects in the “high” exposure treatment had more accurate knowledge and favorable attitudes toward the rate structure than subjects did in the “standard” treatment. Furthermore, individuals who received more information consumed significantly less energy. Despite these results, it is difficult to directly attribute this group’s behavior to the high level of media exposure. First, these subjects received “feedback” from researchers (i.e., a letter congratulating them on their efforts) and gifts for completing a test. Second, the impact of the rate change (e.g., savings to customers for using energy during off-peak times) was not isolated from the information alone. That is, financial savings could also provide “feedback” to customers that might affect behavior. Consequently, there is no way of determining the impact of each informational stimuli on the subjects; therefore, more systematic research is needed.

This dissertation builds on the Heberlein and Baumgartner study and addresses several of its weakness. It also looks at the impact of the three informational media on concept response in both an experimental and control group. Economic feedback (e.g., savings from implementing the innovation) are not included in this study’s design. Its greatest weakness is that it does not examine actual use or behavior, but rather focuses on attitudinal response to the concept.

Another example of an informational campaign is that of a smoking/anti-smoking advertising experiment completed by Pechmann and Raneshwar (1993) in the early 1990s. This study focused on 304 seventh graders to determine whether or not cigarette advertisements increase positive response towards smoking versus anti-smoking ads. In this study, subjects were randomly assigned to a treatment (i.e., anti-smoking written ads) or a control group (i.e., received ads unrelated to smoking). First, participants were exposed to this material. Next, they were provided with information about a teenager’s character and asked to evaluate this person on several attributes (e.g., personal appeal and common sense). Individuals in the experimental group read a description about a teenager who smokes. The control group read about a teenager who does not smoke.

According to Pechmann and Raneshwar, prior to the experiment, respondents did not think that peers who smoked were any different than peers who did not (i.e., less glamorous or mature). The participants did believe, however, that individuals who smoke have less common sense and are less appealing than those who do not smoke. After the experiment, researchers found that participants who reviewed the anti-smoking ads produced more negative smoking inferences and judged the teenager smoker as having less common sense and personal appeal. Furthermore, respondents who saw the anti-smoking versus unrelated advertisements had a slightly higher tendency to discuss negative smoker traits for a longer time than did the control group (Pechmann and Ratneshwar, 1993). These results suggest that health-related education and anti-smoking advertising can work in tandem. In conclusion, Pechmann and Raneshwar warn that anti-smoking advertising may “wear out” over time. Therefore, funds should be allocated to refresh these campaigns periodically. In the same manner, my dissertation builds on this study’s results by looking at the effects of a carsharing brochure on an experimental and control group over time. It also contrasts the response of experimental participants, who receive more information over time, to the control group who only received the brochure. Finally, it examines each of these groups’ comparative responses across the survey.

2.4.2 Use of Videos and Demonstrations in Social Learning Theory

As an alternative to written materials, Bandura (1977) emphasizes the significant impact of observed behavior (i.e., videos or live demonstrations) on others. Furthermore, Ester and Winett (1981-1982) have proposed the use of media-based “modeling” approaches to enhance social learning. These approaches incorporate Everett Rogers’ diffusion of innovation theory (Rogers and Shoemaker, 1971; Rogers, 1995). Rogers defines diffusion as a special type of communication in which innovations are spread through members of a social system (Rogers and Shoemaker, 1971). There are four key elements in the diffusion process: innovation, channels of communication, time, and social system. According to Rogers, there are five stages in the innovation adoption process, including: knowledge, persuasion, decision, implementation, and confirmation (Rogers, 1995). This theory models successive increases in the number of adopters over time. Diffusion studies are concerned with the communication of new ideas from a source to a receiver. In this framework, mass media channels are the most rapid and effective diffusion device (e.g., television media). For Rogers, however, diffusion refers to an unplanned or spontaneous communication, much of which is not applicable to this dissertation (Rogers, 1972).

In the area of energy conservation, Aroson and O’Leary (1982-1983) studied the impacts of an individual demonstrating energy conservation in a college shower room. In a demonstration, students watched a designated person turn off the shower while soaping. When the designated person was present, there was an increase in student use of this water conservation strategy (i.e., from six to 49 percent). This technique resulted in a greater behavioral adoption rate than did written signs. Ester and Winett (1981-1982) have also suggested the extension of approaches using “live” demonstrations. My dissertation builds on this conclusion by developing a drive clinic or interactive trial demonstration of participants with researchers. Rather than watching a researcher demonstrate a new behavior (i.e., how to use the smart carsharing system), the participant is taught how to use this system, which might reduce uncertainty and increase understanding of the steps involved in using such an innovation.

Winett has also examined the impact of modeling on energy conservation behaviors. In contrast to the previous examination, Winett’s studies involve a systematic replication of field experiments, which build on the previous study. Winett (1986) argues that presentation format and mode are critical in “modeling” impacts. Accordingly, videos should employ individuals similar to those in the target audience, depict them in a range of settings that display variations in the desired behavior, show constraints to the new behavior, and provide an interesting story.

In his first study, Winett *et al.* (1982) exposed townhouse and apartment residents to a 20-minute video in which a married couple demonstrated energy-saving behavior and others demonstrated wasteful use of energy. The scenes also emphasized the positive consequences (e.g., money saved) resulting from energy conservation behaviors. A second group viewed another video in which the same couple discussed energy problems, without mentioning or demonstrating conservation strategies.

In the winter, individuals exposed to the modeling video consumed about 12 percent less electricity during the five-week evaluation than those who viewed the second video and 17 percent less than the control group. These reductions were comparable to those displayed by groups receiving either daily feedback (i.e., information about their daily energy use) alone or feedback plus the modeling video. In the summer, subjects exposed to the modeling video used about 12 percent less electricity during the four-week evaluation period than they had previously. Subjects receiving feedback reduced consumption by 19 percent, while those who received feedback and watched the modeling video consumed 22 percent less electricity than they had previously.

In a second study, Winett (1983) replicated these findings, when the video was shown in participants' homes rather than during a group meeting as in the previous study. Energy consumption decreased by approximately 13 percent during the winter evaluation period. Furthermore, this effect was not increased by a second video exposure. Finally, the lack of social interaction (i.e., the videos were not viewed with a group) was not a significant factor in promoting energy conservation behavior.

In another study, Winett *et al*. (1985) extended these findings to a modeling video broadcast over a cable TV channel. Participants, prompted to watch the program, reduced electricity usage by approximately ten percent during the five-week evaluation and generally maintained these reductions in a one month post-evaluation period. Video exposure increased the group's knowledge and adoption of energy conservation behaviors depicted in the program.

Katzev and Thompson (1987) have concluded from Winett *et al.*'s extensive research that carefully designed media interventions that model conservation behaviors may have several effects:

1) leading individuals to save energy;
2) sometimes encouraging individuals to maintain the behavior
3) promoting the adoption of modeled behaviors; and
4) leading individuals to report a reduction in personal comfort due to behavioral change.

Before accepting these conclusions, Katzev and Thompson caution that a more critical review of study design is necessary. Indeed, it is important to rule out other explanations before concluding that a stimulus accounted for a study's results. Katzev and Thompson argue that Winett *et al.*'s studies do not provide consistent control conditions in each experimental study. Hence, it is difficult to compare results across the studies. Furthermore, their results could have been confounded by the extensive recruitment and follow-up methods used. For instance, throughout several studies, participants were often visited by researchers who came to their homes to collect behavioral data. These visits likely led to several participant-researcher conversations about energy-related matters. Consequently, these contacts could have further sensitized participants to energy-related issues, and in turn, promoted the observed energy reductions. Thus, it is difficult to conclude that energy reductions reported in Winett *et al.*'s studies were due to the modeling demonstrations alone and not the feedback of the researchers, for instance.

Despite extensive study in this area, much research still remains to be completed—particularly in the area of careful study design. This dissertation contributes to social learning theory by studying changes in response to an innovation due to several informational media. A limitation of this dissertation is that it does not introduce materials in varying orders to different experimental groups to assess the relative impact of each stimulus. Rather, this dissertation looks at the impact of three instruments on an experimental group over time. A further study is needed that examines the impact of various devices, presented in different orders.

SECTION 2.5 SOCIAL MARKETING THEORY

Social marketing offers the second important framework relevant to this dissertation. It is the application of concepts and techniques used in business to social behaviors. Social marketing theory has been applied to health, family planning, child care, and the environment (Kotler and Roberto, 1989; Andreasen, 1995). These techniques can also be applied to transportation, as I have done in this dissertation.

Social marketing begins with targeted customers. It focuses on understanding a target audience's needs, wants, and perceptions and is directed at creating a "social" campaign or product (e.g., anti-smoking campaigns and carsharing) (Andreasen, 1995).

"Social marketing recognizes that influencing behavior—especially behavior change—cannot come about simply by promoting the benefits of some new course of action.

Careful attention must be paid to the nature of the behavior to be promoted (the product), the ways in which it will be delivered (the place), and the costs that consumers perceive they will have to pay to undertake it (the price)" (Andreasen, 1995).

Other key features of social marketing include an emphasis on program cost effectiveness; the use of market research to design, pretest, and evaluate new programs; careful market segmentation; and a recognition of competition (e.g., traditional auto ownership and leasing are competition to carsharing).

Not surprisingly, social marketing builds upon other theoretical frameworks, including traditional education, persuasion, social influence, behavior modification, and social learning approaches by focusing on target adopters. Social marketing integrates and improves upon those other approaches by addressing many of their weaknesses and focusing on target adopters. Indeed, "[i]t often attempts to educate. It does seek to motivate individuals to act. It does introduce group pressure when appropriate and it often employs modeling and rewards to ensure the longer term success of its programs" (Andreasen, 1995, p. 13).

Each of the building block frameworks for social marketing theory is reviewed below. The traditional education approach emphasizes teaching and learning. Further, it assumes that individuals will alter their behavior if they are educated on what needs to be done and how to implement it. Andreasen (1995) points out several problems with the educational approach. First, it assumes that if beliefs can be changed, then behavioral change will result as well. Social marketing does not make this assumption; rather it focuses on making a behavioral change occur and be sustained. Second, this approach ignores the effects of social pressure. In contrast, social marketing recognizes that many individuals engage in behaviors that they are not personally interested in or perhaps are even opposed to (e.g., teenagers smoking due to peer pressure). Third, it assumes that facts will have an intended impact. In many cases, however, a campaign may have contrary effects. For instance, a breast cancer campaign, which emphasized that women with family histories of cancer had a higher risk for this disease actually discouraged women without cancer histories from conducting breast self-examinations.

The persuasion approach builds upon the educational framework. This model holds that behavioral change will only occur when an individual is sufficiently motivated. The main problem with this approach is convincing individuals to adopt this world view. In contrast, social marketing promotes a user-centered approach to behavioral change, which recognizes that a marketing campaign must begin with the customer's perceptions, needs, and wants (Andreasen, 1995).

In the social influence approach, public campaigns focus their attention on influencing targeted community groups and collective behaviors. This framework addresses the cost concerns of the behavior modification approach; yet, it has a few limitations. For instance, this framework may be effective only in the following situations: 1) social issues and norms of the targeted group are well understood; 2) pressures within the group are influential; and 3) the behavior is socially important and visible (Andreasen, 1995).

An example of an effective social influence campaign might be an anti-smoking or anti-drug campaign deployed in a secondary school.

The behavior modification framework is focused on two simple principles of learning theory: first, individuals execute behaviors because they have been learned; and second, these behaviors result in a positive outcome or reward. Until the early 1960s, a majority of psychological learning theory assumed that individuals had to execute behaviors and be rewarded to learn a new one. The main problem with this approach is that it is costly. It typically must be implemented on an individual level rather than to a targeted group of customers. “Social marketers recognize that, to have maximum social effectiveness in a world of very limited budgets, one must focus on changing groups of consumers—not individuals and not mass markets, but carefully selected segments” (Andreasen, 1995, p. 12).

In the early 1960s, Bandura and Walters (1963) contributed to learning theory when they realized that children could learn new skills by simply watching other children. From this finding, Bandura developed the social learning theory approach described earlier (Bandura, 1977).

Social marketing builds upon and employs several social learning theory principles. For instance, media (e.g., modeling videos and articles) can be used to stimulate learning by targeted groups, and modeling can help develop an individual’s sense that they can perform a new behavior. Nevertheless, the social marketing approach generally prefers in-person training (e.g., drive clinics) over media devices, such as videos and brochures. Similar to social learning theory, social marketing supports a gradual or dynamic approach to behavioral adoption of a new product, concept, or service. Individuals move through definable stages in adopting a new product (Maibach and Cotton, 1995). There are four-stages in Andreasen's social marketing behavioral adoption process: 1) precontemplation, 2) contemplation, 3) action, and 4) maintenance.

Precontemplation is the first stage in the behavioral adoption process during which a target population is introduced to the social product as a possible alternative to their current behavior. The goal of this stage is to generate awareness and interest in the target group. The appropriate tools for this phase are education and media.

In the second phase, contemplation, individuals consider adopting a social product. Individuals first consider the impacts of adopting the social product (e.g., reduced congestion time from using CarLink). This evaluation includes as assessment of the benefits and costs of adoption. Next, they consider what others (e.g., a spouse) might want them to do with respect to the new product. "Behavior change does not take place in a social vacuum. The broader society and its cultural norms and values have important roles to play, as do individual co-workers, friends, and family….Others are almost always involved, playing several roles—providing information about the potential benefits and cost of taking action, serving as role models, and bringing direct pressure to act in the desired way" (Andreasen, 1995, p. 253).

Target users typically evaluate potential satisfaction with a social product on a small subset of attributes. These attributes are important for researchers to understand, particularly in planning product development, communication, and promotion (Kotler and Roberto, 1989). In this dissertation, two household members were invited to participate due to the influence these individuals are likely to have on each other, particularly in response to the CarLink innovation. Then, they contemplate whether or not they can adopt a new behavior. Clearly, if they want to develop an effective marketing program, marketers must document potential influences, including competing alternatives, on the target market's decision to adopt a social product (Andreasen, 1995).

The third stage is action. During this phase, individuals decide whether they can actually produce the new behavior (e.g., join CarLink). Related to this decision, potential customers evaluate the role of the environment (e.g., location of the carsharing system) and other individuals (e.g., a husband or wife) in adopting the new product and/or behavior. In the CarLink market study, the longitudinal survey stopped before the beginning of the action stage. However, the subsequent CarLink field test permitted study participants (in applicable user environments) to join the program. Hence, researchers were able to document behavior during the action stage.

Finally, there is the maintenance phase. This is a key stage because marketers can help consumers conclude that adopting a social product was the right decision (i.e., cognitive dissonance or anxiety that the right choice was made). Marketers should pay close attention to rewards that follow from a new behavior. Essentially, individuals tend to repeat behaviors that are rewarding. "Here, many of the principles of learning theory are especially relevant. Individuals need to be rewarded for what they do—their behavior must be reinforced. Further, they need to be helped to resolve the cognitive dissonance they go through when they undertake something that they once were uncertain was a good idea. Social marketers must work effectively on both mechanisms if their programs are to have permanent influence" (Andreasen, 1995, p. 169).

Although case studies of social marketing have been widely documented (e.g., Fox and Kotler, 1980; Kotler and Roberto, 1989; Andreasen, 1995), there is a paucity of experimental research published on this topic. I found few studies that incorporate experimental design methodologies to test the impacts of social marketing campaigns (Winett *et al.*, 1982; Aronson and O'Leary, 1982-1983; Winett *et al.*, 1983; Winett *et al.*, 1985; Lefebvre and Flora, 1988; Pechmann and Ratneshwar, 1993). Very few have been conducted since the mid-1980s. In addition, only a few of these studies actually looked at the social marketing stages of action and maintenance. Although this dissertation does not provide a "full" social marketing framework evaluation either, it does contribute to this body of research by addressing Andreasen's first two stages of behavioral change. Moreover, the follow-on CarLink field test will aid me in further exploring the third and fourth stages of this model.

SECTION 2.6 INTEGRATION OF SOCIAL MARKETING, SOCIAL LEARNING, AND ACTIVITY ANALYSIS THEORY AND METHODS

In this dissertation, I synthesize social marketing, social learning, and activity analysis theories and methods. I integrate these approaches to develop and employ new survey methods for exploring dynamics in response to a transportation innovation over time.

My research evaluates the behavioral response of households to a new intermodal transportation service, as they learn about the innovation through different instruments (i.e., a brochure, video, and drive clinic). Due to these refinements, my dissertation is unique from all earlier station car and carsharing experimental research.

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CHAPTER THREE: CARSHARING AND NEW MOBILITY: AN INTERNATIONAL PERSPECTIVE

SECTION 3.0 INTRODUCTION

The vast majority of automobile trips in U.S. metropolitan regions are drive-alone car trips. In 1990, approximately 90 percent of work trips and 58 percent of nonwork trips in the United States were made by vehicles with only one occupant (Steininger *et al.*, 1996; Glotz-Richter, 1997). Vehicles are unused an average of 23 hours per day. This form of transportation is expensive and requires large amounts of land.

The universal appeal of private vehicles is demonstrated by rapid motorization rates, even in countries with high fuel prices, good transit systems, and relatively compact land development. But the environmental, resource, and social costs of widespread car use are also high. One strategy for retaining the benefits of car use while limiting costs is to create institutions for sharing vehicles.

The principle of carsharing is simple: Individuals gain the benefits of private car use without the costs and responsibilities of ownership. Instead of owning one or more vehicles, a household accesses a fleet of shared-use vehicles on an as-needed basis. Carsharing may be thought of as organized short-term car rental. Individuals gain access to vehicles by joining organizations that maintain a fleet of cars and light trucks in a network of locations. Generally, participants pay a usage fee each time they use a vehicle.

Carsharing provides the potential to reduce the costs of vehicle travel for the individual as well as for society. When a person owns a car, much of the cost of owning and operating the vehicle is fixed. The variable cost of using the owned vehicle is relatively low, and thus the driver has an incentive to drive more than is economically rational. In contrast, payments by carsharing participants are closely tied to actual vehicle usage. A carsharing system in effect transforms the fixed costs of vehicle ownership into variable costs.

Carsharing is most effective and attractive when seen as a transportation mode that fills the gap between transit and private cars, and can be linked to other transportation modes and services. For long distances, one might use a household vehicle, air transport, rail or bus, or a rental car; and for short distances, one might walk, bicycle, or use a taxi. But for intermediate travel, even routine activities, one might use a shared vehicle. The shared-car option provides other customer attractions: It can also serve as mobility insurance in emergencies, and as a means of satisfying occasional vehicle needs and desires such as carrying goods, pleasure driving in a sports car, or taking the family on a trip.

Over the past decade, carsharing has become more common, especially in Europe and North America. Mostly it involves the shared usage of a few vehicles by a group of individuals. Vehicles typically are deployed in a lot located in a neighborhood, a worksite, or at a transit station. A majority of existing carsharing programs and businesses still manage their services and operations manually. Users place a vehicle reservation in advance with a human operator, obtain their vehicle key through a self-service, manually controlled key box, and record their own mileage and usage data on forms that are stored in the vehicles, key box, or both. As carsharing programs expand beyond 100 vehicles, manually operated systems become expensive and inconvenient, subject to mistakes in reservations, access and billing, and vulnerable to vandalism and theft.

Automated reservations, key management, and billing constitute one response to these problems. The larger European carsharing organizations (CSOs), especially in Germany and Switzerland, have started to deploy a suite of automatic technologies that facilitate the operation and management of services, offer greater convenience and flexibility for users, and provide additional security for vehicles and key management systems. In northern California, a “smart” carsharing demonstration program, called CarLink, with 12 compressed natural gas Honda Civics, began testing and evaluating a variety of state-of-the-art advanced communication and reservation technologies in January 1998 (Shaheen *et al.*, 1998). A second smart field test, known as Intellishare, was launched in March 1999 in southern California with 15 Honda EV Plus electric vehicles, smart cards, and on-board computer technologies. The shared vehicles are available for day use by faculty, staff, and students at the University of California, Riverside campus.

Smart carsharing makes intermodalism more viable, thereby creating the potential for even greater benefits. For example, on returning from work at the end of a day, a traveler rents a shared-use vehicle at a transit station (or other rental site) close to home. She then has unlimited use of the vehicle, should she wish, until she returns it to the station in the morning. After riding the train to the station nearest her office, she “rents” another vehicle to complete her commute. During the day, rather than sitting idle, that car is used as a fleet vehicle by her organization. Altogether, a shared-use vehicle could be used for up to ten distinct trips per day, plus facilitate up to four additional transit trips.

SECTION 3.1 HISTORY OF CARSHARING IN EUROPE

Most carsharing efforts remain small scale and concentrated in Europe. One of the earliest European experiences with carsharing can be traced to a cooperative, known as “Sefage” (Selbstfahrergemeinschaft), which originated in Zurich, Switzerland, in 1948 (Harms and Truffer, 1998). Membership in “Sefage” was primarily motivated by economics. It attracted individuals who could not afford to purchase a car but who found sharing one appealing. Elsewhere, a series of “public car” experiments were attempted, but failed, including a carsharing initiative known as “Procotip,” which began in Montpellier, France, in 1971, and another, called “Witkar,” which was deployed in Amsterdam in 1973 (Doherty et al., 1987; Muheim and Partner, 1996).

In 1983, “Vivalla bil” began in Oerebro, Sweden, as a transportation research experiment. Its members decided to cease operations in the summer of 1998, when the organization’s chairperson resigned and several households decided to leave at the same time. Vivalla bil was a relatively small organization with 35 households sharing five cars. Although small, it inspired all of the existing Swedish carsharing organizations, including “Majornas Bilkooperative,” which now is the oldest and largest CSO in Sweden. This organization has 180 households, 14 vehicles, and a 30 percent annual growth rate.

Even more successful experiences with carsharing began in Europe in the late 1980s (Steininger et al., 1996; Glotz-Richter, 1997). Approximately 200 CSOs are active in 450 cities throughout Switzerland, Germany, Austria, the Netherlands, Denmark, Sweden, Norway, Great Britain, and Italy. These carsharing countries collectively claim over 130,000 participants. The European Car Sharing Association, established in 1991 to support carsharing lobbying activities, reports a membership of 70 CSOs (ECS, 1997). In June 1998, the German carsharing association (formerly BOA—Bundesverband fur organisiertes Autoteilen, which means organization for organized carsharing) merged with ECS to form the new German carsharing association, known as BCS—Bundesverband Car Sharing. Most BCS member organizations also belong to ECS.

Until a few years ago, virtually all CSO start-ups were subsidized with public funding (with a few supported by corporate subsidies). Although many organizations received start-up grants, typically operational costs were not subsidized in European CSOs.
The two oldest and largest carsharing organizations are Mobility CarSharing Switzerland, with 1,200 cars (as of mid-1999) and Stadtauto Drive (formerly StattAuto Berlin) with about 300 cars. The Swiss program, begun in 1987, now operates in 800 locations in over 300 communities, with over 27,000 members. Stadtauto Drive, begun in 1988, now has approximately 7,000 members; their current membership size reflects the 1998 merger of StattAuto Berlin and Hamburg (Euronet and ICLEI, 1996).

Though founded only one year apart, these two organizations evolved independently and quite differently. Mobility CarSharing Switzerland (a May 1997 merger of Auto Teilet

Genossenschaft (ATG) and ShareCom) sprang from a grassroots effort to spread carsharing throughout neighborhoods and transit stations in Switzerland. In contrast, Stadtauto Drive was launched as a university research project to demonstrate that carsharing could offer a viable transportation alternative for Germany. These two organizations are recognized worldwide as modern pioneers of carsharing. Both grew about 50 percent per year until 1996 (Lightfoot, 1997). Mobility CarSharing Switzerland continues to grow about 25 percent per year, while Stadtauto Drive's growth rate has slowed more considerably (Harms and Truffer, 1998).

Stadtauto Drive attributes three reasons for this stagnation (Harms and Truffer, 1998):

1. Many members have moved out of the inner city to the countryside where public transit is limited. This has forced many individuals to purchase private cars because they can no longer easily access carsharing vehicles and transit.

2. Others often realize after joining the CSO that they only require a shared car on rare occasions. Many in this group drop out because the yearly CSO membership fees do not justify occasional usage. At present, Stadtauto Drive members have two fee options: They can pay 192 marks (DM) per year or avoid this annual fee by paying a one-time initiation fee and higher usage rates based on mileage. If an individual's vehicle use is less than 200 marks (or $120) a year, this individual will typically drop out of the organization and use traditional auto rentals to fulfill their occasional vehicle needs.

3. Finally, other members require vehicles so often for tripmaking that the effort to reserve shared-use cars becomes too great a burden. Often these individuals leave the CSO because they prefer dedicated private vehicles over carsharing.

For the first group of individuals—those who move to the country—no solution has been found. To regain their former clients and attract new ones, Stadtauto Drive has started some new initiatives, which are described in the section "Innovating Through a CSO Lifecycle."

Both Stadtauto Drive and Mobility are preparing to enter a modernization phase, moving from manual "key box" operations to a system of smart card technologies for making automatic and advanced reservations, accessing vehicle keys, securing vehicles from theft, and facilitating billing. The shift to smart cards simplifies vehicle access for customers and eases the administration and management of large systems. However, the large investment required for the new communication and reservation technologies puts pressure on these organizations to continue expanding to generate revenue to pay off these investments.

A few smart shared-use vehicle tests have already been implemented in Europe. Lufthansa Airlines instituted an automatic rental system at the Munich and Frankfurt airports in 1993, in which a computer releases a key and starts the billing. After the car is returned, the vehicle communicates distance traveled and fuel consumed to a central computer system. By the end of 1994, 12,000 employees at the two German airports had access to this "carpool" system. Lufthansa reportedly has saved over $20 million in avoided parking infrastructure costs (Morias, 1994). These cost savings have been used as a justification for corporate subsidies of the program. As of 1999, the system is being integrated with smart cards and coordinated with local transit operators (BMBF, 1998). A similar program, called "CarShare," was introduced in 1993 by Swissair at the Zurich airport for flight attendants. It is technologically simpler and works in collaboration with Hertz Rent-a-Car (Wagner, 1997).

In October 1997, the French "Praxitele" program began operation with 50 Renault electric vehicles that were rented and driven between 15 "Praxiparcs" located near transit stations and employment centers (Massot *et al.*, 1999; Parent, 1999). After nearly two years in operation, the program ended in June 1999 due to high costs and lowered demand. A new Praxitele operation is being considered, possibly in the city of Paris with 2,000 vehicles. Furthermore, there are future plans for a carsharing project in La Rochelle, France, with 106 Peugeot electric vehicles.

In October 1997, Volkswagen launched a smart carsharing program in Germany. Their aim is to reduce the number of cars on Europe's roads, reduce car-use costs, and maximize vehicle usage. At present, they are developing automatic information systems that enable car drivers to quickly and easily transfer to public transportation, particularly when roads are congested. Volkswagen is currently running two carsharing projects. The first is operated in an apartment complex, which shares several vehicles that are located outside the building. The second program, a commercial organization shares a range of vehicles. In both cases, a small user fee is collected and an automatic booking system, COCOS—developed by INVERS in Siegen, Germany—is employed. Participants have rated this service highly. Volkswagen believes that the carsharing market will grow at a rate of 50 percent per year for a potential market of 2.45 million shared-use vehicles in Europe within the next ten years.

Along with the few success stories are many failures. Most organizations have found it difficult to make the transition from grassroots, neighborhood-based programs into viable business ventures. They miscalculate the number of vehicles needed, place too great an emphasis on advanced technology, or expend funds for marketing with little return. Many of the failed organizations have merged or been acquired by larger European CSOs.

SECTION 3.2 RECENT STUDY RESULTS FROM EUROPE

Recently, a two-year project, known as Pay-As-You-Drive Carsharing (PAYDC), was completed to explore shared use as an alternative transportation mode in Ireland, the United Kingdom, and the Netherlands. As part of this program, several pilot projects were planned and implemented. These projects operated between six months to one year and were completed in May 1998. One pilot program was deployed in each region. CampusCar, which was implemented at Cranfield University in England, studied a campus application of carsharing. CarSharing Delft in the Netherlands aimed at strengthening the design of private carsharing models. Private carsharing involves one or more individuals who share a car that is either owned by one individual or all of the participants collectively. This project focused mainly on private household carsharing, rather than commercial enterprises, because of the limited knowledge regarding this model in the Netherlands. Finally, Co-op Car in Ireland focused on a station car application of carsharing. These pilot projects provided brief, yet notable experience from which all three regions have benefited.

A final project component included development of a business plan for a start-up organization in Edinburgh, called Edinburgh City Car Club. City Car Club will likely be the most advanced carsharing system in Europe, using on-board computers and GPS technologies for authorizing use, data collection, and vehicle security. City Car Club hopes to have up to 100 vehicles in its fleet, supplied by Budget Rent-a-Car, by the end of its first year. A full operational launch, with an initial fleet of five cars, was deployed in March 1999. As of June 30, 1999, City Car Club had approximately 50 members.

SECTION 3.3 CARSHARING AND STATION CARS IN NORTH AMERICA

Today, there are nine existing carsharing organizations in North America. They share a similar operational model. Members access vehicles at a neighborhood lot located a short walking distance from their home or work site, and they make carsharing reservations over the phone. One organization has recently implemented an automated reservation system based on a computerized, touch-tone reservation system. At present, none of these CSOs use smart technologies to facilitate reservations, operations, and key management. Four of them are run as for-profit businesses, and the rest are run as nonprofit cooperatives. Recently, developments have been initiated to found the North American

Car Sharing Association. See Table 3.1 (below) for a summary of the existing North American Carsharing Organizations.

Table 3.1: Summary of Existing North American CSOs

Name	Location	Start Date	Size	Business Strategy
Auto-Com	Quebec City, Canada	August 1997	450 Members 34 Vehicles	Profit
CommunAuto, Inc.	Montreal, Canada	September 1995	550 Members 32 Vehicles	For Profit
Cooperative Auto Network	Vancouver, Canada	January 1997	385 Members 21 Vehicles	Non Profit
Victoria CarShare	Victoria, Canada	February 1997	70 Members 5 Vehicles	Non Profit
AutoShare-Car Sharing Network, Inc.	Toronto, Canada	October 1998	120 Members 8 Vehicles	Profit
Boulder CarShare Cooperative	Boulder, Colorado	May 1997	8 Members 1 Vehicle	Non Profit
Dancing Rabbit Vehicle Cooperative (DRVC)	Rutledge, Missouri	July 1997	15 Members 3 Vehicles	Non Profit
CarSharing Portland, Inc.	Portland, Oregon	February 1998	185 Members 11 Vehicles	Profit
Olympia Car Coop	Olympia, Washington	March 1998	6 Members 1 Vehicle	Non Profit

Five of the nine North American CSOs are located in Canada. The first and oldest is Auto-Com, located in Quebec City. Auto-Com, which began operations in August 1994, currently has 450 members and 34 cars. Interestingly, this organization began as a nonprofit cooperative, but changed to a for-profit business in 1997. In September 1995, the same group launched a second CSO in Montreal, CommunAuto, Inc. Currently, CommunAuto has over 550 members and 32 cars. CommunAuto was founded as a for-profit business, rather than as a non-profit cooperative.

Less than two years later, two new Canadian CSOs emerged. In January 1997, the Cooperative Auto Network (CAN) began offering carsharing services in British Columbia. At present, CAN has 385 members and 21 vehicles. This CSO operates as a nonprofit cooperative. In February 1997, Victoria Car-Share Co-Op launched its operations in Victoria. This nonprofit cooperative currently has 70 members and five vehicles.

In October 1998, AutoShare–Car Sharing Network, Incorporated began its operations with three cars in downtown Toronto. During its first month of operation, 40 members joined, which is actually 15 members more than the CSO's initial projections. Currently, AutoShare has eight vehicles and more than 120 members. Finally, six additional regions are developing carsharing plans in Calgary, Edmonton, Guelph, Kingston, Kitchener, and Ottawa.

Four carsharing organizations, all two years old or less, operate in the United States. Another two are being planned in the Pacific Northwest, a third in San Francisco, and a fourth in Chicago. Boulder CarShare Cooperative was launched in Boulder, Colorado, in May 1997. The Boulder CSO has eight members who share one vehicle. Members pay a modest monthly fee and mileage charges for vehicle use. This CSO also provides assistance to other neighborhood groups interested in forming a car co-op.

Dancing Rabbit Vehicle Cooperative (DRVC), located in Rutledge, Missouri, has been in operation since July 1997. This CSO currently has 15 members, three biodiesel vehicles, and supplies an average of 370 vehicle miles travel per week to its members. DRVC operates under a nonprofit, cooperative business structure.

The Oregon Department of Environmental Quality and the U.S. Environmental Protection Agency funded a one-year carsharing pilot project in Portland, Oregon, that began operation in February 1998 with two Dodge Neons. Currently, CarSharing Portland, Inc. has 185 individual members, 11 vehicles, and nine locations, and operates as a for-profit business (with government start-up subsidies). The fourth U.S. CSO, Olympia Car Coop, located in Olympia, Washington, has been in operation as a nonprofit cooperative since March 1998. Olympia has six members and one car. This operation guarantees members use at least two weekend days per month and unlimited weekday usage. Olympia currently does not have an hourly charge nor a per mile fee. Members pay an initial and annual membership fee.

A fifth CSO, Motor Pool Co-Op, is planned to be launched in the near future in Corvallis, Oregon. Motor Pool will begin its program with nine members and will be run as a nonprofit cooperative. In December 1999, the city of Seattle, King County Metro, and University of Washington plan to begin carsharing in Seattle in four high-density neighborhoods, launching the program with five to ten vehicles. Based on a contract with the City and Metro, Mobility Inc. will operate the carsharing service with the goal of deploying 100 vehicles and enrolling 1,500 subscribers by the end of its first year. By the end of the second year, more than 200 vehicles are planned to serve residents and employees—the first target groups.

In part, funding for this project has been secured due to the strong interest of Seattle's mayor, the King County executive, and several council members. The Seattle organizers hope to cultivate this project into a profitable private-sector venture sometime during the second year of operation. Additional partners (car rental, taxi, etc.) will also provide their services in conjunction with Mobility Inc. as part of a mobility package.

In San Francisco, a group of environmental organizations, planners, and transportation researchers, have formed a public-private partnership called City CarShare, which consists of public agencies and nonprofit organizations. City CarShare began seeking funds in late 1997. They hope to begin a three-year pilot operation in the fall of 1999, with 50 members and a minimum of eight cars, with the goal of reaching 100 vehicles by the project's end. City CarShare, a nonprofit organization, plans to locate vehicles in dense, transit-rich neighborhoods within San Francisco, and will move into outlying city neighborhoods as membership grows.

In Chicago, a project called "ShareCarGo!" is projected to begin operation in 2000, with a fleet of approximately 12 to 14 vehicles. ShareCarGo! hopes to service its anticipated membership of 100 people with five to six sites around the city.

Better funded efforts to launch carsharing programs in the United States have their roots in "station cars." These are vehicles deployed at passenger rail stations in metropolitan areas and made available to rail commuters. Station car demonstrations are at various stages of planning, funding, and implementation across the country. Station car vehicles are made available either near the home or work end of a transit commute. The largest was the Bay Area Rapid Transit (BART) station car demonstration program in the San Francisco area, with nearly 50 electric vehicles, including 40 PIVCO City Bees from Norway; two Toyota RAV-4s; and five Kewets from Denmark (Bernard and Collins, 1998). This project ended successfully in the spring of 1998. Several activities are now underway to launch follow-up station car projects in the San Francisco Bay Area, including CarLink.

Several station car programs were launched in the mid 1990s by rail transit operators seeking to relieve parking shortages at stations (and desiring to avoid the high cost of building more parking infrastructure), by electric utilities eyeing a potential initial market for battery-powered electric vehicles, and by air quality regulators seeking to reduce vehicle usage and pollution. Most of these programs have struggled with the high cost and low reliability of first-generation electric cars. While shared use is the goal, as of late-1999 none has yet incorporated shared-use practices (Bernard and Nerenberg, 1998). In January 1999, BART released a proposal seeking a for-profit "shared-vehicle" program with at least 25 cars each at four suburban BART stations. Hertz submitted a proposal in May 1999. Launch of this program is planned for early 2000.

SECTION 3.4 RECENT DEVELOPMENTS IN ASIA

Since 1997, there have been increasing developments in carsharing in Singapore and Japan by two auto manufacturers. In August 1997, NTUC INCOME Car Co-operative Limited (Car Co-op) launched its first test of a carsharing system, using an electronic key box and on-board computers, at the Toh Yi estate in Upper Bukit Timah, Singapore. Within the first few weeks of the launch, over 150 people registered to join, although the Co-op could only accept 80 members. The residents of the estate now share four Mitsubishi Lancers. The Car Co-op is being extended to private homeowners. Residents of Villa Marina and Rivervale will automatically become members of the Car Co-op and have access to a fleet of cars, including a Mercedes-Benz limousine and several multi-purpose vehicles. There will be one car for every 40 residents. The developers of the two condominiums will each pay approximately $100,000 towards this operation during the first three years of the program. Members will not pay membership fees during the first years, but they will pay for usage. For example, it will cost $20 per hour to book the limousine. Carsharing lots will be located near public transit stations, so users can rent vehicles at the end of a transit trip. The estates will provide shuttle services to the transit stations.

In October 1997, Honda Motor Company announced its version of carsharing, known as the Intelligent Community Vehicle System (ICVS), which is being tested at their Twin Ring Motegi site in Japan. The ICVS site is comprised of multiple lots from which four different types of electric-powered vehicles can be selected for use—the City Pal, Step Deck, Mon Pal, and Racoon. The vehicles are designed for medium-range, high-speed transportation to minimal-range residential transportation. In the future, ICVS could be used in conjunction with an individual's private vehicle and public transportation to relieve traffic congestion and parking problems. The advanced technologies used in this system allow its users to rent a vehicle at any ICVS lot using their smart cards. These same cards are used to unlock and start the vehicle, thereby eliminating the need for a vehicle key. User fees are calculated automatically and members may have their fees automatically deducted from their bank account. The lots and vehicles are equipped with technologies, including GPS, that allow the ICVS management center to monitor vehicle location in real time. Further, the vehicles are outfitted with platooning technologies that allow a system worker, driving the first vehicle, to lead up to four unmanned, cued vehicles to another port. These same vehicles have an autodriving feature—guided by magnetic nails, induction cables, and ultrasonic sensors—that allows them to enter and leave a port unmanned. Finally, the vehicles are equipped with an autocharging system that instructs the vehicles to dock at a charging terminal when batteries are low.

In May 1999, three hundred Toyota employees began a one-year experiment of a smart carsharing system, called "Crayon." This system employs a suite of advanced electronics, including smart cards; a reservation, location, and recharging management system; automatic vehicle location; a vehicle information and communications system; and a fleet of 35 small electric E-com cars (with plans to increase to 50 cars). Employees, working at Toyota headquarters in central Japan and at the Motomachi Heliport, Hirose Plant, are reserving vehicles and driving them between home and work sites. Eight parking sites will provide charging facilities (with six locations at Toyota headquarters and two at the

Hirose Plant). Employees may also charge the vehicles at their homes using a household 110-volt current. Toyota plans to monitor usage and recharging behavior (Toyota, 1999).

SECTION 3.5 INNOVATING THROUGH A CSO LIFECYCLE

To date, all noncorporate carsharing organizations have begun as small local operations, usually with government funding and inspired by ideological concerns about car dependence and the negative impacts of cars on urban settlements. Based on a study tour and literature review of carsharing in Europe, Lightfoot found that people seeking unique and less expensive ways of owning and employing cars indeed were the core constituents of pilot carsharing projects in the Netherlands, the United Kingdom, and Ireland (Lightfoot, 1997). Given their strong local ideological roots, he concluded that new start-up CSOs are more likely to succeed if they remain at a self-organizing local level as long as possible. Recent history has shown that it is difficult to transform a small grassroots CSO into an economically viable business.

Large successful European CSOs are developing a range of new services. CSO pioneers are exploring a variety of new services and technologies, including partnerships with transit, car-leasing programs, car rental agencies, and taxis. This partnering process includes business and marketing collaborations and/or use of advanced information and communication technologies (Wagner and Shaheen, 1998). Existing examples are described below.

3.5.1 Autodate (Netherlands)

Autodate, founded in 1995, is an umbrella organization that serves 90,000 CSO participants in the Netherlands. In addition to supplying conventional information and marketing functions, Autodate also provides the following services (Harms and Truffer, 1998):

1) Facilitates linkages between private carsharing services and other businesses (e.g., taxi companies and car rental agencies).
2) Links carsharing providers to private companies interested in sharing their fleet vehicles.
3) Promotes the use of shared-vehicle management in land development (e.g., establishment of carsharing in new residential areas).

Autodate is financed entirely by the Dutch Ministry of Transport, but expects other governmental agencies and private businesses to assume an expanding share of the budget (Harms and Truffer, 1998).

3.5.2 EASYDRIVE (Austria)

EASYDRIVE, a for-profit organization in Austria, was founded in August 1997. The Denzel Group, a large automotive sales company, runs EASYDRIVE. The Denzel Group rents the CSO's 85 vehicles from Europcar, a division of Denzel. Every six months, Europcar replaces the EASYDRIVE vehicles with new ones. At present, EASYDRIVE has 70 stations and 1,050 members. In 1999, EASYDRIVE plans to expand its fleet to 200 vehicles, equipped with on-board computers.

EASYDRIVE has several innovative partnerships that facilitate management and attract new members. Partners include Europcar, Wien Municipal Public Transport, OeBB (Austrian Rail), and OeAMTC (an Austrian Car Club with over two million members). OeAMTC acts as a mobility provider, not just a car club, by advertising for EASYDRIVE, providing information about carsharing, and taking EASYDRIVE reservations. EASYDRIVE is also exploring partnerships with developers to establish carsharing lots in new housing communities. Finally, in cooperation with the Austrian Ministry of the Environment, EASYDRIVE has planned the project "Sun&Ride" to encourage car-free tourism, providing tourists with easy access to electric vehicle rentals.

3.5.3 MobiCenter (Germany)

The MobiCenter, operated by Wuppertal AG (WSW), encourages public access to all types of transportation and mobility services, including: information on public transportation (e.g., timetables, fares, park and ride schemes, carsharing, carpooling, car rental, bike and ride, etc.); ticket sales (i.e., local and long distance); seat reservations on German railways; car rental reservations; carsharing; delivery services; and advice/consultation on trip planning.

In its first year (beginning March 1995), MobiCenter averaged about 6,000 customer contacts per month. Two-thirds were questions about timetables, and one-third was about fares and tickets. This organization's goal is to create a central point for mobility information, operated by a large-city public transportation provider.

3.5.4 Mobility CarSharing Switzerland

Mobility CarSharing Switzerland recently deployed two new mobility service programs. The first, Zuri Mobil, is a successful mobility package that is based on a regional public transit offer that also includes carsharing and car rental. The second, Zuger Pass Plus (ZPP), provides a discounted combination of carsharing, public transit, car rental, taxi, bicycle, and other nontransport related services for its customers (similar to a frequent flyer program). ZPP is a partnership of several transportation providers and other businesses. On September 1, 1998, a third partnership was launched with the Swiss National Rail System (SBB), offering a mobility package to 1.5 million SBB passholders (approximately 35 percent of the country's adult population). This package provides users with special discounts and easy smart-card access to carsharing vehicles, rental cars, and transit (Wagner and Schmeck, 1998). Starting as a pilot project in 2001, EASY-RIDE will encompass most Swiss transportation activities, including rail, bus, taxi, carsharing, and car rental by 2005. EASY-RIDE will make all services accessible by smart card. This will simplify ticketing and marketing and open new options for intermodal tripmaking. Almost every public transportation company in Switzerland is a partner in a carsharing mobility package. In the future, this relationship is likely to grow even stronger.

Although partnerships with public transportation agencies are a very successful mobility strategy, partnerships should ideally be based on a broader set of partners (e.g., employment centers, car rental, auto companies, car dealers, gas stations, and auto clubs). New target groups for carsharing can be found in many areas. For instance, mobility packages can be designed in collaboration with auto manufacturers to meet the needs of intense car users. Mercedes-Benz's "Smart," a small two-seater, combustion engine vehicle, is a complementary vehicle to carsharing and intermodal trips (i.e., it's easy to park). When an individual buys a "Smart" in Switzerland, they can also purchase a mobility package (a value of $400) for just $50 per year. This package includes free access to all carsharing vehicles—with no membership fees—at a slightly higher hourly rate and the same mileage rate paid by carsharing members. This package also includes a half-price pass for the Swiss transportation system. This allows the passholder to purchase train and bus tickets for half price throughout the year. In this partnership, "Smart" fits smoothly into a new consumer-oriented mobility package that provides individuals and households with an expanded set of mobility options.

3.5.5 Sixt AG (Germany)

Sixt AG is a car rental company that began in Germany in 1912. They have expanded their scope beyond traditional car rental and created a new service called Car Express. With Car Express, authorized users can rent vehicles from self-service stations at any time of the day or week. Stations exist in Berlin, Munich, Dusseldorf, and Vienna. This new service has made carsharing very simple and convenient to use and is designed to appeal to individuals who might perceive themselves as a car renter, but not a carsharing participant. Because Car Express is part of a larger car rental company, it is unlikely that it will partner with more conventional carsharing organizations.

3.5.6 Stadtauto Drive and CHOICE (Germany)

Stadtauto Drive, with more than 7,000 members in Berlin and Hamburg, is Germany's largest CSO. Stadtauto Drive itself is collaborating with the company of Highly Organized and Integrated City traffic Elements (CHOICE), which has three equal partners: Stadtauto Drive, Volkswagen/Audi and the Center for Social Research Berlin. CHOICE leases vehicles to clients. With CHOICE, a customer has the option of making the leased vehicle, or “Cash Car,” available for CSO use when he or she is out of town. This transaction, based on fixed rates with a supplemental bonus reflecting supply and demand, can reduce the cost of the lease depending on the time the vehicle is loaned back to CHOICE. If the vehicle is returned one-third of the time, the leasing rate is reduced about one-third the amount. CHOICE cars augment Stadtauto Drive’s carsharing fleet most often for weekend or holiday use. Currently, CHOICE has 100 customers.

Another innovation of Stadtauto Drive is its Mobil Card, which carsharing customers can use for accessing an expanded set of services and discounts. This smart card provides a 15 percent cost reduction on public transportation, allows users to take taxis without exchanging cash, pay for food and beverage home delivery, reserve a bicycle, and even book a canoe in Brandenburg, Germany. In early 1998, Mobil Cards could be used at 46 Stadtauto Drive locations throughout Berlin and Potsdam. Beginning in 1995, Stadtauto Drive also began offering its members a food and beverage delivery service called

"Stattkauf." For a moderate fee, members can receive a Stattkauf delivery once a week (Moll, 1996).

Stadtauto Drive, like Mobility CarSharing Switzerland, is also partnering with major car rental companies and CHOICE to provide vehicles to CSO members when it is more economical to rent a vehicle (i.e., when rental periods are greater than two days) or when carsharing demand is at a peak (Petersen, 1998).

3.5.7 StadtAuto Bremen

Another German CSO, StadtAuto Bremen, which now has 1,700 carsharing members and 80 vehicles, launched a transit pass program in June 1998, that links the city's transit pass to the CSO's smart auto card. Members who purchase the "Bremer Karte," which is valid for one year, pay an initial fee of 30 Euro, and pay only for actual costs based on kilometers driven, use, and type of car. An additional innovation of StadtAuto Bremen is its on-board computer systems located in each vehicle (Glotz-Richter, 1998).

SECTION 3.6 USER CHARACTERISTICS AND MARKET POTENTIAL

It is difficult to estimate demand for new technologies and new attributes when customers have no experience with those products and attributes (Kurani *et al.*, 1996). Determining the demand for shared cars is especially difficult because it implies some reorganization of a household's travel patterns and lifestyle. How much inconvenience are people willing to accept in return for less cost? Some market studies on this subject have been conducted in the United States, but they are too tentative to be indicative (Cervero *et al.*, 1994; Cervero *et al.*, 1996). More sophisticated studies are underway at the University of California, Davis, and in Switzerland (Muheim and Partner, 1998; Shaheen *et al.*, 1998).

Several surveys of users have been conducted in Europe and North America by carsharing organizations. Although most of the surveys have small samples, did not use control groups nor travel diaries to collect travel data, and employed simple questionnaires, they do provide useful insights. A survey in Switzerland and Germany found that users were between 25 to 40 years of age with above-average education, were more likely to be male, earned a below-average income (in part due to the low average age of participants), and were sensitive to environmental and traffic problems (Muheim and Partner, 1996). In a separate study, Stadtauto Drive reported similar characteristics: 65 percent male; average age of 33; well educated; and modest incomes (U.S. $2,000 per month) (Muheim and Partner, 1996). Muheim and Partner (1996) reported that men have a greater tendency than women to demand a larger, more diverse fleet of vehicles for a wide range of trip purposes (Hauke, 1993).

In a German survey, Baum and Pesch (1994) explored motivations to participate in a carsharing service. Cost was not considered and multiple answers were possible. Figure 3.1 (below) presents the response to this survey. In Portland, the top two reasons for joining carsharing include the need for an additional vehicle and financial savings.

Figure 3.1: Reasons to Participate in Carsharing

Service Feature	Rating Service Feature Highly
Convenient neighborhood locations (i.e., a short distance to access vehicles)	71.2 %
High probability of vehicle availability	44.7
Low usage tariffs	30.3
Safe and reliable automobiles	28.2
Flexible booking options	22.6
Car-sharing stations available in other cities	< 10
Reduced capital investment (i.e., fixed car costs)	< 10
Low membership fees (e.g., monthly and annual dues)	< 10
Access to mid- and high-priced automobiles	< 10
Well-maintained vehicles	< 10
Mobility information services	< 10

Source: *Baum and Pesch,* 1994, cited in *Muheim and Partner,* 1996

In another European study, Lightfoot (in collaboration with Wagner and Muheim) surveyed individuals who have not participated in carsharing in Europe (Lightfoot, 1997). He found that the principal reasons for not participating were the unprofessional image of many CSOs, an insufficient variety of products and services, higher costs than transit, a system that was "complicated, impractical and time consuming," and vehicles not readily available near home.

Mobility CarSharing Switzerland foresees a large suburban market in Switzerland. They believe that they can capture 12 percent of drivers, many of them in semirural areas. In contrast, Baum and Pesch characterize carsharing as a predominantly urban phenomenon in Germany (Muheim and Partner, 1998; Shaheen *et al.*, 1998). They estimate a potential market of three percent of the population (approximately 2.45 million people).

Based on a more recent review of the carsharing literature, Lightfoot also characterizes commercial carsharing as an urban phenomenon, with significant participation by individuals between 25 to 40 years of age (Lightfoot, 1997). Lightfoot concludes that "rural" carsharing approaches are more informal and cooperative. Located in small, dispersed communities, they tend to attract higher female participation and are often used to substitute for the purchase of a second household vehicle.

3.6.1 Economics of Carsharing

The model CSO is one in which the vehicles are used intensively by customers who drive infrequently. The CSO needs high utilization to keep per-use costs low, but CSOs are economically attractive only to those who are not intensive vehicle users.

Unfortunately, it is difficult to evaluate the economics of existing CSOs to determine their success. Economic data are sparse and not well documented due to the proprietary nature of much of these data, the casual organization of many CSOs, and their relative youth. Since virtually all CSO start-ups were subsidized until recently (many still are), and many have failed or been acquired, an economic analysis is not straightforward. The economic data and findings for users and operators reported here help to parameterize the attributes of a typical CSO in Europe. These numbers should be considered indicative, not definitive.

The largest CSOs, aiming for a balance between high vehicle utilization and high customer convenience (in terms of proximity and availability), claim that they can guarantee their customers over 95 percent vehicle availability. They accomplish this level of availability by providing about one car for every 15-20 members (Muheim and Partner, 1996; Lightfoot, 1997). Based on a study of the moderately large Dortmund CSO (called "Stadtmobil") in Germany, Lightfoot found that a clustering strategy of three vehicles per location provides optimal vehicle availability and easy physical access (Lightfoot, 1997). Optimal is defined here more in terms of consumer convenience than overall economics. As an indication of vehicle utilization, Stadtauto Drive reports that their vehicles average 34,213 km (21,250 miles) per year, compared to the 14,587 km (9,060 miles) of the average German car. Vehicle trips tend to be of short duration and distance: 77 percent of Stadtauto Drive "rentals" are fewer than 24 hours in length, and 56 percent range between 19 and 100 km (12 and 62 miles)—the other 44 percent fall below 19 km (12 miles) and above 100 km (62 miles). The average occupancy rate of a Stadtauto Drive vehicle is two persons, compared to the German average of 1.3 (Euronet and ICLEI, 1996). Vehicles are used fairly intensively, but individual members tend to be sporadic users, with Stadtauto Drive members driving less than half that of the average driver 4,025 v. 8,758 km (2,500 v. 5,440 miles) per year (Euronet and ICLEI, 1996).

As an indication of the economic attractiveness of carsharing, Muheim and Partner found that expenses of early Mobility members were reduced by 2,500 francs (FF) or $1,700 annually and that carsharing is cost effective for users who drive fewer than 9,064 km (5,630 miles) per year (Muheim and Partner, 1996). Baum and Pesch report the breakeven point for carsharing in Germany at 6,875 km (4,270 miles) per year (Baum and Pesch, 1994), and Petersen reported a breakeven point for Stadtauto Drive of 18,306 km

(11,370 miles) (Petersen, 1993-1995). These findings are for European CSOs at varying times and situations and are not well documented.

SECTION 3.7 SOCIAL AND ENVIRONMENTAL BENEFITS OF CARSHARING

Individuals deciding whether to participate in carsharing generally do not consider indirect and nonmarket effects (with the notable exception of a small group who may be ideologically motivated). Yet these environmental and social benefits may be large. If these effects are large, then it is important for the success of carsharing to quantify them so that government, employers, and others will be encouraged to support carsharing. For instance, Lufthansa financially supports carsharing for its employees because it can avoid the substantial cost of providing additional parking infrastructure. Large environmental, economic, and social benefits can be generated with carsharing primarily through a reduction in vehicle usage, but also by reducing the demand for parking space. Vehicle travel will tend to be reduced because drivers are more directly confronted with the per-usage cost of driving, and presumably will respond rationally by reducing vehicle use.

According to three carsharing surveys conducted between 1990 and 1994, and indicated in Table 3.2 below, the magnitude of these nonmarket and indirect benefits are substantial. Indeed, approximately 30 percent of carsharing participants sell their cars. Autodate reports a 39 percent reduction in vehicles (Autodate, 1998) and in Oslo, Norway, 68 percent of individuals reportedly gave up a vehicle after participating in carsharing (Klintman, 1998), which cites (Berge, 1997).

Table 3.2: Vehicle-Ownership After Joining CSOs[1]

PASSENGER CAR-OWNERSHIP BEHAVIOR OF CSO MEMBERS	SHARE OF USERS		
	Wagner (1990)	**Hauke (1993)**	**Baum and Pesch (1994)**
Would never buy a car	37.2%	35.7%	12.9%
Forgone the planned purchase of a private car due to car sharing	——	15.6%	31.5%
Given up a private car because of car sharing	26.2%	42.4%	23.0%
Given up their car independent of carsharing	31.1%	——	29.7%
Continue to own a private car	5.5%	6.3%	3.0%

Source: *Muheim and Partner,* 1996, which cites: *C. Wagner*, ATG-UMFRAGE 1990. ATG, Stans. German, 1990; *U. Hauke*, Carsharing-Eine Empirische Zielgruppenanalyse unter Einbeziehung Sozialpsychologischer Aspekte zur Ableitung einer Marketing-Konzeption. Hauke, Feldstrasse, 1993; *Baum and Pesch*, 1994.

Reduced car ownership generally translates into reduced driving. Indeed, a Mobility CarSharing Switzerland study (conducted by the former ATG) reported that car mileage for individuals who owned private vehicles was reduced by 33 to 50 percent after they joined the CSO. Most of these individuals increased public transportation usage to meet many of their other transportation needs (Muheim and Partner, 1996).

In the Netherlands, former car owners reduced car mileage by 37 percent—from 15,907 to 10,095 km (9,880 to 6,270 miles) annually. Former non-car owners reduced private vehicle mileage[2] by 29 percent—from 5,394 to 3,800 km (3,350 to 2,360 miles). These

[1] Note these statistics are between four to eight years old and generally reflect the behavior of early adopters of carsharing.
[2] Many non-car owners borrow vehicles from their friends and family. Due to carsharing, borrowed, private vehicle mileage is reduced.

numbers are the average of four CSOs that were studied. After joining a CSO, participants use bicycles and the train more frequently (Meijkamp and Theunissen, 1996). Similarly, for Germany, Baum and Pesch reported that carsharing reduces private car mileage by 58 percent, from 7,044 km to 4,073 km (4,375 miles to 2,530 miles) per year, after membership (Baum and Pesch, 1994). Most of this reduced travel seems to be foregone travel, but some is transferred to other modes. Baum and Pesch, for instance, report that public transportation use by CSO members increased by about 1,546 km (960 miles) per year. Table 3.3 (below) summarizes the change in modal split due to carsharing in Germany. This dramatic reduction in car use by CSO members—of half or more—is much greater in Europe than would be expected in North America.

Table 3.3: Change in Modal Split
(percentages based on annual kilometers traveled)

Means of Transport	Without Carsharing	With Carsharing
Private or borrowed car	60.5%	13.4%
Carsharing	—	24.9%
Car rental	2.9%	3.1%
Taxi	0.8%	1.3%
Public transportation	35.8%	57.3%

Source: *Harms and Truffer,* 1998, which cites *Baum and Pesch,* 1994.

In contrast to the findings in the Netherlands, Muheim and Inderbitzin report that the mobility behavior of individuals in Switzerland, who did not own a car before CSO membership, was not altered significantly (Muheim and Partner, 1996). These investigators found that for this group of customers, carsharing trips often substitute for vehicle trips that were typically made with a borrowed car (Muheim and Inberbitzin, 1992).

Overall, then, CSOs provide the promise of large reductions in car usage and associated adverse effects. It remains to be seen whether these effects persist as CSO participation extends beyond early adopter groups and into North America and Asia.

SECTION 3.8 CONCLUSION

Until the past decade, almost all efforts at organizing carsharing organizations resulted in failure. For a variety of reasons, a more successful era began in the late 1980s in Europe. A number of carsharing organizations are now firmly established and on notable growth trajectories. These CSOs appear to provide large social benefits. Car travel and ownership diminish greatly when individuals gain access to carsharing, far greater than with virtually any other demand-management strategy known. Particularly appealing is that carsharing represents an enhancement in mobility and accessibility for many people, especially those less affluent.

Some lessons in how and where to launch carsharing are becoming apparent. Based on this review of the literature and the experience of this author, I conclude that CSOs are more likely to be economically successful when they provide a dense network and variety of vehicles, serve a diverse mix of users, create joint-marketing partnerships, design a flexible yet simple rate system, and provide for easy emergency access to taxis and long-term car rentals. They are more likely to thrive when environmental consciousness is high; when driving disincentives such as high parking costs and traffic congestion are pervasive; when car ownership costs are rather high; and when alternative modes of transportation are easily accessible.

An even more important lesson, though not yet well documented, is the need for partnership management to offer enhanced products and services (Wagner and Shaheen, 1998). More business-oriented CSOs thrive by acquiring those that fail or lack strong leadership. But to retain customer loyalty, they must improve services and/or reduce costs. Two linked strategies are being followed: (1) coordinate and link with other mobility and nonmobility services (e.g., food providers); and (2) incorporate advanced communication, reservation, and billing technologies in conjunction with significant membership growth. But advanced technologies are expensive and linking with other services is successful only if the customer base is large. Hence, CSOs either remain quite small or follow a spiraling growth trajectory.

Taking a longer view, CSOs may be the prototype of an entirely new business activity: mobility service companies. As car ownership proliferates and vehicles become more modular and specialized, entrepreneurial companies may see an opportunity to assume the full care and servicing of mobility needs in neighborhoods, work sites, transit stations, and shopping centers, based on a partnership management strategy (Womak, 1994). These new mobility companies might handle insurance, registration, and maintenance, and could substitute vehicles as household situations change. One can imagine a future in which the pioneering CSOs combine their operational expertise with the entrepreneurial capabilities of advanced technology suppliers and other businesses to create mobility services that enhance our social, economical, and environmental well being.

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CHAPTER FOUR: STUDY APPROACH

SECTION 4.0 STUDY GOALS AND OBJECTIVES

This dissertation, using social marketing and social learning theories, explores the processes by which travelers can and might accept or adapt to a transportation innovation. To study dynamics in target adopter response and learning, I developed and examined three informational media to explain the CarLink concept, namely a brochure, video, and "trial" clinic.

To gather the innovation response data, I worked closely with advertising and video production specialists to design several CarLink research instruments, including questionnaires, a drive clinic, and focus groups. These instruments integrate social marketing and learning methods with the activity analysis approach, described in Chapter 2: Literature Review. Over a four-month period in 1998, I directed a team of researchers to administer a quasi-longitudinal survey to collect the attitudinal and belief data needed to evaluate:

- Two dynamic innovation response hypotheses, which predict that an individual's learning and valuing response to an innovation will be positively altered by cumulative informational media;
- Validity of the social marketing framework (i.e., the behavioral adoption model);

- Impact of social influence from friends, family, and colleagues (i.e., during the contemplation phase of innovation adoption) on study participant response to the CarLink system;
- Usefulness and effectiveness of three social learning methods in explaining and demonstrating the CarLink system;
- "Social Desirability Effect[1]" on study participant response, as a result of drive clinic interaction with researchers; and
- Identify target audience characteristics of potential CarLink adopters.

This chapter describes the study approach I employ in this dissertation; it includes seven sections. The first section explains the CarLink project, including my thesis, a nine-month field test, and my role in each. The second section discusses my study approach as it relates to the dynamic response hypotheses. The third section is a description of the quasi-experimental research design, hypotheses, and other theories and methods tested. The fourth section describes the independent and dependent variables I employ to test the study hypotheses, as well as several social marketing and learning approaches incorporated into this dissertation. The fifth section explains how I operationalize key study variables, namely the psychographic or attitudinal scales. Sixth is a discussion of the data collection process. The final section includes a brief description of analysis techniques.

[1] The "Social Desirability Effect" is the tendency of participants to overstate a socially desirable position, especially in the presence of researchers.

SECTION 4.1 CARLINK PROJECT OVERVIEW

The CarLink project has three main research components: First, a review of relevant carsharing literature (i.e., Chapter 3 of this dissertation). Second is the longitudinal market survey of 302 individuals (212 households) in the Bay Area, including four focus groups with survey participants. Third is a nine-month demonstration of the CarLink system, which includes interviews and focus groups with field test participants. As the CarLink project manager and lead researcher, I designed the study methodologies and direct(ed) data collection efforts for all three studies. My dissertation includes the first two components.

The CarLink field test is linked to the longitudinal survey through many of the study participants. Indeed, approximately 60 percent of the field test participants joined the CarLink program after participating in the market survey. While the longitudinal survey and my dissertation focus on participant attitudes and response to the CarLink concept, the field test examines actual behavior.

Longitudinal survey and field test participants represent four groups: current Bay Area Rapid Transit District (BART) commuters, individuals who might use BART when carsharing becomes available, people who do not usually take transit but could take it to work; and individuals who live in neighborhoods with substantial BART ridership. These groups represent potential CarLink customers (or target adopters).

4.1.1 Field Test Description

In the field test, participants access CarLink vehicles at the Dublin/Pleasanton BART station and at the Lawrence Livermore National Laboratory (LLNL), about fifteen miles east of the BART station. CarLink members can drive the cars to and from LLNL (i.e., the employment center in this demonstration), the BART station, their homes, and other activity locations throughout the region.

CarLink is a partnership-based program. The project partners include BART, American Honda Motor Company, the Institute of Transportation Studies at the University of California Davis (UC Davis), the California Department of Transportation (Caltrans), LLNL, Teletrac, and INVERS.

The CarLink field test employs a fleet of twelve 1998 Honda compressed natural gas (CNG) vehicles, a smart key management system[2] developed by INVERS, which uses contactless smart cards. A reservations system, called COCOS, provides a two-way flow of information via modem connection between the key manager and a central control computer, located at UC Davis. Reservations are made via COCOS and a Web site maintained by LLNL. The fleet management system, CUCUM, assigns the vehicle keys and records user ID, time, date of use, and VMT data. Vehicles are monitored using the Teletrac radio frequency (RF)-based system vehicle tracking system. Teletrac records the travel-use characteristics of the CarLink vehicles.

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[2] The key management system is comprised of three components: a key dispenser, a reservations system called Car-sharing Organization and Communication System (COCOS), and the fleet management system called COCOS Universal Communication Manager (CUCUM).

Ultimately, the bundle of smart transportation system technologies that a CarLink system might employ, includes:

- Global positioning systems (GPS), linked with a wireless communication system (e.g., cellular digital packet data), for use in automatic vehicle location, central system communication, and as navigational aids;
- A fleet management system for billing and reservations via kiosks, telephone, or other user interface (such as an Internet-based travel planner linked to a range of intermodal travel services); and
- Smart cards for controlling user access to vehicles and billing.

Launched on January 20, 1999, the CarLink project involves up to 60 participants who share the CNG Honda vehicles. The CarLink demonstration includes three types of participants, each paying different prices and using the cars at different times. The price structures reflect data obtained from the longitudinal survey and subsequent focus groups, which were conducted between June and October 1998.

- **Homeside Users** drive a CarLink vehicle between home and the BART station daily, keeping the car overnight and through the weekends for personal use. There is a monthly fee of $200 per month, which covers fuel, insurance, and maintenance costs. If a participant would like to drive more than one tank of fuel permits, an individual can obtain a CNG refueling card and pay for their additional fuel needs (i.e., approximately $.80/gallon).

- **Workside Commuters** take BART to the Dublin/Pleasanton station and drive the CarLink vehicles to and from work at LLNL. There is a monthly fee of $60 per month, which can be shared with a co-worker by carpooling. Again, the monthly fee includes fuel, insurance, and maintenance costs.

- **Day Users** employ CarLink vehicles for business trips or personal errands during the day. The fee is $1.50 per hour and $.10 per mile for personal trips. Participants do not pay for work trips because LLNL donates the CNG fuel to this program.

To summarize, my dissertation focuses on the first two CarLink study components—the institutional literature review and longitudinal survey and focus groups. This dissertation does not include results from the field test (described above). The final report for the CarLink field test will be available in the winter of 2000, through the Institute of Transportation Studies-Davis.[3]

SECTION 4.2 OVERALL APPROACH AND HYPOTHESES

This section includes a discussion of the overall research approach I employ in this dissertation. The focus of my study is the longitudinal market survey, which evaluates participant response to the CarLink concept after the presentation of several informational media. Following the research overview is a discussion of the study hypotheses. Data collected from the survey are used to test the hypotheses in my

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[3] For ITS-Davis publications, please see http://www.engr.ucdavis.edu/~its/.

dissertation. Finally, this section includes a brief description of the social marketing and learning theories and methods tested in this study.

For my dissertation, I developed a research methodology, which is premised on social marketing, social learning theory, and human activity analysis approaches. The study methodology engages subjects to reflect on their travel mode preferences and behavioral motivations over the course of the program.

This dissertation focuses on the responses of 302 individuals (representing 212 households), who live and work in the San Francisco Bay Area, over a four-month period. In my study, participants from each household considered the carsharing innovation and answered questionnaires in their homes.

I employ a longitudinal survey design that includes both an experimental and control group. This design recognizes that consumer attitudes are shaped and develop over time (i.e., as an individual moves from the precontemplation phase of the behavioral adoption process, through the first and second phases of contemplation, which precede adoption). In my study, control participants only received the brochure, whereas the experimental group received three different media throughout. As subjects reviewed and participated in the survey, they were engaged in the early phases of the social marketing framework. I developed detailed CarLink questionnaires to aid participants through the decision-making process (Kurani and Lee-Gosselin, 1996). Participant perceptions before and after each stimuli were collected through the survey instruments.

Throughout the survey, experimental participants were exposed to three social learning tools, including an:

- Informational brochure;
- Video; and
- Interactive "trial" or "drive clinic" with the CarLink vehicles, equipped with smart technologies; smart cards; and the smart key manager kiosk used to dispense keys.

Following each exposure, I asked participants to respond to several stated-response questions regarding their potential use and willingness to join a carsharing organization. The survey consisted of four questionnaires: a baseline (or initial survey completed by each household) and three identical questionnaires that followed each of the informational media. At the completion of the survey, I held four focus groups with study participants in October 1998.

4.2.1 Study Hypotheses

This dissertation tests the two main study hypotheses. To evaluate these hypotheses, I designed and implemented a longitudinal study, with the assistance of several researchers whom I directed. Both hypotheses focus on evolutions in an individual's response to a transportation innovation over time. Dynamics in an individual's learning and valuing response are revealed in the attitudes and beliefs collected in the questionnaires and focus groups. The dynamic response hypotheses are as follows:

Hypothesis One: An individual's response to an innovation will be positively altered by informational media (i.e., video, brochure, and drive clinic). Furthermore, individuals who are not exposed to additional information about the innovation will become increasingly negative toward it over time.

Hypothesis One is key to this dissertation’s main objective of understanding the processes by which a traveler’s perceptions might change in response to a transportation innovation, depending on the presentation or learning method. According to Rogers (1972), an individual’s reaction to an innovation will develop after the first time it is encountered. To help test this hypothesis, several CarLink informational media were deployed. I paid careful attention to product presentation methods, the environment in which the product was delivered, and consumer costs (e.g., financial and convenience costs). Because behavioral change is unlikely to result from the mere promotion of a product’s benefits, I developed the informational media to aid my understanding of the target market’s response to the CarLink concept.

In the case of the experimental group, it is hypothesized that individuals will become more positive toward CarLink over time. In contrast, the control group’s response to the concept will remain stable or become more negative over time. See Section 4.4: Independent and Dependent Variables, for a discussion of the dependent variables used to test the first hypothesis and evaluate the “Social Desirability Effect” as a result of drive clinic participation.

Hypothesis Two: An individual's valuing response to an innovation's negative mobility attributes (e.g., limitations on instant mobility) will become more positive after learning more about the new technology. In contrast, an individual—unexposed to additional information about the innovation—will respond the same to negative mobility attributes across the study (i.e., his or her response will remain unchanged).

This hypothesis builds on the first, but specifies that an individual's reaction to specific attributes will change as he or she responds to each informational stimuli. Not surprisingly, different travel modes impose capability constraints (Kurani and Lee-Gosselin, 1996) and opportunities on individuals. Each traveler evaluates these mobility attributes in the modal decision-making process.

According to social marketing theory, target users typically evaluate potential satisfaction with a social product on the basis of a small subset of attributes. Hence, it is important that researchers understand key attributes, particularly for future planning, product development, communication, and promotion (Kotler and Roberto, 1989). For my study, I developed a question with a series of responses to help measure response dynamics to a range of CarLink attributes. Those perceived as negative attributes by participants are of particular interest to this dissertation.

In the case of the experimental group, it is hypothesized that an individual's response to negatively perceived CarLink attributes will become more positive over time. In contrast, the control group's response to those attributes will remain stable or become even more negative over time. Again, please see Section 4.4 for a discussion of the dependent variables used to test the first hypothesis and assess the "Social Desirability Effect."

4.2.2 Other Theories and Methods Tested

The results of the longitudinal survey are also used to validate several relevant social marketing and learning theories and methods. First, I use Hypothesis One and other survey results to evaluate the early phases of the social marketing framework, as discussed in Chapter 2: Literature Review, of this dissertation.

Second, I evaluate the impact of social influence—from friends, family, and colleagues—on participant response to the CarLink concept. As mentioned earlier, social marketing experts argue that friend and family play a powerful role in shaping an individual's decision to adopt a social product.

Finally, I assess the effectiveness of the three social learning methods I explored in my study (i.e., the brochure, video, and drive clinic). This dissertation provides a test bed for the two dynamic response hypotheses and several social marketing and learning theories and approaches.

SECTION 4.3 RESEARCH DESIGN

In this section, I describe the quasi-longitudinal survey approach that I designed and implemented for this dissertation. As the lead researcher and project manager, I trained and directed a team of CarLink researchers to execute the longitudinal market study. This four-month effort consisted of a three-part survey, including educational media (i.e., brochure, video, and drive clinic), an experimental and control group, and four focus groups.

The research approach I developed can be characterized as a quasi-experimental design due to the lack of random assignment in the study population. Quasi-experimental designs "…are distinguished from 'true' experiments primarily by the lack of random assignment of subjects to an experimental and a control group" (Breen and Blankenship, 1989). My survey explores the response of Bay Area residents to the carsharing concept over time.

The research methodology I employ can also be categorized as a longitudinal or panel design because the same set of individuals (and households) were examined each time. One of the advantages of a longitudinal study is that it "can reveal which *individuals* are changing over time because the same respondents are surveyed again and again…Despite their clear advantage for understanding causal direction and processes of change, longitudinal designs, especially panel studies, represent a small fraction of survey research, [m]ainly for economic reasons" (Singleton *et al.*, 1993, p. 257). However, a longitudinal design has the limitation that something other than the experimental stimuli may explain the observed change. The control group was added to the design to help me "screen" out this effect.

4.3.1 Survey Design and Implementation

For this dissertation, the survey design and implementation process required approximately nine months. This included questionnaire design, pretests, production, and distribution. After the survey ended, I oversaw a three-month data entry effort. I also directed an extensive data management and cleaning effort, which required several months to complete. In the spring of 1999, I started data analysis.

As mentioned above, I pretested the CarLink questionnaires with the assistance of another researcher whom I directed. The questionnaires were previewed at UC Davis, among a group of graduate students studying transportation. This pretest was useful in identifying poorly worded questions and in improving the organization of each instrument.

I developed the baseline (or initial) household questionnaire to document several household independent variables, such as vehicle ownership and attitudes toward a number of issues. I assumed that household members have similar opinions, interests, and lifestyles. There were approximately 1.3 experimental respondents per household and 1.6 control respondents per household in my study. Both experimental and control households received the same baseline questionnaires.

Next, I developed three longitudinal surveys for collecting CarLink response data. In the first phase, second household members received a slightly different questionnaire than the first respondent. The reason for this difference is that many questions, answered by the first household member in the baseline questionnaire, also had to be collected for the second household participant (e.g., commute patterns; use of rental cars; attitudes toward current mode, automobiles, and transit; income; age, and education).

On July 24, 1998, the research team—I participated in and directed—mailed the first survey package to participants. This included the baseline questionnaire, a CarLink brochure explaining the smart carsharing concept, and two brochure questionnaires—one for each household participant, if applicable. The “Smart CarLink Initial Questionnaire” was completed by one individual on behalf of the household. The “Smart CarLink Brochure Questionnaires” were answered by each household respondent. At this time, both experimental and control group participants received identical survey packages.

On August 19, 1998, the research team mailed the second package. In this phase, the experimental group received a CarLink modeling video, which illustrates how the carsharing concept works in greater detail, and two video questionnaires (i.e., one for each household participant). The second-phase instruments were almost identical to the brochure questionnaires for the experimental and control groups. The main difference is that the experimental group’s questionnaire requested feedback on the video, whereas the control’s did not.

After experimental group participants returned their second-phase responses, I directed a team of researchers in scheduling subjects for a 30- to 45-minute appointment at an eight-day drive clinic held between September 13 and 26, 1998, at the Dublin/Pleasanton BART Station. I trained and directed this same team to lead participants through the CarLink system. (For the drive clinic summary, see Chapter 8 of this dissertation.) At the end of the clinic, participants received their final survey package, which included a questionnaire and a three-day travel diary for each respondent. Finally, researchers also prepared and mailed the final survey instruments to control participants.

During the study, 113 experimental participants dropped out of the survey after completing the first phase. A total of 185 experimental participants dropped out, including those who agreed to participate in the study but did not return the initial questionnaires. Two hundred and seven experimental participants completed the longitudinal survey.

In contrast, a smaller control group was sampled due to study costs. A total of 128 individuals were recruited, and 95 participants completed the study. Fifteen control group participants dropped out after completing the initial questionnaire. A total of 33 individuals dropped out, including those who agreed to participate but never returned the first instruments.

Please see Appendix I to this dissertation for a copy of the survey instruments.

SECTION 4.4 INDEPENDENT AND DEPENDENT VARIABLES

To test the hypotheses and the other social marketing and learning approaches addressed in my dissertation, I specified two sets of explanatory variables: independent and dependent. Independent variables are assumed to have a causal effect on dependent variables, and a dependent variable is assumed to be caused by one or more independent variables. This section includes a discussion of the independent and dependent variables explored in my study.

For descriptive purposes, I use the independent variables to explore the overall profile of the sample population. Second, I employ many of these variables to determine whether a significant difference exists between the control and experimental populations. Since both groups are drawn from the same sampling frame, I expect them to be similar in sociodemographic and psychographic composure. If the experimental and control groups are not significantly different across the independent variables, I can more confidently attribute differences in group response (i.e., in the dependent variables) to the informational media versus another variable.

Third, I examine several independent variables (particularly, psychographic ones) to assess their explanatory power in predicting why some individuals are more positive to the CarLink concept than others.

Finally, I use several dependent variables to isolate the effects of the CarLink informational media on the experimental group. Further, I employ them to test the dynamic response hypotheses and other relevant social marketing and learning theories and methods.

4.4.1 Independent Variables

In my study, there are four categories of independent variables. The first category includes demographic characteristics: community and household size, income, marital status, age, gender, income, auto ownership, education, employment status, occupation, and number of licensed household drivers. These variables are important in that many explain current mode choice.

As mentioned above, independent variables can also be used to demonstrate homogeneity in sample characteristics for the experimental and control groups. Homogeneity helps researchers to isolate the effects of other factors beyond experimental stimuli (i.e., exposure to carsharing information). In my study, chi-square (χ^2), t-test, and analysis of variance (ANOVA) statistics are used to determine whether the samples are statistically different (i.e., heterogeneous). See Chapter 6: Baseline Analysis of Study Population, for a discussion of the independent variables in this study.

The second category of independent variables consists of trip characteristic and mode choice factors. Variables include vehicle miles of travel (VMT), number of household commuters, carpool/vanpool participation, commute modes, vehicle availability, rental car use, daily activity modes, weekly trip activities, commuting costs, location of nearest transit station, BART acceptance, and attitudes toward current ways of getting around. I operationalize attitudes toward current mode through a composite measure or scale. See Section 4.5 for a discussion of attitudinal variable operationalization.

The third category of independent variables includes general psychographic characteristics. Psychographics describe individuals in terms of their opinions, activities, interests, lifestyles, and buying behavior (Breen and Blankenship, 1989). Attitudes toward a range of issues, including vehicles, congestion, the environment, and experimentation, are also operationalized through scales. See Section 4.5 for a discussion of the five psychographic variables developed to measure the above attitudes.

The final category of independent variables (I call “other”) includes participant membership status in time-share rentals (i.e., a shared vacation property), health or country clubs, and food cooperatives. Independent variables from each of the categories described above are reviewed and evaluated in Chapter 6: Baseline Analysis of Study Population.

4.4.2 Dependent Variables

To test my study hypotheses and other social marketing and learning approaches, I developed several survey questions for capturing participant response to the CarLink concept. Several questions, asked throughout the longitudinal survey, were designed to evaluate dynamics in participant response to the CarLink innovation. Variables developed to test the hypotheses and other relevant methods are discussed in the following text.

4.4.2.1 CarLink Usage and Understanding

I test the first hypothesis by monitoring response changes to the question: "Do you think that you would use the CarLink: Smart Carsharing System?" Responses include "Yes" or "No." This question is the main dependent variable in my study.

Results from this question (or dependent variable) are also used to evaluate the validity of the social marketing framework as it relates to the early phases of innovation adoption. Please see Chapter 2: Literature Review for a discussion of the theoretical and methodological areas relevant to this dissertation. Furthermore, I use the results from this variable to evaluate the "Social Desirability Effect" after experimental subjects participate in the clinic.

I also employ these results, in conjunction with a second question, to assess the effectiveness of three social learning methods in explaining the CarLink concept (i.e., the brochure, video, and drive clinic). The second question is: "What do you think about the CarLink concept now that you have [reviewed the brochure and video or attended the drive clinic]?"

Responses include:

- I would be very interested in trying this new mobility system;
- I would like more information;
- I do not understand how the system works;

- This concept would not fit the needs of my household today;
- This concept could fit the needs of my household in the future, but not today; and
- other, please specify.

4.4.2.2 CarLink Attributes

Next, I test the second hypothesis by monitoring response changes to the following question. "I think that CarLink would…." Responses include:

- Get me to work on time;
- Be enjoyable to me;
- Allow me to store important items (e.g., shopping bags);
- Fit my budget;
- Allow me to be spontaneous;
- Help me go everywhere;
- Allow me to visit friends when I want;
- Help me do my shopping;
- Make me feel safe;
- Say a lot about who I am;
- Be great for my lifestyle needs;
- Allow me to quickly respond to an emergency; and
- Offer comfortable seating.

This question is critical to my study. Responses are used to determine which CarLink attributes are considered to be negative by respondents. Furthermore, the responses allow me to monitor changes in negative attributes over time in both the experimental and control groups.

4.4.2.3 Role of Study Instruments and Social Influence on Stated CarLink Use

Finally, I evaluate the impact of social influence from friends, family, and colleagues on study participant response to the CarLink concept. To capture the data for evaluating the impact of social influence on willingness to use the CarLink system, I developed a third question: "When did you realize that you might be able to use this service? (Please check one response)." Responses include: 1) During the recruitment process; 2) When I was reading the brochure; 3) When I was watching the video; 4) When I was attending the drive clinic; 5) When I was talking with a friend about the CarLink system; 6) When I was filling out the questionnaire last time; 7) When I spoke with someone from the CarLink project; and 8) When I was filling out this questionnaire. I also asked the control group this question; however, these participants were not provided with the third and fourth responses (listed above) since they did not receive the video nor did they attend the clinic.

This study's dependent variables are reviewed and evaluated in Chapter 7: CarLink Longitudinal Survey Results. Response results to the CarLink brochure, video, and drive clinic are presented in Chapter 5: Data Collection.

SECTION 4.5 OPERATIONALIZATION OF KEY STUDY VARIABLES

For this dissertation, I operationalized several key variables by creating scales that represent real concepts (e.g., mode or CarLink satisfaction). Scales offer researchers a more efficient data device than a single question might in capturing a concept or response. In my study, I develop and use several scales to evaluate participant response to the CarLink concept, current mode, and CarLink relative to present modes, and to contrast the responses of the control and experimental groups.

Cronbach's alpha is used to assess scale reliability (Nunnally, 1978). Cronbach's alpha is a measure of internal consistency, and it is often used for evaluating attitudinal questions on a Likert-type or similar scale. It generates a score based on an inter-item correlation and the number of items comprising the scale. Cronbach's alpha can be raised by increasing the number of questions, which is the most common method, or by including questions that are similar in nature. Scores range from 0 to 1, with scores of 0.6 or above generally signifying internal consistency.

4.5.1 Modal Satisfaction

The success of a transportation innovation depends in part on an individual's attitude toward the traditional auto (Cullaine, 1992). In this dissertation, it is important to understand how essential vehicles are to an individual's lifestyle. To explore participant attitudes to their current modes, I developed a modal satisfaction scale, a CarLink satisfaction scale, and the CarLink relative to current transportation (i.e., CarLink relative) scale. I use the mode satisfaction variable to help explain response to the CarLink innovation. These scales were created by developing a list of attitudinal questions that I later combined into a single measure. It is interesting to note that 96.7% of participant households in this study own one or more vehicles.

In the first phase, I asked participant households about satisfaction with their current modes. This scale is based on their response to fifteen questions on a five-point Likert-type scale.

The ***mode satisfaction score*** is comprised of responses to the following question: "My current ways of getting around…":

- Get me to work on time;
- Allow me to store important items (e.g., clothes, shopping bags);
- Fit my budget;
- Allow me to be spontaneous;
- Help me go everywhere;
- Allow me to visit friends when I want;
- Give me a sense of freedom;
- Help me to do my shopping;
- Make me feel safe;
- Give me a sense of independence;
- Say a lot about who I am;

- Are great for my lifestyle needs;
- Allow me to quickly respond to an emergency; and
- Are comfortable.

Cronbach's alpha for the mode satisfaction scale is .9262, which means that this scale is highly reliable. In this dissertation, I use the mode satisfaction scale (or variable) in a CarLink regression analysis. Results from the regression model are included in Chapter 7: CarLink Longitudinal Survey Results.

I also created another modal scale for a second question, which I call "CarLink Satisfaction." I developed this scale from the following question and 13 responses. "I think that CarLink would…." Responses include:

- Get me to work on time;
- Be enjoyable to me;
- Allow me to store important items (e.g., shopping bags);
- Fit my budget;
- Allow me to be spontaneous;
- Help me go everywhere;
- Allow me to visit friends when I want;
- Help me do my shopping;
- Make me feel safe;
- Say a lot about who I am;

- Be great for my lifestyle needs;
- Allow me to quickly respond to an emergency; and
- Offer comfortable seating.

This scale's Cronbach's alpha scores range between .8856 and .9199 across the three phases of the longitudinal survey, suggesting that this is also a reliable, if not very good measure. See table below.

Cronbach's Alpha Scores: CarLink Satisfaction	
Time	**Score**
Phase 1	.9199
Phase 2	.8856
Phase 3	.8871

Although this scale is reliable, I could not use it to evaluate the second hypothesis because it conceals respondent evaluation to each attribute. For instance, in the initial phase, the majority of respondents (71%) received a score ranging between 1.0 and 3.0, meaning participants think CarLink compares favorably to their current mode. A score of 3.0 means that a respondent is neutral; approximately 10% were neutral. Although I use this score to evaluate aggregate response changes, it is not useful for evaluating the second hypothesis.

Lastly, I created a final modal scale, which I call "CarLink Relative." I developed this scale from the following question and 10 responses. "Compared to my current ways of getting around, I would say that the CarLink system could…." Responses include:

- Save me money;
- Save me time;
- Provide me with a range of vehicles;
- Reduce the hassles associated with personal vehicles (e.g., licensing);
- Help reduce congestion;
- Help reduce air pollution;
- Increase my household's transit ridership;
- Complement my current lifestyle needs;
- Complement my current ways of getting around; and
- Complement my future lifestyle needs.

This scale's Cronbach's alpha scores range between .8426 and .8458 across the three phases of the longitudinal survey, suggesting that this is also a reliable, if not very good measure. See table below.

Cronbach's Alpha Scores: CarLink Relative	
Time	**Score**
Phase 1	.8452
Phase 2	.8458
Phase 3	.8426

4.5.2 Attitudes Toward A Variety of Issues

For the initial questionnaire, I created a question comprised of twenty-seven statements on a five-point Likert-type scale, to gather data about household attitudes towards a variety of issues relevant to my dissertation. I created five attitudinal scales from these data: vehicle hassle, congestion, vehicle enjoyment, environmental concern, and like to experiment with new ways of doing things (or "experimenter").

I developed each of these scales because attitudes toward vehicles, congestion, the environment, and experimentation are likely to be important factors in explaining participant response to a transportation alternative, such as CarLink. Indeed, Cullaine (1992) found that transportation and environmental attitudes are important in explaining public response to transportation policies discouraging auto use. Results from these attitudinal scales are included in Chapter 6: Baseline Analysis of Study Population.

Cronbach's alpha scores for each of these scales include:

1. Vehicle hassle: .3136;
2. Congestion: .4909;
3. Vehicle enjoyment: .5223;
4. Environmental concern: .5015; and
5. Experimenter: .2161.

Most of these alpha scores are acceptable, with higher scores representing stronger measures. It is important to note, however, that the scores for the experimenter and vehicle hassle scales are quite low. Since these scales are important to this study, I decided to include the lower scoring scales and note this in my analysis. These scores could be improved by asking more questions of a similar nature; each of these scales only had four to five questions. The CarLink and modal satisfaction scales (discussed earlier), consisting of ten or more questions, had Cronbach's alpha scores of .8449 or better.

The ***vehicle hassle score*** is comprised of the following responses:

- Finding a parking space is a real hassle;
- I use transit when it goes where I want it to go;
- Car maintenance is a hassle;
- A smog check is a real hassle; and
- The costs of owning a car are higher than the benefits.

The ***congestion score*** consists of responses to the following:

- Congestion on the road is something one has to live with;
- Traffic growth is a serious problem; and
- The roadways are congested due to too many vehicles on the road.

The ***vehicle enjoyment score*** is comprised of the following responses:

- I like driving alone;
- I have to admit the type of car I own says a lot about who I am;
- I prefer to drive my personal vehicle to places I need to go;
- To me, a car is nothing more than a convenient way to get around (Likert-type score reversed);
- If possible, I would like to change from driving to work to some other transportation mode (Likert score reversed);
- Automobiles mean personal freedom; and
- I wouldn't give up my own vehicle(s) even if there is a feasible alternative.

The ***environmental score*** is comprised of the following responses:

- I am willing to reduce my auto use to improve transportation and air quality;
- I am willing to drive an electric or other clean-fuel vehicle to improve air quality;
- We can find cost-effective technological solutions to the problem of air pollution;
- Environmental problems are the biggest crisis and challenge of our times;
- It is time to change the way we live in order to solve environmental problems;
- Traffic fumes are a major contributor to global warming, smog, and other environmental problems; and
- I'd be willing to ride a bike or take transit to work in order to reduce air pollution.

The ***experimenter score*** consists of responses to the following:

- I like to experiment with new ways of doing things;
- If friends and neighbors reduced their driving, I would follow their example;
- I would like a job that doesn't require that I keep learning new skills; and
- I always follow a manufacturer's warnings regarding how to use a product.

To summarize, I developed each of these scales to capture participant attitudes toward their current modes, CarLink, personal vehicles, congestion, the environment, and experimentation.

SECTION 4.6 DATA COLLECTION PROCESS

For this dissertation, data collection began with targeted customers in the Bay Area. A total of 360 experimental participants were recruited (with refreshment), and 207 experimental participants completed the survey. A smaller control population was recruited due to limited study resources. A total of 128 individuals were recruited, and 95 participants completed the survey.

Study data were collected from the longitudinal questionnaire instruments and the subsequent focus groups conducted with 37 individuals. I elaborate on the data collection process in the next chapter (i.e., Chapter 5: Data Collection).

SECTION 4.7 ANALYSIS TECHNIQUES

Survey data were entered into FileMaker Pro 4.0. The data files were read into SPSS windows (versions 8.0 and 9.0) for the analysis. The analytical study approach I employed can best be characterized as a repeated measures design with three data collection time periods.

I used the following analysis techniques: univariate, scaling methods, bivariate, and multivariate regression. Both parametric (e.g., analysis of variance) and non-parametric (e.g., χ^2) analyses were used to evaluate the data. First, I employed univariate analysis to examine and present frequency distributions of group data for describing the study population. Frequency distributions and summary statistics were produced for all interval and continuous level variables, including scale scores.

I also developed several composite measures (or scales) to capture attitudinal response in my study. Scales offer a more efficient data device than a single variable for attitudinal data. Indeed, several attitudinal items are more likely to provide a more accurate indication of an attitudinal variable than a single indicator alone. Eight scale scores were calculated to provide attitudinal measures for this dissertation; they are based on theoretical and logical question groupings.

The eight scales in my study are: 1) mode satisfaction, 2) vehicle hassle, 3) congestion, 4) vehicle enjoyment, 5) environmental concern, 6) experimentation, 7) CarLink satisfaction, and 8) CarLink relative. Cronbach's alpha statistic (described in Section

4.5.1, earlier) was calculated to assess scale reliability. Scores range from 0 to 1, with scores of 0.6 or greater signifying internal consistency.

I also employed bivariate analysis in this dissertation. Bivariate analysis or cross-tabs play a significant role in my study; they are used to explain relationships among study variables. Nominal and ordinal study variables were examined using bivariate counts and plots. Cross-tabulation tables (or cross-tabs) were constructed, and the Pearson's χ^2 test for independence was calculated where appropriate. My study hypotheses were addressed using Pearson's χ^2. These results are presented in Chapter 6: Baseline Analysis of Study Population and Chapter 7: CarLink Longitudinal Survey Results. The χ^2 statistic is described in the following paragraph.

Pearson's χ^2 is a measure of deviance to test the independence of two or more groups. When discrete groups (e.g., control and experimental) have different values or scores for a variable, the χ^2 statistic is used to determine whether this difference is due to randomness or whether the groups are truly different.

The χ^2 test uses probability to determine the expected values of a variable, if the sample groups were identical. It then subtracts the expected values from the observed values to produce residuals; the residuals are used to compute the χ^2 statistic. A high χ^2 value permits researchers to reject the null hypothesis (i.e., the groups are really the same and only appear different due to typical randomness).

After the χ^2 statistic is calculated, the result is located on a distribution table in conjunction with the number of degrees of freedom (i.e., based on the number of sample groups and the number of variables choices) to produce a probability or p-value. A p-value of 0.05 or less is considered statistically significant (i.e., the null hypothesis can be rejected).

Finally, I employed analysis of variance (ANOVA), where appropriate, to explore such relationships. ANOVA is a statistical technique used to compare variance among sample means for several variables or groups. It enables researchers to analyze two or more independent variables simultaneously, such as group identification (i.e., control versus experimental) or household size. The ratio of the observed variance to the expected is the F statistic. The F statistic is dependent upon degrees of freedom, which are based on the number of variables and groups. An F value of 0.05 or less is generally considered statistically significant (i.e., the null hypothesis can be rejected).

Regression analysis was also employed to determine which independent variables are most significant in explaining an individual's current mode choice and positive response to the CarLink concept (i.e., "yes" to the question: "Do you think that you would use CarLink?"). These results are presented in Chapter 6: Baseline Analysis of Study Population and Chapter 7: CarLink Longitudinal Survey Results.

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CHAPTER FIVE: DATA COLLECTION

SECTION 5.0 INTRODUCTION

This chapter describes the data collection effort that I developed and directed for this dissertation, including the sampling frame, sampling process, questionnaires, informational materials, and focus groups. This process required several researchers and market research firm recruiters. I supervised the UC Davis research team and participated in the data collection process throughout.

As discussed in the previous chapter (i.e., Chapter 4: Study Approach), the primary data collection tools are the informational media and longitudinal survey. The survey includes four questionnaire instruments: an initial or baseline questionnaire and three CarLink response questionnaires that were distributed during separate phases of this study.

I developed these instruments along with another researcher, whom I directed. The instruments were pretested at UC Davis among transportation graduate students. We designed the baseline questionnaire to collect several household independent variables, such as vehicle ownership and attitudes toward their current transportation modes, vehicles, congestion, the environment, and experimentation. In the baseline instrument, I assumed that the attitudinal data reflect those of other household members. In the final study population, there were approximately 1.3 experimental respondents per household and 1.6 control respondents per household. Both experimental and control households received the same initial baseline questionnaires.

I also developed three longitudinal surveys for collecting CarLink response data. In the first-phase packet, second household members received a slightly different questionnaire than the first household respondent. The reason for this is that several questions answered by the first household member in the baseline questionnaire also had to be completed by the second participant (e.g., commute patterns; use of rental cars; attitudes toward current mode, automobiles, and transit; income; age, and education). Please see the Appendix II for the survey instruments.

Following the survey, I moderated four focus groups with 37 participants. I designed these groups to gather data from respondents on essential CarLink features, such as vehicle types, lot design and location, and billing. They were also developed to reveal how much the participants value the innovation and whether or not CarLink might meet the transportation needs of their community.

This chapter includes five sections. The first section describes the sampling frame and procedures. The second discusses the study's sampling bias. The third section focuses on the longitudinal questionnaires and study incentives. The fourth discusses the informational materials developed and participant response to each. The final section provides a description of the focus group data collection method.

SECTION 5.1 SAMPLING FRAME AND PROCEDURES

In this section, I discuss the sampling framework, including the four population segments, sample refreshment, and the final sample size. I also describe the recruitment process and overall sample response rates.

As I discussed in the second chapter of this dissertation, social marketing begins with targeted customers (Andreasen, 1995). To collect data useful for understanding the needs, wants, and perceptions of potential carsharing users, I designed a sampling framework directed at four target segments in the East San Francisco Bay Area. The sampling segments include:

1) Existing BART riders, including commuters to central business districts (San Francisco, Berkeley, and Oakland) and "reverse commuters" to the Dublin/Pleasanton station;
2) Individuals identified as possible new BART patrons, if shared-use vehicles became available;
3) Nontransit (i.e., BART or any other transit service) riders who work at employment sites (for the field test, specifically the Lawrence Livermore National Laboratory) where employees ride BART. To some extent, these individuals represent the same potential as in 1 and 2 above, but they were chosen to represent possible users of employment-based CarLink vehicles; and
4) Nontransit riders from neighborhoods with substantial BART ridership to represent possible new users of community-based CarLink vehicles.

5.1.1 Four Study Population Segments

Along with another UC Davis researcher, I designed a targeted sampling framework consisting of the four population segments listed above and other characteristics (i.e., housing and employment location), which could enable participation in one of the CarLink user groups (i.e., Homeside, Workside Commuter, and Day User). Each of the four samples consisted of two subgroups. These sample populations include:

1. ***Potential Homeside Users*** who live in Dublin/Pleasanton region. One adult member of the household works in San Francisco or the East Bay.

    A. No adult household member rides BART more than one day a week. The initial experimental group sample size consisted of 31 individuals (Initial Target: 35).

    B. Adult household member rides BART at least three days a week. The initial experimental group sample size included 42 individuals (Initial Target: 35).

Initial Experimental Sample: 73 Refreshment of 1B: 24 Final Experimental Sample: 50 Response Rate: 52%

2. ***Potential Homeside Users*** who live in two contrasting neighborhoods in the Dublin/Pleasanton area. These neighborhoods were approximately five miles from the Dublin/Pleasanton BART station.

A. High-density housing (condominiums, apartments; if possible, in pedestrian-friendly neighborhoods with shops, etc., but not low income).

The initial experimental group sample size consisted of 42 individuals (Initial Target: 35). Additionally, a control group was recruited; the initial sample size included 22 individuals (Initial Target: 25).

B. Low-density housing developments.

The initial experimental group sample size included 33 individuals (Initial Target: 35). The initial control group sample consisted of 34 individuals (Initial Target: 25).

Initial Experimental Sample: 75 Final Experimental Sample: 51 Response Rate: 68%
Initial Control Sample: 56 Control Refreshment of 2A: 4 Final Control Sample: 50 Response Rate: 83%

3. Potential Day Users who live in the Dublin/Pleasanton region. One adult member of the household works at Lawrence Livermore National Laboratory (LLNL) or another employment center in the Dublin/Pleasanton region.

A. Car commuters. The initial experimental group sample size consisted of 58 individuals (Initial Target: 40).

B. Other commuters (walk, bike, bus, shuttle, carpool). The initial experimental group sample size included 42 individuals (Initial Target: 40).

Initial Experimental Sample: 100 Final Experimental Sample: 55 Response Rate: 55%

4. Potential Workside Commuters who live in the East Bay or in San Francisco. One adult member of the household works at LLNL or another employment center in the Dublin/Pleasanton region.

A. Commuter to the Dublin/Pleasanton region who rides BART at least three days per week.

The initial experimental group sample size consisted of 17 individuals (Initial Target: 20). For this segment, there was also a control group; the initial sample size included 19 individuals (Initial Target: 25).

B. Commuter to Dublin/Pleasanton region who can use BART, but seldom does (i.e., potential BART rider).

The initial experimental group sample size included 55 individuals (Initial Target: 60). The initial control group sample size consisted of 35 individuals (Initial Target: 25).

Initial Experimental Sample: 72 Refreshment of 4A: 16 Final Experimental Sample: 51 Response Rate: 58%
Initial Control Sample: 54 Refreshment of 4A: 14 Final Control Sample: 45 Response Rate: 66%

5.1.2 Sample Refreshment

In August 1998, along with two other UC Davis researchers whom I directed, I refreshed the study sample for the following experimental groups through nonprobability quota sampling at the Dublin/Pleasanton BART station:

- Segment 1B (Potential Homeside User), low-density housing, and
- Segment 4A (Potential Commuter), BART user three or more days per week.

Control group segments were also refreshed, including:

- Segment 2A (Potential Homeside User), low-density housing, and
- Segment 4A (Potential Homeside User), BART user three or more days per week.

5.1.3 Final Sample Counts

Final counts and response rates for all sample groups are reasonable or better. (See Tables 5.1 and 5.2, which follow.)

Table 5.1: Number of Households in Each Group

Group type	Status		Total
	Non-dropout	Dropout	
Control			
2A	12	1	13
2B	18	4	22
4A	11	1	12
4B	17	5	22
Total	**58**	**11**	**69**
Experimental			
1A	12	6	18
1B	21	10	31
2A	19	8	27
2B	17	8	25
3A	26	26	52
3B	20	13	33
4A	8	6	14
4B	31	13	44
Total	**154**	**90**	**244**

Table 5.2: Number of Individuals in Each Group

Group type	Status		Total
	Non-dropout	Dropout	
Control			
2A	21	1	22
2B	29	5	34
4A	17	2	19
4B	28	7	35
Total	**95**	**15**	**110**
Experimental			
1A	21	10	31
1B	29	13	42
2A	28	14	42
2B	23	10	33
3A	30	28	58
3B	25	17	42
4A	10	7	17
4B	41	14	55
Total	**207**	**113**	**320**

Overall, a higher percentage of dropouts occurred after the second survey phase than the first. In the initial experimental group, 15.6% dropped out of the study after returning their initial questionnaire. Further, 23% of the experimental population dropped out after the second phase (i.e., they did not attend the drive clinic and return their final questionnaires). This is not surprising because completing the final phase required that participants attend a drive clinic. Several households were unable to participate in one of the clinics. Consequently, many had to drop out.

Similarly, a higher percentage of control group participants dropped out after the second phase (i.e., versus the first). Indeed, 2.7% of control group participants dropped out after returning the initial questionnaire, and 11.2% of the control population dropped out after returning the second-phase questionnaire. Again, this is not surprising because control participants likely lost interest in the study after the first phase (i.e., after they reviewed the brochure). In the second and third study phases, control group participants did not receive additional informational media.

5.1.4 Recruitment

Study recruitment was conducted between May and July 1998. My initial target for the experimental group, at the start of the study, was 300 respondents. A total of 360 experimental participants were recruited (with refreshment), and 207 experimental participants completed the longitudinal survey. For the control group, a smaller population was sampled due to study costs. My initial target was 100 participants. A total of 128 individuals were recruited, and a total of 95 control participants completed the study.

A minimum criterion for participation was that each respondent have a valid driver's license. Although this was a principal criterion, 1.9% of the total study population did not have a driver's license. Furthermore, experimental households were required to own or have access to a VCR to watch the CarLink video. This criterion was not a barrier to study participation. In this study, experimental and control participants were selected for their potential eligibility with the CarLink system in the Dublin/Pleasanton area, including residence or employment in the region or ability to ride BART to or from home or work.

I contracted Margaret Yarbrough Associates, a Bay Area market research firm, to randomly sample experimental participants for target group 1 (i.e., using the random digit dialing technique). For experimental group 2 and control groups 2 and 4, the firm employed the quota sampling method. A quota sample is a nonprobability (or nonrandom) method in which "…interviewers are given quotas of different types of people with whom they are to conduct interviews" (Kalton, 1983, p. 91). Quota sampling helps with sampling expense and nonresponse by substituting "an alternative respondent for an unavailable or unwilling respondent" (Kalton, 1983, p. 93). However, the results of a quota sample may contain "…hidden biases and uncertainties" (Aaker and Day, 1990, p. 367).

Study resources could not support a randomly sampled control group nor one equivalent in size to the experimental, so the quota sampling method was used to capture key study segments (i.e., groups 2 and 4). Midway through the study, I decided to refresh several samples. I suspect that each group needed to be refreshed because many individuals did not fully understand the study when they were recruited. Most were recruited on the BART platform, which proved to be very difficult. Since many riders exiting or entering a train are not receptive to market researchers.

UC Davis researchers, whom I trained and directed, recruited study groups 3 and 4. I chose to recruit these two groups because the market research firm's estimate for this task was beyond the study's allocated budget. These two groups were more difficult to recruit because it was not possible to access a list of LLNL, Hacienda Business Park, and Bishop

Ranch employees. To recruit these groups, the UC Davis team posted a recruitment article on NEWSONLINE, an online news site at LLNL. This announcement described the study purpose and requirements to lab employees. I also placed a recruitment article in the Tri-Valley Herald to recruit other individuals employed in the region. Individuals who read the story and wanted more information contacted the UC Davis research team by phone or email to determine their eligibility for participation. Key criteria for sample groups 3 and 4 included employment in the Dublin/Pleasanton region and current commute patterns (e.g., drive-alone, carpool, BART, bus, etc.). Again, midway through this study, we refreshed several study samples (i.e., described in section 5.1.2, above). UC Davis researchers conducted the refreshment recruiting at the Dublin/Pleasanton BART station using the quota sampling method.

Individuals who were recruited at BART or through random digit dialing received a brief verbal description of the study commitments and incentives. Subjects who responded to the newspaper article or LLNL online recruitment piece received a similar verbal description from the UC Davis research team. After recruitment, overall participant contact was minimized. A few weeks before the survey was launched, each household received a reminder letter with a study description. During each phase, participants received a brief letter that described the study phase contents and requirements. If study packages were not returned, UC Davis researchers made reminder calls to each household. If subjects conveyed that they no longer wanted to participate, we deleted them from our mailing list. Researchers also contacted experimental participants to schedule and confirm their drive clinic appointments. Each participant received a reminder call regarding his or her appointment time. Generally, we tried to minimize and standardize contact with all participant groups.

5.1.5 Response Rate

Given the typical nonresponse and attrition rates for a longitudinal survey, we over-recruited each of the four target groups. The response rate for the experimental group was 57.5%. The response rate for the control group was 74.2%. According to Babbie (1983), "a response rate of at least 50 percent is *adequate* for analysis and reporting. A response rate of at least 60 percent is *good*. And a response rate of 70 percent is *very good"* (p. 226). In the case of a high response rate, there is less chance that the sample participants are biased (Babbie, 1983).

Heberlein and Baumgartner (1978), who reviewed 98 mailed survey questionnaires, found over one quarter of these studies had a final response rate of more than 80%. However, these response rates were applicable to a one-time survey. High survey response rates can be achieved by including postage-paid return envelopes, designing questionnaires that are easy to complete, increasing the perceived importance of a study, and contacting individuals through advanced letters and reminders. In my study, I tried to increase the return rate by:

- Mailing questionnaires through BART to increase perceived importance (BART also paid for postage);

- Including postage-paid envelopes; designing questionnaires with multiple section headings and instructions (and pre-testing them several times);
- Providing incentives (i.e., $125 for the experimental group and $75 for the control group);
- Including letters that described the study and survey package contents from researchers at UC Davis, and conducting reminder calls; and
- Conducting reminder calls to participants, who did not return their questionnaires by the specified deadline, for each survey phase.

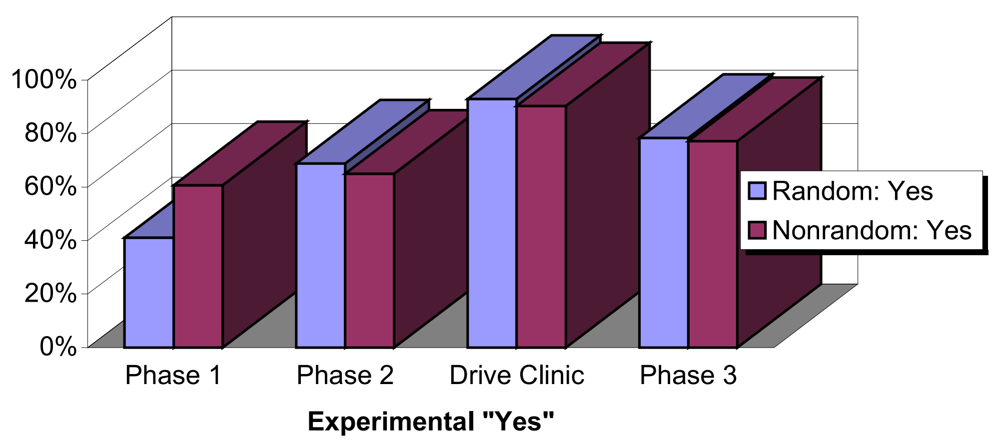
Heberlein and Baumgartner argue that the most effective way to increase response rate is to increase the individuals' perceived importance of the study through multiple contacts. "Each additional contact further serves to convince potential respondents of the importance of their input. Contacts that show some special attention and greater expense and effort by the investigator also would seem to increase a sense of importance" (e.g., telephone calls and personal contact) (Heberlein and Baumgartner, 1978, p. 458).
In this dissertation, a *good* to *very good* response rate was achieved overall, particularly given the longitudinal design (i.e., a three-phase survey). A high response rate is useful because it helps counter the effects of participant bias (i.e., nonrandom recruitment), which is a concern in my study. Indeed, 77% of the initial experimental population was recruited using nonprobability methods.

Twenty-three percent of the experimental population were randomly selected through stratified random sampling by the market research firm. Individuals were recruited through random digit dialing (i.e., 1A and 1B, described above). Twenty-four percent of the randomly selected experimental population completed the study; the other 76% are part of the nonrandom study sample. Again, the entire control group was sampled using nonrandom methods (or the quota method). Thus, there is a sampling bias.

SECTION 5.2 SAMPLING BIAS

To investigate the impacts of the sampling bias, I evaluated the responses of the nonrandomly sampled experimental participants versus the randomly selected experimental group. To assess these effects over time, I examined the response of these two groups on the principal dependent variable in my study (i.e., Would you be willing to join CarLink?). Please see Figure 5.1 below.

Figure 5.1: Do you think that you would use CarLink?



The response of the control respondents must be evaluated separately from the experimental group because the control group was sampled using a nonrandom method and only received one of the three informational stimuli.

Findings indicate that the nonrandom population was initially more positive toward the CarLink concept than the randomly selected group (i.e., only 41.1% of the random population responded that they would be willing to join a CarLink program versus 60.7% of the nonrandom population). In the second phase, the random population response increased by 27.8 percentage points to 68.9%, while the nonrandom population only increased by 4.3 percentage points to 65.0%. At the drive clinic, the difference between each group lessened even more (i.e., 2.7 percentage points). Indeed, for the random population, a positive response to the CarLink concept increased by an additional 24.1 percentage points to 93%. Similarly, the nonrandom population's response increased by 25.3 percentage points to 90.3%. In the final phase, the randomly selected population's response dropped by 14.6 percentage points to 78.4%. And, the nonrandom group's response dropped by 13.1 percentage points to 77.2%. This analysis reveals that the difference in CarLink response between the two groups was much more pronounced at the beginning of the study. Moreover, the difference between the groups decreased throughout the survey. The effects of the sampling bias appear to lessen over time, and the positive response of each group to the CarLink concept became more similar.

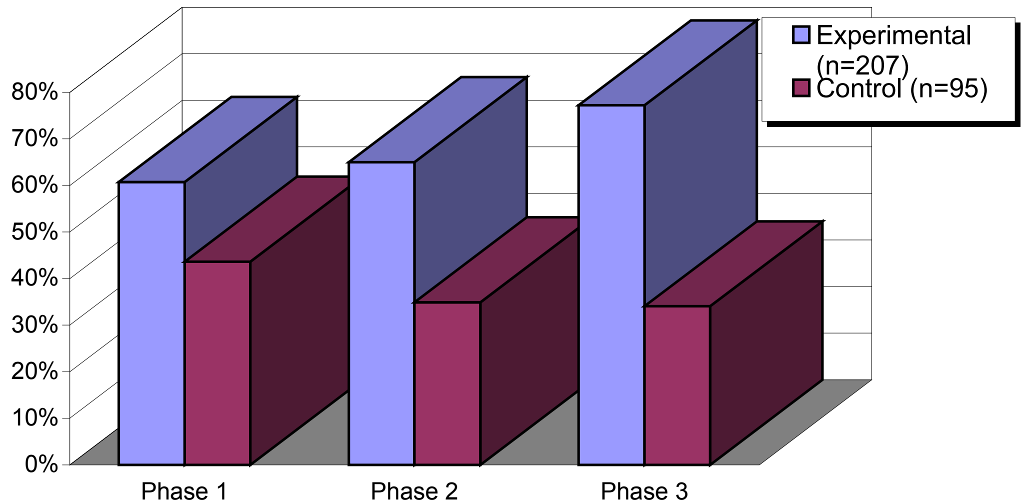
In the first phase, a statistically significant difference was found between the random and nonrandom experimental groups ($\chi^2 = 8.82$, p-value = .003). In the second phase, a difference was not found between the two groups ($\chi^2 = 0.31$, p-value = .580). Lastly, a statistically significant difference was not found in the drive clinic (χ^2 = 0.38, p-value = .538) or final phase (χ^2 = 0.03, p-value = .85).

I might argue that each group is representative of potential target adopters. Further, I might attribute a more positive initial response in the nonrandom group to their early interest in the concept, which may also have motivated them to agree (or contact researchers) to participate in this study. In contrast, the randomly selected group was initially much less familiar with the concept[1], which also might explain the difference in their early response. After exposure to the CarLink educational materials, both groups appeared to be increasingly similar in concept response, despite the initial sampling bias. Finally, I might argue that the educational media, particularly the video and drive clinic, had significant and equalizing effects on the two experimental subgroups (i.e., random versus nonrandom).

It is interesting to note that control participants, who were selected nonrandomly, became increasingly negative toward the CarLink system over time in contrast to the nonrandom experimental group. See Figure 5.2 below.

[1] The random group had less interaction with recruiters/researchers during the recruitment process. They agreed to participate in the study after receiving a very brief phone description from the market research firm.

Figure 5.2: Do you think that you would use CarLink? (Nonrandom Only)



Surprisingly, a significant difference was found in the first phase between the nonrandom experimental and control groups (χ^2 = 9.00, p-value = .003). Perhaps this can be explained by recruitment differences (i.e., newspaper or online article versus BART platform recruitment). As expected, a significant difference was found during the second phase (χ^2 = 25.49, p-value = .000) and third phase (χ^2 = 46.22, p-value = .000). This difference may be attributed to the informational media.

SECTION 5.3 QUESTIONNAIRE DESIGN AND INCENTIVES

For my study, I developed several questionnaires to collect study data from the control and experimental participants. The study questionnaires include:

- Baseline household questionnaire,
- Brochure questionnaire (for each household member to complete, if applicable),
- Video questionnaire for the experimental group and a second-phase questionnaire for the control group (for each household member to complete, if applicable),
- Drive clinic questionnaire for the experimental group and a third-phase questionnaire for the control group (for each household member to complete, if applicable),
- In-vehicle query checklist for the drive clinic, and
- Drive clinic exit interview.

The brochure questionnaire also included CarLink response questions, which were answered by both household participants, if applicable. In this phase, both the experimental and control groups received the same questionnaire, as well as the CarLink brochure. While I encouraged the experimental group to keep the CarLink brochure for future reference, I asked the control group to return it with their initial packet. Control group participants returned their brochures to limit their CarLink media exposure to a one-time event. Most control group participants returned their brochure as requested. If control respondents did not return the brochure with their questionnaires, UC Davis researchers contacted them to return it with their second-phase packet.

The second- and third-phase questionnaires differed slightly for the experimental and control groups. Each household participant received the same questionnaire for each study phase. The difference in the instruments reflects that the control group did not receive any further CarLink media (e.g., the video or drive clinic). Since the experimental group received additional stimuli, these participants were asked to evaluate each instrument and the control group was not. Each of the remaining questionnaires asked the same questions in subsequent phases, except for a few regarding the informational media. The study instruments had to be almost identical to document adaptations over time in response to each stimulus.

For the drive clinic, I developed an in-vehicle query checklist and exit interview questionnaire, along with another researcher whom I directed. I designed the in-vehicle query to document a household's questions regarding the CarLink system when subjects test-drove a CarLink vehicle (i.e., a compressed natural gas Honda Civic, which is also the vehicle used in the field test). The exit interview questionnaire was developed to guide UC Davis researchers in wording questions identically. During the exit interview, researchers asked participants about their interest in joining a CarLink program (i.e., the same question used throughout the survey to test the first hypothesis); how they would like to pay for the CarLink service (i.e., rate and method, such as a credit card); and if they would be interested in any CarLink accessories (e.g., cell phone and Internet access). The drive clinic questionnaire instruments can be found in Appendix I of this dissertation.

5.3.1 Household Study Incentives

In my study, I awarded participants two sets of study incentives (i.e., a different level for the control and experimental groups). To compensate respondents for their time, experimental participants were offered a household incentive of $125 for completing the survey. This incentive covered both household members, if applicable. If an individual was from a single-member household, he or she received the same amount as a two-member household. When participants attended the drive clinic, I gave them a $75 (cash incentive), along with their final survey package. To participate in the clinic, respondents had to return their first- and second-phase questionnaires. When participants returned the final-phase survey, including travel diaries, they received the remaining $50 incentive.

Control group participants were offered a $75 incentive, if they completed all three survey phases. If they did not finish the study, I did not award them an incentive. Lastly focus group participants received a $40 incentive.

SECTION 5.4 INFORMATIONAL MATERIALS

To help test my study hypotheses, I developed several CarLink informational media to monitor change in an individual's response to the smart carsharing concept over time. As mentioned earlier, change is not likely to result from the mere promotion of a product's benefits. Consequently, I directed much attention toward the development of educational media for my dissertation. I aimed to develop materials that attracted the attention of study participants and encouraged learning. According to Fleming (1987), learning is limited to an individual's perceptions, which evolve and develop over time, and can be affected by a designer.

Social marketers argue that it is critical to understand the learning process. Knowledge can help marketers to develop and schedule information streams during an opportune stage, such as precontemplation, contemplation, action, or maintenance (Kotler and Roberto, 1989; Andreasen, 1995). Since this dissertation focuses on participant response to the CarLink concept, rather than reactions to an actual service, my analysis focuses on the first two stages of Andreasen's social marketing model (i.e., the behavioral adoption process).

In developing educational materials, marketers should consider the types and amount of information distributed. At a minimum, it is important to highlight a new product's distinctiveness from other alternatives (e.g., car rental and taxi services as they relate to CarLink). Furthermore, it is essential to emphasize product attributes in educational media because target users typically evaluate product satisfaction on a subset of attributes. In the brochure and video, I discussed differences between carsharing and other modes. Additionally, I described positive carsharing attributes, such as economic savings, reduced vehicle hassle, environmental benefits, and links to activity centers. In addition, I incorporated several communication strategies into material development. I employed the following techniques:

- Developed CarLink name and logo. Extensive research has shown that when two words are associated, forming a mental image, more learning occurs because the two images interact.
- Consistently used CarLink logo and color scheme (i.e., orange and blue) throughout survey; similarity can aid in grouping and labeling new concepts. Furthermore, similarity can aid in the transfer of learning from one situation to another.

- Presented information in organized sections to facilitate learning.
- Introduced novelty to increase an individual's attention, such as: different fonts and colors, animation, and music in the video.
- Used questionnaires after each media presentation to prompt participants to think actively about the smart carsharing concept (Fleming, 1987).
- Integrated headings and titles, where applicable (Resnick, 1981).

Not surprisingly, some techniques appeared to be more effective than others in communicating the carsharing concept and its attributes to the study population. Participant reaction to CarLink after each stimulus (i.e., what don't they understand, and do they want any additional information) is discussed in the following text. Please see Chapter 7: Longitudinal Survey Results for participant reaction to CarLink stated use after each stimulus.

5.4.1 Brochure Development

In developing the brochure, I employed several communication techniques with the aid of an advertising firm, Montgomery Pfeifer. The San Francisco-based advertising firm, well known for its work on new products and technologies, was contracted to design the brochure and illustrations. Due to their interest in the carsharing concept, the firm provided their services at a greatly reduced rate.

Magill *et al.* (1981) provide the following recommendations for developing informational materials:

1. Determine specific objectives for materials (e.g., carsharing attributes, costs of traditional auto use, benefits of CarLink, demonstrating how this system works);
2. Develop copy and illustrations;
3. Pretest draft brochure;
4. Revise and complete production;
5. Provide contact information on materials to encourage communication between target market and project managers[2];
6. Distribute materials to target population; and
7. Evaluate brochure effectiveness.

Each of the steps outlined above was followed in developing the CarLink brochure. Not surprisingly, it is critical that informational media are "…attractive and of high quality, and produced as professionally as possible" (Magill *et al.*, 1981, p. 40). The CarLink brochure design was further enhanced by using cover graphics, which are important in attracting a reader's attention, employing photographs and illustrations, and avoiding large blank spaces, which can reduce reader attention (Magill *et al.*, 1981).

After designing the first mock-up brochure, I pretested the draft among transportation innovation experts (i.e., from the Institute of Transportation Studies-Davis (ITS-Davis), Honda, and BART). On the basis of their input, I made many changes to the design, text, and artwork. A second mock-up was circulated for a final pretest; during this evaluation, experts requested only minor changes to the draft copy.

After participants reviewed the brochure, only 7.6% of the individuals in the total sample said they did not understand the concept; however, this self-reported figure is doubtful. I hypothesize that many individuals might have confused a carsharing organization with a rental car company. After reviewing the brochure, 54% of respondents indicated that there were CarLink features that they did not understand, including[3]: costs (17.2%); maintenance/insurance (16.3%); vehicle availability (15.6%); CarLink lots (13.5%); getting to and from CarLink lots (8.4%); other (6.3%), and reservations (3.7%). Furthermore, several participants requested more information about costs (12.1%); lot locations (8.4%); and logistics (5%). Another 5.9% wanted more information, but they did not specify what this was.

See Table 5.3 (below) for a summary of suggestions for improving the brochure. These suggestions were collected from an open-ended question asked of the entire study population (i.e., both experimental and control) in the brochure questionnaire.

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[2] I provided contact information in both the brochure and video. During the survey, I received several calls about completing and returning questionnaires. However, these participants did not request additional information about the CarLink system.

[3] Percentages are calculated on total respondents to this question.

Table 5.3: Responses to Brochure Improvement Question

Suggestions for Improving the Brochure		
Responses	**Number of Responses**	**Percentage**
No suggestion	71	N/A
Need more information on service	35	21.3%
Problems with numbering system	32	19.5%
Problems with "map" or fold format	29	17.7%
Need more information on costs	19	11.6%
Confusing layout	15	9.2%
Too long	12	7.3%
Need more information on lot location	10	6.1%
Color/pictures need improvement	9	5.5%
Need examples	3	1.8%
Total	**164**	**100%**

Over 160 comments for improving the brochure were collected from the total population. Not surprisingly, this brochure could be substantially improved to address the concerns and questions of potential target adopters. A majority of the comments focused on the brochure design and format. The selected design was intended to pique the interests of readers and introduce some challenge (or novelty) to sustain attention. However, the "mapping" design (i.e., the brochure was designed to be the size of a map and folded to look like one) was not the best for this market segment. A simpler design with more detail on costs, lot location, and reservations should be developed.

5.4.2 Video Development

As an alternative to brochures, Bandura (1977) promotes videos and live demonstrations due to the significant impacts of observed behavior on learning. Winett and Kagel (1985) also suggest the use of videos for presenting interesting stories that depict individuals employing the new behaviors (e.g., using the CarLink system). Thus, I also developed a carsharing modeling video. I designed the resulting 12-minute, CarLink video in conjunction with two UC Davis researchers and Creative Communication Services, a Division of Information Technology at UC Davis.

In developing the video, I employed several media-based learning techniques. Researchers investigating how individuals learn from videos provide the following suggestions:

- Reduce video complexity by using simple language (Reeves and Thorson, 1986).
- Design the program so the video and audio convey the same message (Grimes, 1990).
- Use story examples that help convey the video's central message (e.g., using CarLink is simple and convenient) (Meadowcraft and Reeves, 1989).
- Use several examples to represent different applications (e.g., CarLink being used by several families with different lifestyles) (Tennyson, 1980).
- Display attributes (e.g., convenience, smart technologies, intermodal access, multiple lots and vehicle models, environmental benefits, etc.) to increase concept learning (Anderson and Faust, 1973).

- Provide pauses between complex segments, such as unrelated scene changes. This provides time for perceptual processing. Thus, music and explanatory examples were used to give the audience time and assistance in processing new information (Cennamo, 1993).
- Use of pictures to repeat verbally stated information (e.g., a CarLink economic comparison figure and use of parking spaces by multiple cars). This technique has been demonstrated to increase learning over a verbal display alone (Levie and Lentz, 1982).

I pretested the video among BART employees and several innovation experts at ITS-Davis and Honda. On the basis of their input, I made many changes to the design, script, and footage. A second mock-up was circulated for final review, during which experts requested only minor changes to the draft video.

After experimental participants reviewed the video, only 1.4% of the individuals said they did not understand the concept. After watching the video, 22% of respondents indicated that there were still CarLink features that they did not understand, including[4]: costs (3.8%), CarLink lots (3.1%), vehicle availability (2.3%), maintenance/insurance (1.5%), and reservations (1.5%). It is important to note that the percentage of respondents listing each of these items decreased from those reported after the brochure presentation (discussed earlier). In addition, a new area of misunderstanding was listed, i.e., uncertainty about accessing different vehicle models (1.5%), although only a few participants listed this response.

Although fewer than the previous phase, several participants requested more information about costs (9.5%); lot locations (15%); vehicle availability (11%); and maintenance and insurance (3.6%). There was a 6.6 percentage point increase, however in information requests regarding lot locations (i.e., from 8.4% to 15%). In addition, 11% requested information about vehicle availability, and 3.6% wanted more information about vehicle maintenance and insurance. I suspect that this increase in informational requests for lot locations, vehicle availability, maintenance, and insurance reflects the increasing interest of participants in where and how these services might be located and operated. The video does not provide specific details about lot locations, vehicles, and operations. Rather, it provides a few scenarios that demonstrate individuals using the CarLink service. The overall increase in questions asked might suggest that many participants are moving from the precontemplation phase of behavioral adoption into contemplation (i.e., they have begun to assess the benefits and costs of usage). Hence, a more detailed video might be developed in the future, which addresses all of these questions.

See Table 5.4 (below) for a summary of suggestions for improving the video. These suggestions were collected from an open-ended question contained in the experimental group's video questionnaire.

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[4] Again, percentages are calculated on the total respondents who answered this question.

Table 5.4: Responses to Video Improvement Question

Suggestions for Improving the Video		
Responses	**Number of Responses**	**Percentage**
Good—no suggestions	35	——
Need more information on service	15	20.3%
Need more information on costs	13	17.6%
Style is dated (e.g., too formal or poor quality)	8	10.8%
Need more examples of other households	8	10.8%
Did not like music	7	9.4%
Need more information on accessories (e.g., car seats and bikes)	5	6.7%
Need more information on safety and security	5	6.7%
Need more information on vehicle availability	4	5.4%
Video adds nothing new	3	4.1%
Did not like narrator	3	4.1%
Confusing or too complicated	3	4.1%
Total	**74**	**100%**

Over 70 comments for improving the video were collected from the experimental group. Although the video could be improved to address the concerns and questions of potential target adopters, overall, it was received more positively than the brochure. A majority of the comments focused on the need for additional information about services, costs, and vehicle availability. An updated design was also suggested that includes more examples, different music, and another narrator. Only a few (i.e., 2.8%) said that the video was too complicated. Indeed, 32% responded that the video was good and did not provide any suggestions for improving it.

In this phase, I also asked participants whether the CarLink video clarified any questions that they had about the innovation after reading the brochure. Almost half of respondents said the video clarified questions they had about CarLink.

SECTION 5.5 DRIVE CLINIC DEVELOPMENT

The drive clinic provided study participants with an opportunity to use a smart card to access a CarLink vehicle; release the vehicle immobilizer, which blocks unauthorized use; and drive a CarLink CNG vehicle. During this experiment, participants were accompanied by a researcher—trained and directed by myself—who documented participant observations, questions, and concerns. Prior to the clinic, I carefully trained, researchers on leading participants through the trial/demonstration and recording responses on the in-vehicle query checklist and exit interview questionnaire. I instructed researchers to use the exit-interview wording exactly and to precisely record responses. See Chapter 8: Drive Clinic Summary for a more detailed discussion and results from the in-vehicle query and exit interview.

At the end of the clinic, each participant completed a 20-minute exit interview. During this interview, researchers documented participant response to the CarLink system and willingness to participate and pay for such a system. At the end of the clinic, respondents received a travel diary and final questionnaire to take home. Over the next few weeks, they completed these materials. This process allowed participants time to reflect on their observations from the clinic and answer questions about the CarLink concept within the context of their actual travel. The drive clinic was conducted in September 1998.

I developed this “live demonstration” tool to add to the set of learning stimuli tested in my study. Building on video modeling theory, I incorporated a few additional principles into this media, including:

- An opportunity to practice or experiment with a new system or concept (e.g., the smart carsharing technologies) is important and aids in the learning process (Fleming, 1987).
- Demonstration of new skills can lead to the understanding and confidence of participants (Berliner and Gage, 1976).
- Feedback to participants facilitates learning (Kulhavy, 1977).

After experimental participants attended the drive clinic, only 0.5% of individuals said they did not understand the concept. After attending the clinic, 8.3% of respondents indicated that they still did not understand some of the CarLink features, including[5]: costs (4.2%); availability (3.3%); other (3.2%), which includes lots, insurance, refueling, and reservations; and CarLink lots (1.1%). It is interesting to note that while the level of understanding increased in most areas, there was a .4 percentage point decrease in cost understanding and a one percentage point decrease in vehicle availability understanding after the clinic. I suspect that the change in vehicle availability understanding reflects confusion resulting from the clinic itself. The clinic differs from the CarLink concept presented in the brochure and video in that it demonstrates the system on a significantly

[5] Again, percentages are calculated on the total respondents who answered this question.

reduced scale (i.e., only one lot and vehicle style) than had been conveyed in the earlier informational media.

For some, this demonstration may have provided a great deal of useful information for evaluating CarLink (perhaps more because the sample live and work in the Dublin/Pleasanton region). However, for others, the limited “trial” scale may have confused participants who thought a broader system would be available. Hence, it is difficult—if not impossible—to separate the possible impacts of this stimulus on the survey population. This is why an actual demonstration, consisting of multiple lots, vehicles, and transit stations, will likely provide a more accurate test of the target market for this service.

Furthermore, several participants requested more information about costs (9.0%); lot locations (15%); vehicle availability (12%); and 4.0% wanted more information about maintenance and insurance. Overall, these percentages remained relatively stable between the video and drive clinic media, with a slight increase in informational requests on vehicle availability (i.e., one percentage point) and maintenance and insurance (i.e., .4 percentage point).

I suspect these requests remained stable through this stimulus because many details were not yet available for an actual service (i.e., the clinic still tested response to the concept versus an actual product). This is a limitation of all the informational media. It is impossible to provide a detailed description of services that do not yet exist.

Nevertheless, it is still important to gather response data to determine whether or not such concepts should be pursued. Consequently, these data demonstrate that individuals respond to the concept but still have many unanswered questions. Hence, response estimates should be considered with caution.

See Table 5.5 (below) for a summary of suggestions for improving the drive clinic. These suggestions were collected from an open-ended question contained in the final-phase questionnaire distributed to the experimental population.

Table 5.5: Responses to Drive Clinic Improvement Question

Suggestions for Improving the Clinic		
Responses	**Number of Responses**	**Percentage**
Good/no suggestions	72	N/A
Liked interviewers	11	N/A
Liked test drive	3	N/A
Need more information on costs, lots, etc.	15	26.3%
Disliked test drive	8	14.0%
Provide more accessories (e.g., vehicle styles, and receipts with reservation system)	8	14.0%
Disliked interviewers	7	12.3%
Allow participants to drive CNG vehicles on freeways	5	8.8%
Not helpful	5	8.8%
Deploy from two stations, so users can see how a multi-port station would work	5	8.8%
Too short—wanted more time	4	7.0%
Total	**57**	**100%**

Only 57 comments for improving the drive clinic were collected from the experimental group. Although the drive clinic may have addressed many participant questions and concerns from earlier phases, many individuals asked similar questions to those after the video. This implies that more detailed and specific information is necessary for the drive clinic. A majority of the comments about the clinic focused on the need for more information about services, costs, and vehicle availability. Several disliked the vehicle test drive itself. Others requested that more accessories (e.g., receipts) be included in the clinic to further demonstrate the system. Finally, several commented on the clinic design, suggestions included using other interviewers (or researchers), providing longer participant appointment times, and allowing participants to drive the CNG vehicles on the freeway to get a better feel for acceleration. It is interesting to note that over 86 positive comments were also received, which included: good drive clinic, no suggestions for improvement; liked the interviewers; and enjoyed the test drive. Researchers also asked participants whether the drive clinic clarified any questions they had after watching the video. Again, almost half of the respondents said that the drive clinic clarified their questions.

Despite participant concerns about the informational materials, the study media provide a significant amount of input for designing marketing materials in the future. These suggestions can be used to improve educational stimuli to make them more helpful to target adopters as they move through the behavioral adoption process.

SECTION 5.6 FOCUS GROUPS

For my study, I designed the focus groups to provide a setting in which several survey participants came together in October 1998[6], to explore larger visions of a CarLink system in the San Francisco Bay Area. I intended this process to reflect how users constructed and imagined a larger CarLink service. These images were built by the group through their discussion of their experiences during the longitudinal survey, the drive clinic (if applicable[7]), and subsequent reflection on the concept. Through the process of building such images, participants revealed what they considered to be the essential features of such a system. These features included key system design elements (e.g., what types of cars are available, where they are available, how they are accessed, how use is billed, etc.).

By constructing this image, participants revealed how much they valued the new transportation service, how that value was constructed, and whether this system in fact complements (e.g., adds riders to transit) or competes with (e.g., draws riders from transit) conventional transit services. Thus, the final images produced were less important than what was revealed in the process of building the images. A "consensus" image of a widespread CarLink system did not necessarily emerge from each of the groups. Please see Chapter 7: Focus Group Summary for a synthesis of the study results.

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[6] I moderated three focus groups with drive clinic participants and one focus group with control participants in October 1998.
[7] This was not the case for control group participants.

The next chapter focuses on the baseline or sociodemographic, psychographic, and trip characteristic data for the experimental and control group participants in my study. I used these data to describe the study population and determine whether or not they are heterogeneous. Sample heterogeneity helps me rule out that differences in CarLink response are due to independent factors versus informational media.

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CHAPTER SIX: BASELINE ANALYSIS OF STUDY POPULATION

SECTION 6.0 INTRODUCTION

This dissertation examines the results of a four-month longitudinal survey and four focus groups, designed to collect participant reactions to the CarLink concept. I developed this survey to gather and monitor change in response. The first survey instrument I administered to households was the baseline questionnaire which was designed to collect independent variable data, including sociodemographics and attitudes toward transportation, the environment and experimentation. The results are presented below.

Baseline data are critical to my dissertation for two main reasons. First, they provide a profile of study respondents prior to participation in the CarLink study. I later use these results to describe early CarLink adopters (i.e., Chapter 7: CarLink Longitudinal Survey Results). Second, I use these data to identify potential differences between the experimental and control groups. In this chapter, I discuss homogeneity between samples across a range of independent or explanatory variables. Dissimilarities can be used to help explain CarLink response differences over time. When the two groups are similar, I can more confidently attribute a difference in CarLink response to the informational media as opposed to another factor. Further, I examine demographic variables to identify potential differences between study dropouts and individuals that completed the survey.

This chapter includes frequencies and summary statistics for evaluating variable homogeneity across the study groups, as well as characterizing the sample population. Study results are organized into the following sections:

- Demographics (e.g., age, income, etc.);
- Travel characteristics and mode choice;
- Psychographics (i.e., attitudes toward transportation, the environment, and experimentation);
- Other issues, including participation in time-share vacation rentals, health and country clubs, and food cooperatives.

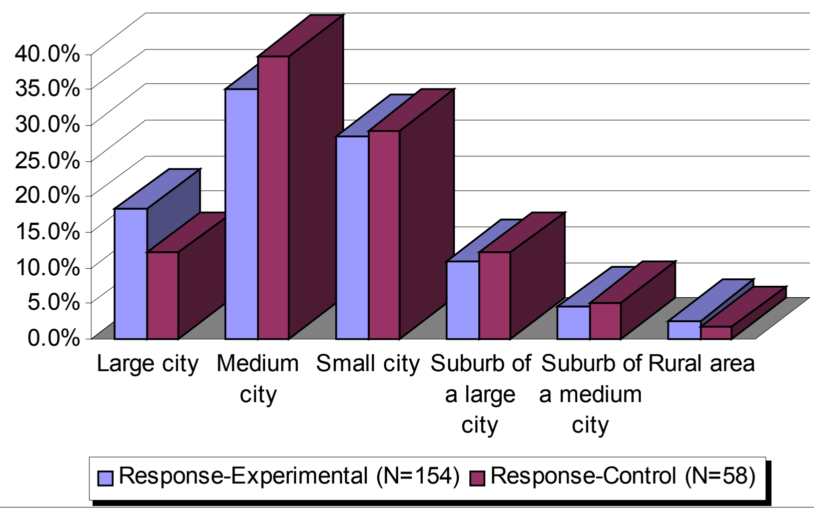
SECTION 6.1 DEMOGRAPHICS

In my study, demographic characteristics include community and household size, income, marital status, age, gender, income, auto ownership, education, employment status, occupation, and number of licensed household drivers. I examine all of these factors because most, if not all, influence mode choice. Specifically, I use them to profile the study population and explore their significance to current mode preference. Further, I employ them to test for sample homogeneity between the experimental and control groups. Chi-square and t-test statistics and p-values are used to determine whether or not the samples are statistically different (i.e., homogeneous) or not. Analysis of variance is also used, where appropriate.

6.1.1 Community Size

Community size is often an important variable to mode choice because it is an indication of land use characteristics and residential density. For instance, individuals who live in rural areas are more dependent on automobiles than individuals living in cities with better transit access. Of the sample households, 81.6% live in cities (i.e., ranging in size from large to small), and 16.0% live in the suburbs. (See Figure 6.1 below.)

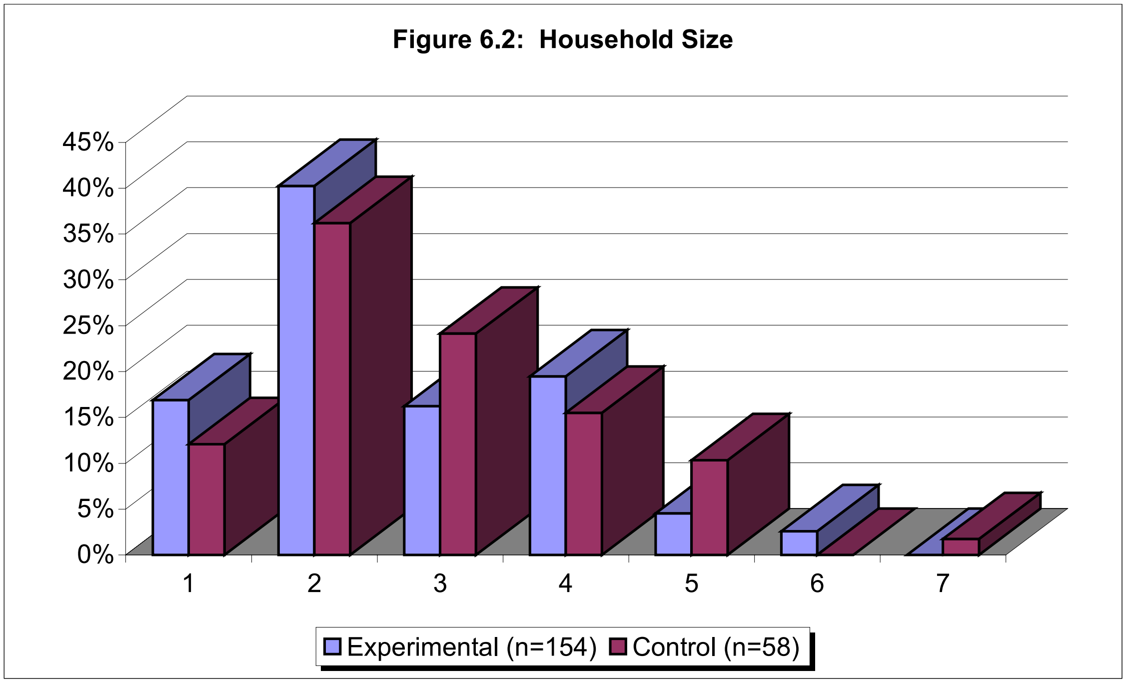
Figure 6.1: Community Size



The percentage distribution for the control and experimental households is an approximate. There is no statistical difference for this variable between the control and experimental groups ($\chi^2 = 1.42$, p-value = .922). Medium city (i.e., between 50,000 and 250,000 inhabitants) has the highest percentage of total participants and small city has the next highest.

6.1.2 Household Size

Household size is an important indicator of travel demand. Typically, larger households make more trips, which may also have an impact on mode choice. Household size ranges from one person living alone to seven individuals. (See Figure 6.2 below.)



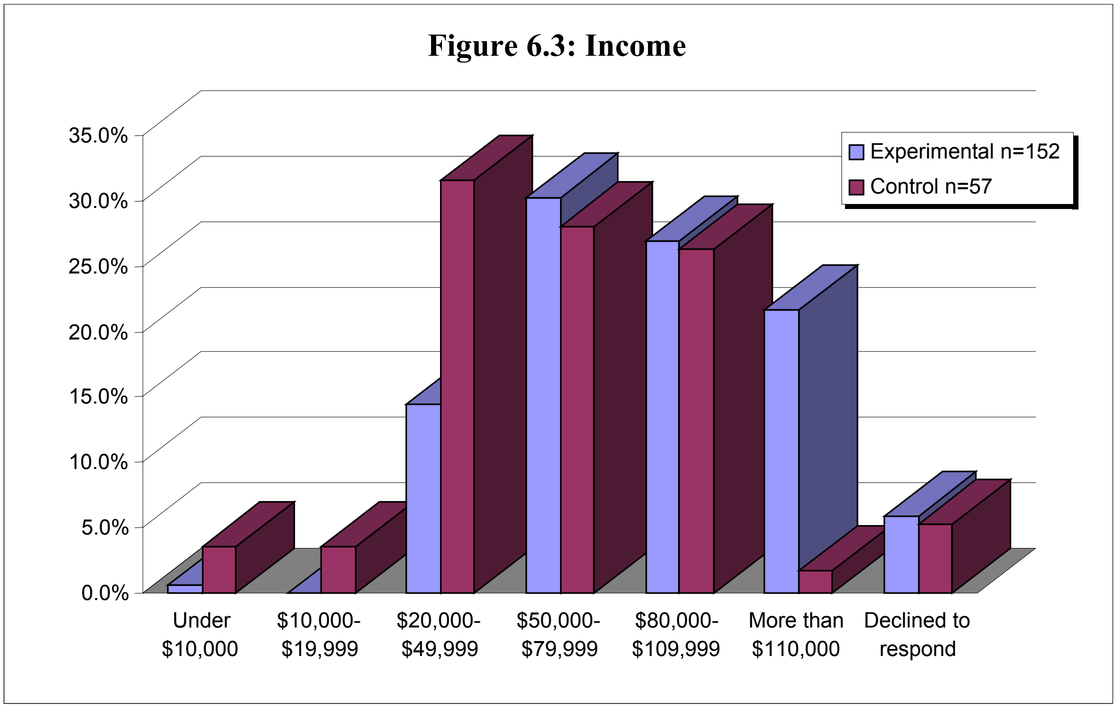
Over 91% of households have four members or fewer. Two-member households account for 39.2% of the total. The average household size for the experimental and control groups are 2.62 and 2.83, respectively. No statistical difference was found between the control and experimental groups for household size (t-test = 1.05, p-value = .295). For this variable, dropouts are the same as nondropouts (t-test = -1.814, p-value = .071). Further, no difference was identified between the different phases of dropouts (i.e., Phase

2 and 3). ANOVA results for group interaction (i.e., experimental vs. control) and the main dependent variable in this study (i.e., Would you be willing to use CarLink?) are also insignificant (i.e., F = 1.123, p-value = .291). The ANOVA results for household size, run against the main dependent variable and the experimental vs. control variable, did not indicate a statistically significant relationship with the dependent variable. (See ANOVA source table below.)

ANOVA Source Table: Household Size					
Source	**Sum of Squares**	**df**	**Mean Square**	**F**	**Significance**
Experimental versus Control	3.423	1	3.423	2.193	.140
Would Use CarLink System	4.518	1	4.518	2.895	.090
Interaction	1.752	1	1.752	1.123	.291
Error	319.971	205	1.561		
Total	1801.000	209			

6.1.3 Income

Higher incomes produce more travel (United States Department of Transportation, 1995). Hence, it is important to look at this variable and its potential influence on travel demand and mode choice. The range for household income is from $10,000 to over $110,000. Only five households (about 2.5% of 200 valid households, excluding 12 households that refused to respond to this question) are below $20,000, and 72.8% have an income of at least $50,000. Approximately 17%, or thirty-four households, have an income above $110,000 a year (See Figure 6.3 below.). Overall, the sample has a relatively high income.



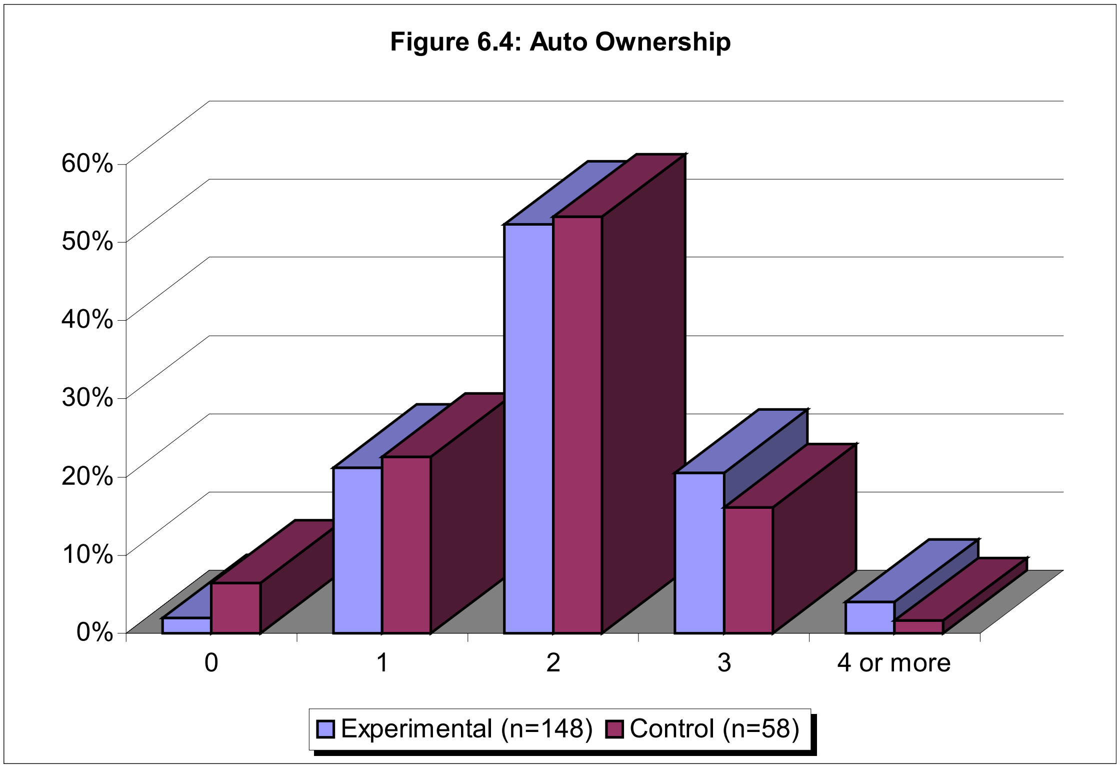
A statistically significant difference between these two groups was found (χ^2 = 24.27, p-value = .000). The group difference is likely due to the high proportion of experimental participants (i.e., sample Groups 3 and 4), who work at Lawrence Livermore National Laboratory (i.e. the employment center in the CarLink field test). However, for testing my study hypotheses, this difference in income is not a serious concern.

I used several crosstabs of income and the main dependent variable (i.e., “Would you be willing to join CarLink?”) to evaluate potential impacts of this variable on study results. A statistically significant (i.e., p < .050) relationship was only found for the crosstab of income and CarLink response during the first phase. In the second and third phases, this relationship was no longer statistically significant (i.e., the p-values ranged from .161 and

.875) for the control and experimental groups. For income, the dropout group is similar to nondropouts (χ^2 = 6.208, p-value = .400).

6.1.4 Auto Ownership

Not surprisingly, auto ownership has direct effects on mode choice and travel. Indeed, individuals who do not own vehicles are more likely to choose other travel modes than those who do. In my sample, only seven households claimed they do not own any vehicles while another seven reported that they own four vehicles or more. Over 52% of the sample households have two vehicles. (See Figure 6.4 on next page.) Data indicate that there are no significant differences between the control and experimental groups (χ^2 = 3.231, p-value = .072).



6.1.5 Age

As expected, age and lifestyle affect travel demand. At different life stages, individuals travel more, which also affects mode choice. Hence, it is important to examine this variable relative to mode preference and CarLink interest. Over 92% of the participants are between 24 to 64 years of age. (See Table 6.1 below.) Again, age distribution for each category is about the same across the two groups (χ^2 = 0.793, p-value = .851). Dropouts are approximately the same as nondropouts for age (χ^2 = 0.849, p-value = .991).

Table 6.1: Age

Age	Experimental (n=207)	Control (n=95)	Total (n=302)	Dropouts (n=128)
23 or younger	2.9%	4.2%	3.3%	4.7%
24-40	44.9%	38.9%	43.0%	45.7
41-64	49.8%	49.5%	49.7%	48.0%
65-74	2.4%	2.1%	2.3%	1.6%
75 or older	0.0%	5.3%	1.7%	0.0%
Total	**100%**	**100%**	**100%**	**100%**

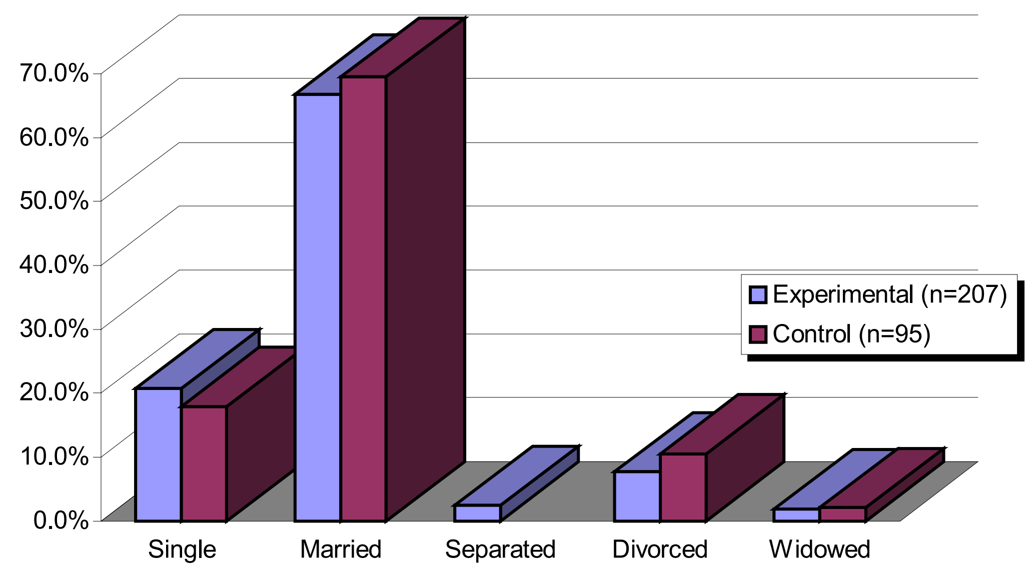
6.1.6 Gender

Overall, women make slightly fewer trips than men. Hence, it is important to explore this variable to understand its potential effects on mode choice and CarLink. Total female participation in this study is one percentage point less than that of the male population. However, the control group has a higher percentage of females than males (53.7% females vs. 46.3% males, n=95). The reverse is true for the experimental group (51.0% males vs. 49.0% females, n=207). Nevertheless, the experimental and control groups are not significantly different (χ^2 = 0.56, p-value = .453). The dropouts are the same as nondropouts for gender (χ^2 = 0.549, p-value = .999). Lastly, there is no difference between the different phases of dropouts (i.e., Phase 2 and 3).

6.1.7 Marital Status

Marital status may affect travel demand. For instance, individuals who are single may travel more than married couples. Consequently, I included this variable to determine its potential effects on mode choice. The marital status distribution is shown in Figure 6.5 below. A statistically significant difference was not found among the control (n=95) and experimental (n=207) groups (χ^2 = 6.43, p-value = .798); therefore, these groups are homogenous. Dropouts are also similar to nondropouts (χ^2 = 9.220, p-value = .161). Finally, there is no difference between the different dropouts from the various study phases (i.e., Phase 2 and 3).

Figure 6.5: Marital Status



6.1.8 Education

Education generally has strong effects on travel (United States Department of Transportation, 1995). Hence, it is an important variable for consideration in this dissertation. Over 58% of participants have a Bachelor's degree or higher. Over 19% have a Master's degree or Ph.D. (See Table 6.2 below.) In contrasting the education level of the experimental and control group participants, I found that 63.1% of control and

56.5% of experimental participants have a Bachelor's degree or higher. The control group has a slightly higher education level than the experimental. Since this difference is rather small, a statistically significant difference was not identified between the experimental and control groups (χ^2 = 6.04, p-value = .750). Furthermore, dropouts are the same as nondropouts (χ^2 = 3.200, p-value = .783). Lastly, there is no difference between the various dropouts (i.e., Phase 2 versus 3).

Table 6.2: Education

Education Level	**Experimental (n=207)**	**Control (n=95)**	**Total (n=302)**	**Dropouts (n=128)**
Some high school	1.0%	2.1%	1.3%	0.8%
High school	8.2%	9.5%	8.6%	4.7%
Some college	20.8%	20.0%	20.5%	21.1%
Vocational school	6.8%	2.1%	5.3%	7.8%
Associate's degree	5.3%	3.2%	4.6%	4.7%
Bachelor's degree	27.1%	28.4%	27.5%	25.8%
Some graduate school	10.1%	14.7%	11.6%	11.7%
Master's degree	14.0%	15.8%	14.6%	10.1%
Ph.D.	5.3%	4.2%	5.0%	7.8%
Missing data	1.4%	0.0%	1.0%	5.5%
Total	**100%**	**100%**	**100%**	**100%**

6.1.9 Employment Status

Employment status is related to travel demand and mode choice, particularly for non-workers. In my study, 90.1% of total participants either work full-time, part-time, or are self-employed. Full-time employment accounts for 71.9% of the total sample size. In the experimental group, 91.3% of the individuals are full-time, part-time, or self-employed.

(See Figure 6.6a below.) For the control group, this percentage is lower (i.e., 87.4%.)

(See Figure 6.6b below.)

Figure 6.6a: Employment Status-Experimental Group (n=207)

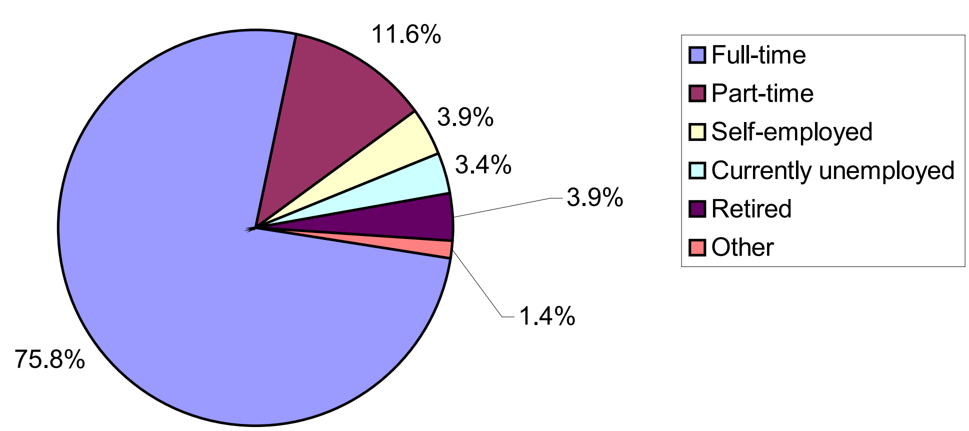
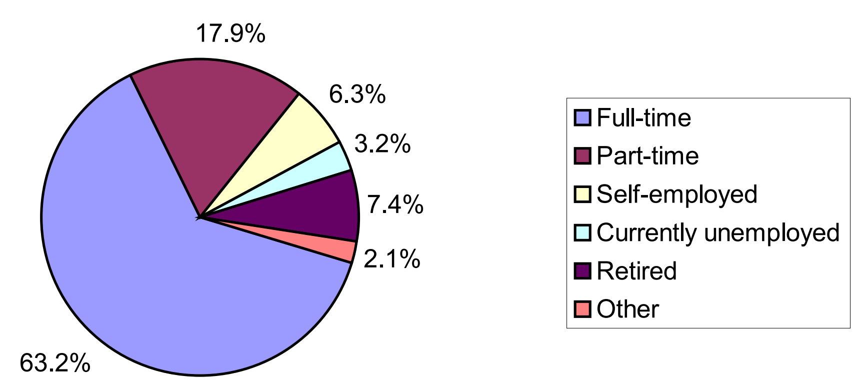


Figure 6.6b: Employment Status-Control Group (n=95)



This slight difference might be explained by gender. Recall that the control group had a higher percentage of female participants than males. In the control group, employment rates might be slightly lower in part because some women are not employed outside their home. Nevertheless, a statistically significant difference was not found between the two groups (χ^2 = 5.826, p-value = .212). Dropouts are the same as nondropouts (χ^2 = 5.982, p-value = .425). Further, there is no difference between dropouts from different phases (i.e., Phase 2 versus 3).

6.1.10 Occupation

Not surprisingly, an individual's occupation (e.g., traveling sales) can often affect travel demand and mode choice. In this survey, 45.7% of total participants work in professional jobs; 17.9% are in managerial or administrative positions; and 11.2% are employed in clerical jobs. (See Table 6.3 below.)

Table 6.3: Occupation

Occupation	Experimental (n=207)	Control (n=95)	Total (n=302)	Dropouts (n=128)
Professional/technical	46.9%	43.2%	45.7%	54.7%
Manager/administrator	18.8%	15.8%	17.9%	10.9%
Clerical	12.1%	9.5%	11.2%	10.2%
Sales	4.8%	4.2%	4.6%	8.6%
Service/repair	4.3%	9.5%	6.0%	3.1%
Production/construction	4.3%	3.2%	4.0%	2.3%
Homemaker	3.4%	9.5%	5.3%	4.7%
Missing data/other	5.4%	5.1%	5.3%	5.5%
Total	**100%**	**100%**	**100%**	**100%**

A statistically significant difference was not found between the experimental and the control groups (χ^2 = 2.79, p-value = .990). Furthermore, dropouts were not significantly different from individuals who completed the survey (χ^2 = 9.14, p-value = .240).

6.1.11 Driver's License

Finally, a driver's license is required for auto use or operation. Hence, it is an important variable for mode choice understanding. Over 98% of the participants who completed this study had a driver's license, with little difference between the experimental and control groups. The percentage of dropouts with a driver's license (i.e., 97.6%) was not significantly different from the nondropouts (χ^2 = 0.0426, p-value = .837). Thus, it is highly unlikely that individuals dropped out of the study because they did not have a driver's license and would not be able to drive a CarLink vehicle.

6.1.12 Dropouts

In this study, there were few control group dropouts, particularly during Phase 2. I did not identify any major differences between the control and experimental dropouts. A more useful comparison is that of dropouts to nondropouts (i.e., both control and experimental). Throughout, no significant differences were found between these groups. In this chapter, I only report dropout trends for sociodemographic variables.

6.1.13 Summary

Overall, the experimental and control groups had a high degree of homogeneity across the sociodemographic characteristics. Only one difference was identified: household income. Sample homogeneity is very important for testing this study's hypotheses. It helps me to isolate the effects of other factors beyond the experimental media (i.e., exposure to carsharing information). Interestingly, in my analysis, none of the sociodemographic variables described above were significant predictors in my mode choice or stated CarLink usage models (See Section 6.5: Mode Choice Models, for this analysis).

SECTION 6.2 TRIP CHARACTERISTICS AND MODE CHOICE

In my study, trip characteristics and mode choice factors include:

- Vehicle miles of travel (VMT),
- Number of household commuters,
- Carpool/vanpool participation,
- Commute modes,
- Household vehicle availability,
- Rental car use,
- Daily activity modes,
- Weekly trip activities,
- Commuting costs,

- Location of nearest transit station,
- BART acceptance, and
- Attitudes toward current ways of getting around.

These results are important because they help explain how, how often, and why the study participants currently travel and if vehicle availability (e.g., station locations or schedules) might affect their current mode choice. It is also helpful to understand the relative importance of trip characteristics (e.g., commute costs), sociodemographic variables, and psychographics (i.e., attitudes toward transportation and the environment) on mode choice. This knowledge can help transportation researchers in marketing a new transportation product to target adopters (e.g., transit station distance and cost are critical factors in mode choice). Such information could be used to selectively target various market segments for a new transportation product. Trip characteristics and mode choice results are as follows.

6.2.1 Household Vehicle Miles of Travel

Approximately 81.1% of total study households reported that they drive over 10,000 miles per year, and 15% of households said they drive less than that per year (see Figure 6.7 below). In Europe, individuals who drive less than 10,000 miles per year are considered ideal candidates for traditional carsharing schemes (i.e., individuals obtain a vehicle from a single lot, return it to that same lot after their trip, and use carsharing to supplement transit and nonmotorized trips).

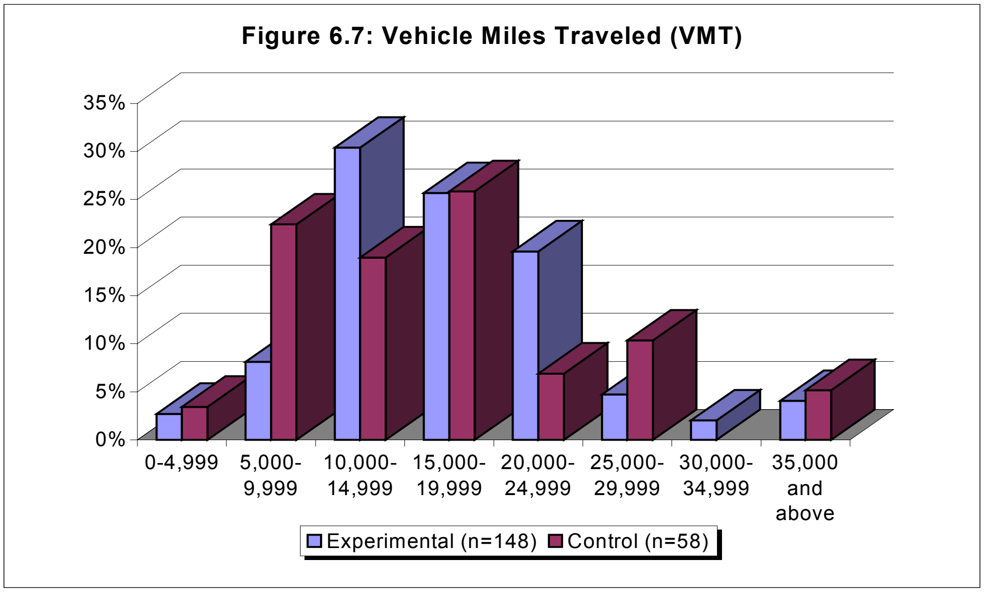


Figure 6.7 shows the VMT percentage distributions for the experimental and control groups. There is a significant difference between the control and experimental groups for this variable ($\chi^2 = 16.68$, p-value = .020). No particular trend, however, differentiates these two groups (e.g., the experimental group does not make longer or shorter trips than the control group). I included VMT in early mode choice models (see Section 6.5) and the CarLink user model (see Chapter 7: Longitudinal Survey Results). However, VMT was not a significant predictor in any of the models. Thus, I conclude that this difference between the control and experimental groups is not a serious concern to my results and hypotheses.

In the United States, an average household drives about 15,000 miles per year (United States Department of Transportation, 1995). Consequently, Americans make fewer transit and nonmotorized trips than Europeans. Indeed, less than 2% of trips are made by transit in the U.S. (Vincent *et al.*, 1994); hence, it is an interesting question whether or not carsharing linked with transit might work in the United States. In this study, the CarLink model offers a potentially more convenient and flexible service than the traditional carsharing systems of Europe. The CarLink concept is based on the notion of a dense-lot network, which is planned to facilitate convenient access to transit and other popular activity centers and one-way rentals (i.e., an individual does not have to return a vehicle to the same lot he or she rents it from). In contrast, practically all carsharing models require that individuals conduct rentals from the same lot.

In this way, CarLink has the potential to aid travelers in accessing shared-use vehicles for frequent trips (e.g., commuting) rather than just occasional ones. If economically viable, CarLink might offer Americans an alternative to owning a second or third household vehicle, by allowing one or more household members to make their trips through a multi-modal network facilitated by CarLink (i.e., links to transit and lots available in employment centers and residential areas). The difference between CarLink and traditional carsharing is that CarLink attempts to create a network, or "web" of lots, linked to transit, which might allow many more individuals to use it regularly than the two-way lot design. Consequently, the high percentage of VMT reported by participants in this dissertation may not be as great an obstacle to carsharing as one might expect of a traditional carsharing model in the U.S.

6.2.2 Number of Household Commuters

Of the total households surveyed in my study, 56.9% had one to two commuters, 10.3% had three or more commuters, and 2.3% had no commuters. (See Table 6.4 below.)

Table 6.4: Household Commuters

Number of Household Commuters	Experimental (n=207)	Control (n=95)	Total (n=302)
0	1.9%	3.2%	2.3%
1	30.5%	18.9%	26.8%
2	31.4%	27.4%	30.1%
3	4.3%	4.2%	4.3%
4	4.3%	4.2%	4.3%
5	1.0%	2.1%	1.3%
6	0.5%	0.0%	0.4%
Missing Data	26.1%	40.0%	30.5%
Total	**100%**	**100%**	**100%**

Statistically, the experimental and control groups are similar (t-test = 0.737, p-value = .462). ANOVA results for the experimental versus control interaction and the dependent variable are also insignificant (F = 0.683, p-value = .409). Following is the factorial ANOVA table for the number of household commuters that was run against the main dependent variable and group participation (i.e., experimental vs. control). The F scores are not high enough to conclude that the group participation and commuter variables interact in influencing the dependent variable.

ANOVA Source Table: Household Commuters					
Source	**Sum of Squares**	**df**	**Mean Square**	**F**	**Significance**
Experimental versus Control	1.840	1	1.840	1.746	0.188
Would Use CarLink System	2.752	1	2.752	2.612	0.108
Interaction	0.720	1	0.720	0.683	0.409
Error	213.860	203	1.053		
Total	897.000	207			

6.2.3 Carpool/Vanpool Participation

Over 82% of total participants reported that they either drive alone or carpool/vanpool to work. Approximately 15% of the respondents currently carpool, and 37.4% carpooled in the past but no longer do so. (See Table 6.5 below.) No statistical difference was identified between experimental and control groups (χ^2 = 3.74, p-value = .154).

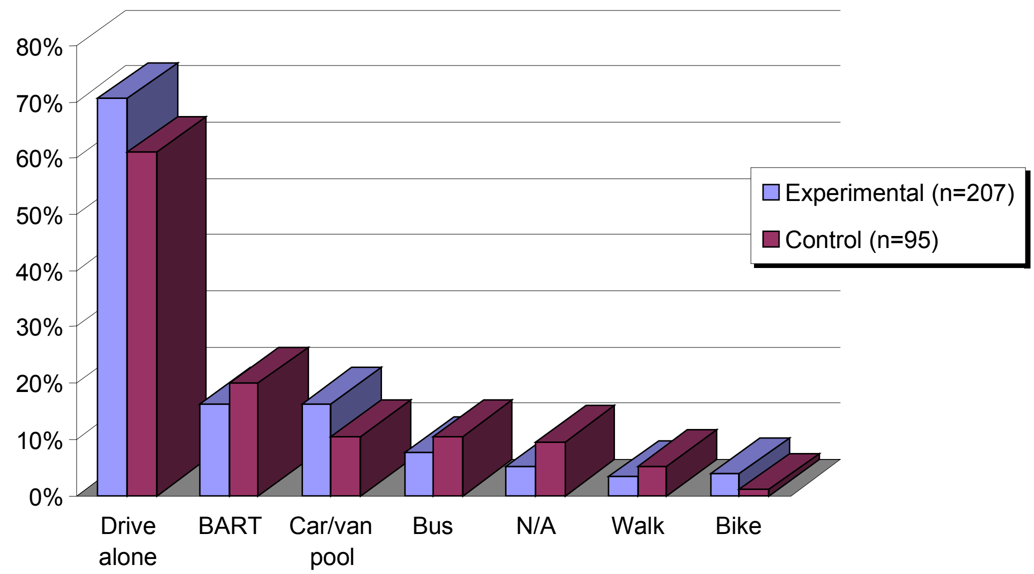
Table 6.5: Carpool to Work Status

Carpool Status	Experimental (n=207)	Control (n=95)	Total (n=302)
No	43.0%	54.7%	46.7%
Yes, but no longer	39.1%	33.7%	37.4%
Yes, currently	16.9%	11.6%	15.2%
Missing	1.0%	0.0%	0.7%
Total	**100%**	**100%**	**100%**

6.2.4 Commute Modes

Of the total participants surveyed, approximately 67.5% drive alone to work, 15% carpool or vanpool, and 33.1% take public transportation, walk, or bike. Note that 20 participants chose the "Not applicable" option, and only seven households reported that they had no household commuters. This gap might reflect that some individuals are self-employed or work at home and do not commute regularly. (See Figure 6.8 below.)

Figure 6.8: Commute Modes

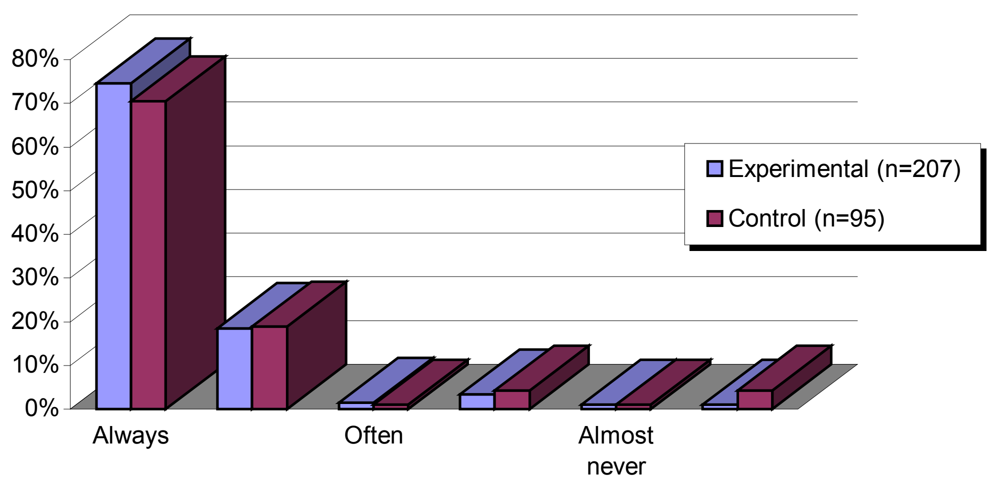


A higher percentage of experimental participants drive alone (i.e., 70.5% vs. 61.1%) and carpool or vanpool (i.e., 16.4% vs. 10.5%) to work than the control group. In contrast, a higher percentage of control group participants take BART (i.e., 20.0% vs. 16.4%) and/or a bus (i.e., 10.5% vs. 7.7%). Hence, the experimental group commutes more by autos and carpools than the control. The control group also commutes more by transit than the experimental group. Nevertheless, a statistically significant difference was not found between the experimental and control groups (χ^2 = 7.45; p-value = .281).

6.2.5 Household Vehicle Availability

Of the total study participants, 91.4% report that a household vehicle is always or almost always available for use. Close to 7% report that a vehicle is either sometimes, almost never, or never available. The latter group might represent early adopters of a carsharing system. (See Figure 6.9 below.) The control and experimental groups are not significantly different (χ^2 = 3.67, p-value = .597).

Figure 6.9: Vehicle Availability



6.2.6 Rental Car Use

Of the total participants surveyed in this study, 74.2% reported that they use rental cars. (See Table 6.6 below.).

Table 6.6: Rental Car User

Use Rental Cars	Experimental (n=207)	Control (n=95)	Total (n=302)
Yes	76.8%	68.4%	74.2%
No/missing	23.2%	31.6%	25.8%
Total	**100%**	**100%**	**100%**

At least once a month, 32.9% of experimental participants reported that they use rental vehicles for work, 17.4% use rental cars for leisure travel, and only 3.9% employ rental vehicles for personal use at home. (See Table 6.7 below.)

Table 6.7: Rental Car Use: Purpose and Frequency
Experimental Group (n=207)

Rental Use	More than once a week	Once a week or less	Once a month or less	Once a year or less	None	Missing data	Total (n=207)
Work-related travel	1.0%	3.9%	28.0%	15.9%	28.5%	22.7%	100%
Vacation travel	1.9%	0.5%	15.0%	52.2%	7.7%	22.7%	100%
Personal use at home	0.0%	0.5%	3.4%	17.4%	56.0%	22.7%	100%

In contrast, 7.4% of control group participants report that they use rental vehicles for work, 8.5% use rental cars for vacation travel, and only 2.2% employ rental vehicles for personal use at least once a month per year. (See Table 6.8 below.)

Table 6.8: Rental Car Use: Purpose and Frequency Control Group (n=95)

Rental Use	More than once a week	Once a week or less	Once a month or less	Once a year or less	None	Missing Data	Total (n=95)
Work-related travel	1.1%	1.1%	5.2%	10.5%	52.6%	29.5%	**100%**
Vacation travel	0.0%	1.1%	7.4%	54.7%	7.3%	29.5%	**100%**
Personal use at home	0.0%	1.1%	1.1%	10.5%	57.8%	29.5%	**100%**

A statistically significant difference between the control and experimental groups was not found (χ^2 = 2.46, p-value = .117). Therefore, any difference in CarLink response between the experimental and control groups is not likely due to trends in their rental car usage.

6.2.7 Daily Activity Modes

In my survey, I also asked participants what transportation modes they regularly use to conduct their everyday activities, i.e., more than two or three days per week. Approximately 68% of total participants use a household vehicle to accomplish their daily activities. (See Table 6.9 below.) A significant difference was found between the control and experimental groups (χ^2 = 13.22, p-value = .004). The data show that the experimental group tends to make more trips in household vehicles.

Table 6.9: Trips in Household Vehicle

Trips in Private Vehicle	Experimental (n=207)	Control (n=95)	Total (n=302)
None	3.4%	13.7%	6.6%
1-3 times a month	17.3%	22.1%	18.8%
4-7 times a month	7.2%	6.3%	6.9%
> 7 times a month	72.1%	57.9%	67.7%
Total	**100%**	**100%**	**100%**

In this study, only 27.7% of participants bicycle or walk to accomplish daily activities; 8.6% ride buses; and 13.2% take rail/BART. (See Tables 6.10 to 6.12.)

Table 6.10: Trips Walking, Jogging or Bicycling

Non-Motorized Trips	Experimental (n=207)	Control (n=95)	Total (n=302)
None	26.4%	38.9%	30.4%
1-3 times a month	27.9%	27.4%	27.7%
4-7 times a month	15.9%	10.5%	14.2%
> 7 times a month	29.8%	23.2%	27.7%
Total	**100%**	**100%**	**100%**

Table 6.11: Trips by Bus

Trips by Bus	Experimental (n=207)	Control (n=95)	Total (n=302)
None	76.4%	75.8%	76.2%
1-3 times a month	11.1%	11.6%	11.2%
4-7 times a month	3.4%	5.2%	4.0%
> 7 times a month	9.1%	7.4%	8.6%
Total	**100%**	**100%**	**100%**

Table 6.12: Trips by BART/Rail

Trips by Rail	Experimental (n=207)	Control (n=95)	Total (n=302)
None	50.2%	57.9%	52.7%
1-3 times a month	30.9%	22.1%	28.1%
4-7 times a month	5.8%	6.3%	6.0%
> 7 times a month	13.1%	13.7%	13.2%
Total	**100%**	**100%**	**100%**

For non-motorized trips, no significant difference was found between the experimental and control groups (χ^2 = 5.72, p-value = .126), bus trips (χ^2 = 0.825, p-value = .844), BART/rail trips (χ^2 = 2.48, p-value = .478), telecommuting (χ^2 = 5.041, p-value = .169), or other (χ^2 = 4.76, p-value = .844). In early mode choice models, I included the daily activity mode variable, but trip number (by mode) was not a significant predictor in any of the models. Hence, I conclude that this difference between the experimental and control groups is not a serious concern to my results and study hypotheses.

Not surprisingly, only 6.6% of total participants currently accomplish their daily activities by telecommuting. (See Table 6.13 below.)

Table 6.13: Trips by Telecommuting

Trips Made by Telecommuting	**Experimental (n=207)**	**Control (n=95)**	**Total (n=302)**
None	75.8%	85.2%	78.8%
1-3 times a month	14.0%	5.3%	11.3%
4-7 times a month	3.4%	3.2%	3.3%
> 7 times a month	6.8%	6.3%	6.6%
Total	**100%**	**100%**	**100%**

Finally, approximately 2.3% of total individuals use other modes (e.g., airplanes) to accomplish their daily activities. (See Table 6.14 below.)

Table 6.14: Other Trips

Other Trips (e.g., airplanes)	Experimental (n=207)	Control (n=95)	Total (n=302)
None	93.7%	96.8%	94.7%
1-3 times a month	2.4%	2.1%	2.3%
4-7 times a month	1.0%	0.0%	0.7%
> 7 times a month	2.9%	1.1%	2.3%
Total	**100%**	**100%**	**100%**

6.2.8 Weekly Trip Activities

I also asked participants how often they make various trip types, such as commuting, work-related meetings, shopping, medical appointment, eating out, entertainment/social activities, and errands. Tables 6.15 and 6.16 (below) present these results for the experimental and control groups.

Table 6.15: Number of Trips Made by Activity
Experimental Group (n=207)

Activity	4 or more times a week	2-3 times a week	Once a week	None
Commuting to work	75.5%	9.1%	4.8%	10.6%
Taking others	15.4%	16.8%	21.6%	46.2%
Errands	14.9%	45.7%	32.2%	7.2%
Work-related activities	14.4%	17.3%	21.2%	47.1%
Shopping	13.5%	52.4%	28.8%	5.3%
Entertainment/ recreational/ social activities	13.0%	47.1%	33.6%	6.3%
Going to/takeout meals	4.3%	40.4%	42.8%	12.5%
Other	1.4%	1.4%	6.3%	0.0%
Doctor appointments	0.%	0.5%	31.7%	67.3%

Table 6.16: Number of Trips Made by Activity
Control Group (n=95)

Activity	4 or more times a week	2-3 times a week	Once a week	None
Commuting to work	64.2%	16.8%	1.1%	17.9%
Work-related activities	21.1%	9.4%	8.4%	61.1%
Taking others	16.8%	10.5%	27.4%	45.3%
Errands	16.8%	34.7%	33.7%	14.8%
Shopping	13.7%	38.9%	40.0%	7.4%
Entertainment/ recreational/ social activities	9.5%	41.1%	36.8%	12.6%
Going to/takeout meals	7.4%	33.7%	38.9%	20.0%
Doctor appointments	4.2%	32.6%	1.1%	62.1%
Other	0.0%	0.0%	4.2%	0.0%

Over 50% of total respondents reported making many different types of trips at least two or more times per week, namely:

- Shopping (65.9% for experimental and 52.6% for control);
- Entertainment/social activities (60.1% for experimental and 50.6% for control);
- Errands (60.6% for experimental and 51.5% for control); and
- Commuting (84.6% for experimental and 81.0% for control).

Furthermore, 49.7% of participant households said that they would consider buying a new household vehicle within two years. The most popular uses for the new vehicles include: weekend/vacation trips, driving others to activities, and business errands. I would expect that most of these activities could be accomplished using a CarLink vehicle alone or in combination with other modes (e.g., rail or bike).

6.2.9 Commute Costs

Commuting costs are also of interest to my study. For this analysis, I compared the total sample commute costs for driving, carpooling, and transit. Participants were encouraged to calculate expenses for all applicable modes. The question asked individuals to provide round-trip commute costs for all the modes of travel they currently use. Some respondents answered this question for all three modes, which means that several likely misunderstood this question. Approximately 34% of respondents said they spend less than \$3 per roundtrip driving to work, while 57.4% report that they spend less than \$6 per roundtrip. Driving costs were estimated for 289 participant questionnaires; 274 answered for carpooling; and 272 individuals provided transit costs.

Just 7% of carpool respondents (i.e., 18 individuals) spend less than \$3 per roundtrip on carpooling to work, and 17.2% reported costs of less than \$6 per day. For transit, 7% said that they spend less than \$3 per roundtrip, and 13.2% thought they spend less than \$6. I found a significant difference between the control and experimental groups for driving costs ($\chi^2 = 12.06$, p-value = .034), with the experimental group generally paying more to drive. No difference was found for carpooling ($\chi^2 = 3.82$, p-value = .576) or public transportation costs ($\chi^2 = 10.37$, p-value = .065). Commute costs were included in my mode choice models. Auto and transit costs are both significant predictors in mode choice in this study. (See Section 6.5.)

6.2.10 Nearest Transit Station Location

In this analysis, I am also interested in transit awareness. To gauge participant knowledge, I asked respondents if they could name the transit station closest to their home or workplace. Participants from 187 households said “Yes” to the transit station closest to their home, and 162 households responded “Yes” to a workplace station. Only 90 households (i.e., approximately 50%), however, knew whether or not both stations were serviced by the same transit provider. This implies that many could use transit to commute from home to work; however, there is an informational barrier to its use. The experimental and control groups are not statistically different for any portions of this question (i.e., home station (χ^2 = 0.16, p-value = .688); work station (χ^2 = 0.22, p-value = .632); and same station (χ^2 = 0.71, p-value = .400)).

6.2.11 BART Acceptance

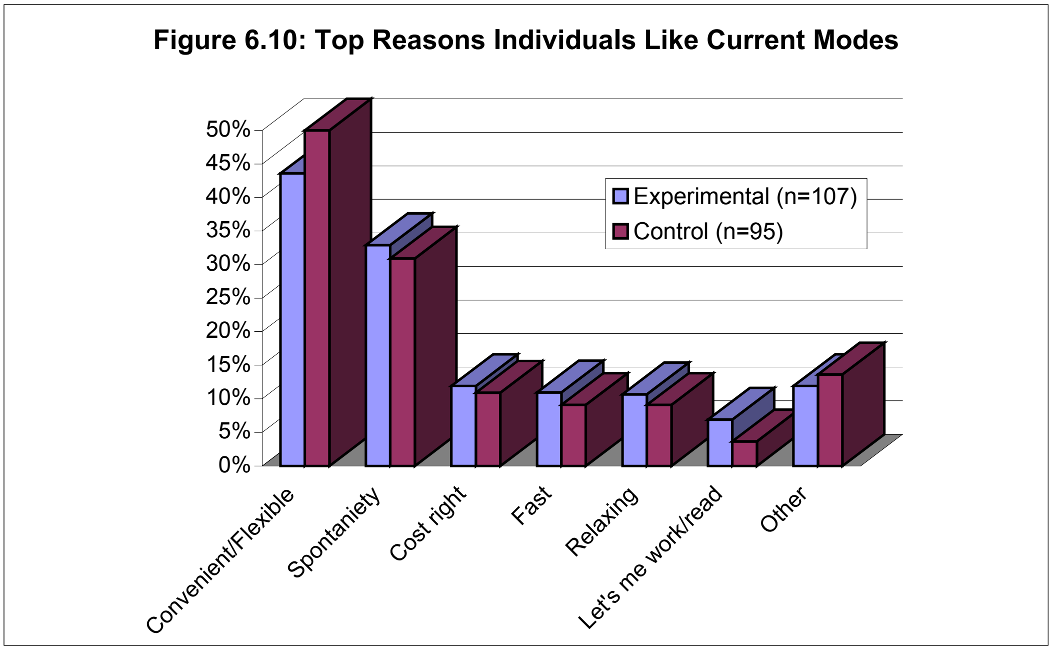
Another important question that I explored is whether participants are favorable towards the Bay Area Rapid Transit (BART) District service. Over 22% of the total sample (or 168 households) reported that at least one household member takes BART three or more days per week.

In the initial questionnaire, I also asked respondents to list the top three reasons they use BART. The most popular reason for taking BART is close proximity to a station near their home or work site (i.e., convenience). Traffic congestion is the second most important reason. The third reason is convenient departure times. All of which imply that if transit access and frequency/reliability of service were increased, more individuals might use BART.

In contrast, individuals who do not take BART were asked to indicate the top three reasons they do not use this service. The most popular reason is that the stations are too far. The second is inconvenient schedules. And, the third is that a vehicle is needed during the day. A significant difference was not found between the experimental and control groups ($\chi^2 = 7.61$, p-value = .107). Both BART and non-BART users also expressed concern about BART accessibility, frequency, and reliability. A smart carsharing service, deployed from BART transit stations, could aid individuals in accessing BART and meeting their daytime vehicle needs.

6.2.12 Attitudes Towards Current Ways of Getting Around

Another topic I explored is how participants feel about their current ways of getting around and what they like and dislike about them. First, I asked respondents what they like about their current modes. See Figure 6.10 (below) for the top reasons, disaggregated by the experimental and control groups. A statistical difference was found between them.



The most popular reason for all of the participants is convenience, namely flexibility and reliability. Nearly 43.6% of experimental and 50% of control participants selected this response. The second most popular reason for the experimental (i.e., 32.9%) and control (i.e., 31%) group includes the attributes of personal space, freedom, and spontaneity. Third, 11.9% of the experimental and 11% of the control groups listed affordability. Fourth, 11% of the experimental and 9% of the control said that their current modes are fast and save time. Fifth, 10.7% of the experimental and 9% of the control group responded that their current methods are relaxing. Finally, 6.9% of the experimental and 4% of the control said that their current ways give them time to work and read.

Next, I asked participants to evaluate their current ways of getting around on a five-point Likert scale ranging from “strongly disagree” to “strongly agree.” Individuals were given a list of 15 statements (or attributes) to consider about their current modes. Overall, a majority of the total participants agreed or strongly agreed that their current ways of getting around accomplished almost all of the 15 factors listed. The only exception to this is the attribute “Says a lot about who I am.” Only 12.5% of total participants chose “agree” or “strongly agree” for this factor. This implies that most respondents consider a vehicle a transportation tool.

The top positive attributes are as follow. Approximately 89% agreed that their current mode helps them get to work on time. Second, 82.6% agreed that their current method allows them to be spontaneous. Third, another 82.6% agreed that their current modes help them to go everywhere. Fourth, 81.8% agreed that their current ways allow them to respond to an emergency.

For each of the 15 modal attributes, individuals were also asked to specify if a factor was a major or minor reason for their current mode choice. See Table 6.17 (below) for a list of the major reasons.

Major reasons include getting to work on time, ability to go everywhere and respond to emergencies, spontaneity, and budget. Minor reasons are: allows storage; says a lot about who I am; and allows me to visit friends whenever I want. A significant difference was not found between the experimental and control groups for these attributes (χ^2 = 9.907, p-value = .707).

Table 6.17: Major Reasons for Current Mode

Response	Experimental (n=207)	Control (n=95)
Get to work on time	79.0%	75.8%
Helps go everywhere	69.0%	74.7%
Quick responses to emergencies	60.0%	67.4%
Allows spontaneity	55.0%	67.4%
Sense of independence	52.0%	63.2%
Helps with shopping	50.0%	65.3%
Sense of freedom	50.0%	61.1%
Fits budget	50.0%	49.5%
Comfortable	47.0%	53.7%
Fits lifestyle needs	40.0%	57.9%
Visit friends whenever	40.0%	49.5%
Enjoyable	37.0%	46.3%
Feel safe	36.0%	43.2%
Allows the storing of items	25.0%	35.8%
Says who I am	11.0%	22.1%

Lastly, I asked respondents to specify what they dislike about their current ways of getting around. Participants selected the top three reasons they dislike their current modes, from a list of twelve possible responses. Results indicate that travel time is the number one concern. Approximately 49% of participants don't like their current way of getting around because they waste too much time in traffic, 32% responded that their current modes are too costly, and 32% said that vehicle maintenance is a hassle. Again, no difference was found between the experimental and control groups ($\chi^2 = 8.265$, p-value = .142).

Despite these concerns, most participants reported that a household vehicle is essential to their lifestyle, and 47% of respondents are satisfied with their current modes. By providing access to shared cars and facilitating public transportation use, CarLink might address several of this population's modal concerns.

SECTION 6.3 PSYCHOGRAPHIC CHARACTERISTICS

Psychographics describe individuals in terms of their opinions, activities, interests, lifestyle, and buying behavior (Breen and Blankenship, 1989). Attitudinal variables are often critical to explaining behavior. Consequently, I included a total of eight psychographic variables in this portion of my analysis. These include attitudes toward current modes, vehicles, congestion, the environment, and experimentation. In the first-phase questionnaire, I asked households about their attitudes toward a variety of issues.

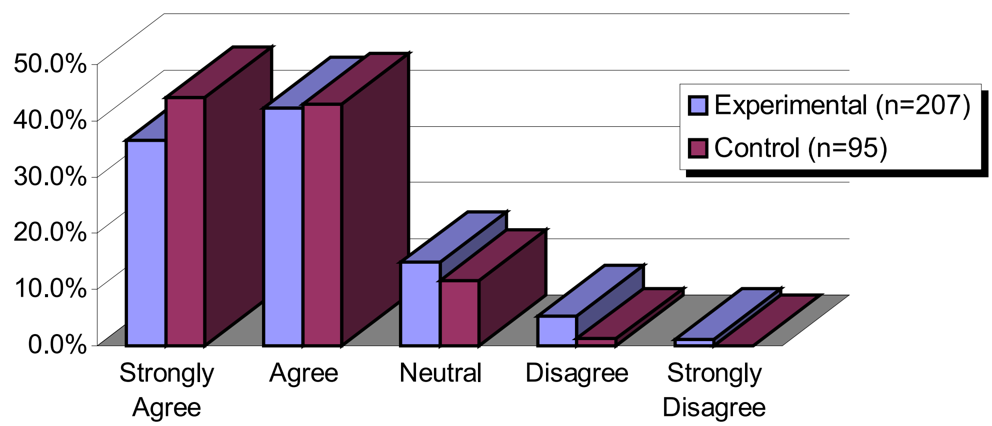
I categorized responses to a list of 27 questions into five scales: vehicle hassle, congestion, vehicle enjoyment, environmental concern, and experimentation. (See Chapter 4: Study Approach, for a discussion of scale design.) Figures in this section summarize the results.

It is worth noting that congestion and environmental concern are significant issues for this study population. Over 80% of households expressed concern about congestion and the environment, and consider using transportation alternatives to help reduce air pollution and traffic. This implies that environmental and congestion concerns might play a key role in the adoption of a transportation alternative by study participants.

6.3.1 Modal Satisfaction

Of experimental participants surveyed, 78.8% agree or strongly agree that they are satisfied with their current methods of transportation. Similarly, 87.2% of the control group are satisfied with their current modes. Approximately 15% of both groups are neutral. (See Figure 6.11 below.) There is no statistical difference for modal satisfaction between the experimental and control groups (t-test = -1.114, p-value = .266). Please note that this scale has a high reliability (i.e., a Cronbach's alpha of .9262).

Figure 6.11: Modal Satisfaction



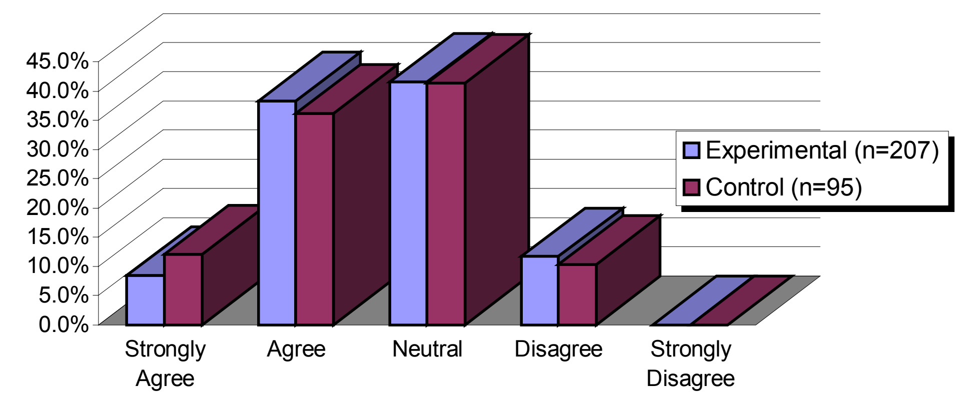
Following is the ANOVA source table for the modal satisfaction scale calculated for group participation and the main dependent variable. There are very few significant F statistics, indicating that the interaction of media type, group participation, and modal satisfaction is not significant in predicting response to the main dependent variable. The significant F statistics do reveal a relationship between modal satisfaction and CarLink response. This also supports the CarLink regression modal findings. (See Chapter 7: CarLink Longitudinal Survey Results.)

ANOVA Source Table: Modal Satisfaction					
TIME 1					
Source	**Sum of Squares**	**Df**	**Mean Square**	**F**	**Significance**
Experimental versus Control	0.344	1	0.344	0.919	0.340
Would Use CarLink System	2.568	2	1.284	3.433	0.036
Interaction	1.808	2	0.904	2.418	0.094
Error	42.260	113	0.374		
Total	508.538	119			
TIME 2					
Experimental versus Control	0.315	1	0.315	0.800	0.373
Would Use CarLink System	3.550E-03	1	3.550E-03	0.009	0.925
Interaction	1.225	1	1.225	3.111	0.081
Error	43.324	110	0.394		
Total	494.582	114			
TIME 3					
Experimental versus Control	0.580	1	0.580	1.562	0.214
Would Use CarLink System	2.539	1	2.539	6.836	0.010
Interaction	0.187	1	0.187	0.504	0.479
Error	42.718	115	0.371		
Total	512.520	119			

6.3.2 Perception of Vehicle Hassle

Of the experimental participants surveyed, 46.7% agree or strongly agree that vehicles are a hassle, and 48.3% of the control group have the same view. Approximately 41% of both groups are neutral. In contrast, only 11.7% of the experimental and 10.3% of control participants disagree or strongly disagree that vehicles are a hassle. (See Figure 6.12 below.)

Figure 6.12: Vehicle Hassle Scale



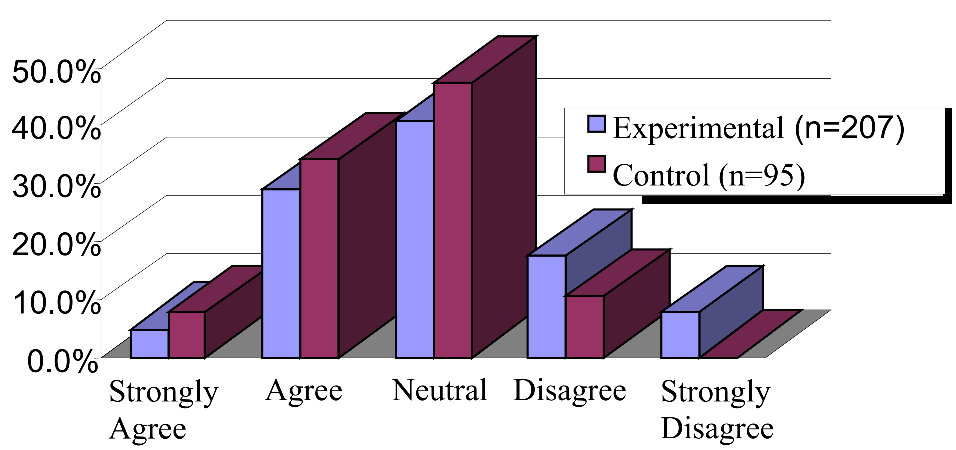
Close to half of the study population regard vehicles as aggravating. Not surprisingly, this negative aspect of vehicle ownership might play a critical role in marketing smart carsharing to target adopters. This scale is also a significant predictor in the transit and CarLink models I developed. (See Section 6.5 and Chapter 7.) A statistical difference was not found between the experimental and control groups (t-test = .320, p-value = .749). It is important to note, however, that this scale has a moderate to low reliability (i.e., a Cronbach's alpha of .3136). The ANOVA source table (below) indicates the relationship among the vehicle hassle score, group participation, and the main dependent variable. Overall there is little significance probably because the experimental and control groups are so similar and the majority of respondents chose agree or neutral to the vehicle hassle related questions. A significant F statistic does reveal a relationship between the vehicle hassle scale and CarLink response. This also supports the CarLink regression model results. (See Chapter 7: Longitudinal Survey Results.)

ANOVA Source Table: Vehicle Hassle					
TIME 1					
Source	**Sum of Squares**	**df**	**Mean Square**	**F**	**Significance**
Experimental versus Control	0.650	1	0.650	1.541	0.217
Would Use CarLink System	0.309	2	0.154	0.366	0.694
Interaction	3.689	2	1.845	4.371	0.015
Error	47.691	113	0.422		
Total	812.840	119			
TIME 2					
Experimental versus Control	0.239	1	0.239	0.510	0.477
Would Use CarLink System	0.239	1	0.239	0.510	0.477
Interaction	0.128	1	0.128	0.272	0.603
Error	51.628	110	0.469		
Total	773.680	114			
TIME 3					
Experimental versus Control	0.202	1	0.202	0.465	0.497
Would Use CarLink System	2.785	1	2.785	6.410	0.013
Interaction	1.028	1	1.028	2.366	0.127
Error	49.971	115	0.435		
Total	811.760	119			

6.3.3 Perception of Vehicle Enjoyment

Thirty-four percent of experimental and 42.1% of control participants agree or strongly agree that vehicles are enjoyable. Over 40% of experimental and 47.4% of control participants are neutral about vehicle enjoyment. Twenty-five percent of experimental participants, in contrast to 10.5% of control respondents, disagree or strongly disagree that vehicles are enjoyable. (See Figure 6.13 below.)

Figure 6.13: Vehicle Enjoyment Scale



No statistically significant difference was identified between the experimental and control groups for this scale (t-test = -1.582, p-value = .116). Also, vehicle enjoyment is a significant predictor in the auto mode model I developed for this study. (See Section 6.5: Mode Choice Models.) Furthermore, the ANOVA source table (below) indicated the relationship among this scale, group participation, and the main dependent variable. The ANOVA reveals that this scale does not interact with group participation to explain

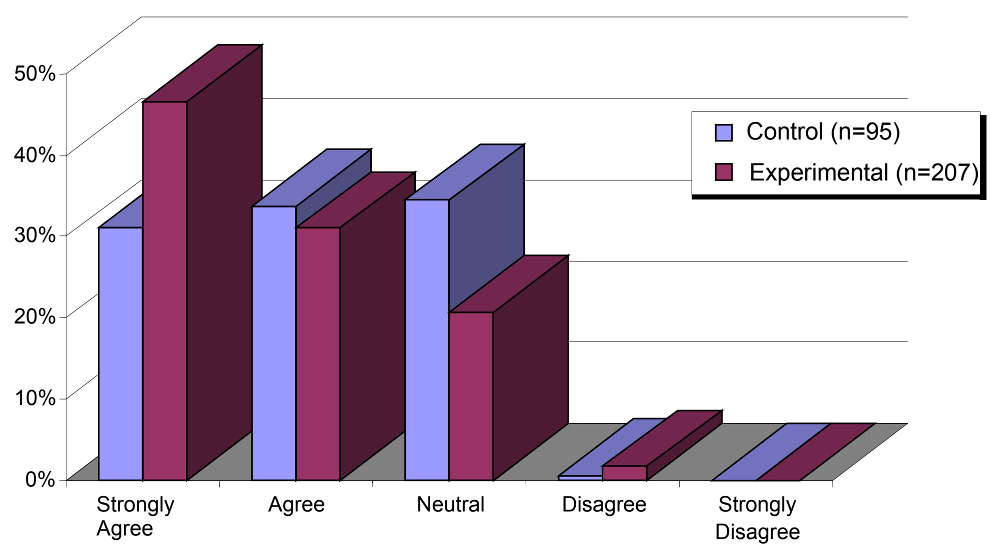
CarLink response. The only significant relationship identified is between this scale and the question "Would You Use the CarLink System" in Times 2 and 3 (see ANOVA source table below). It is possible that vehicle enjoyment affects desire to join CarLink, regardless of informational media. Indeed, vehicle enjoyment appears to affect auto use (see Chapter 7: CarLink Longitudinal Survey Results).

ANOVA Source Table: Vehicle Enjoyment					
TIME 1					
Source	**Sum of Squares**	**df**	**Mean Square**	**F**	**Significance**
Experimental versus Control	5.506E-02	1	5.506E-02	0.150	0.699
Would Use CarLink System	1.916	2	0.958	2.615	0.078
Interaction	1.037	2	0.519	1.416	0.247
Error	41.387	113	0.366		
Total	1008.673	119			
TIME 2					
Experimental versus Control	0.481	1	0.481	1.340	0.250
Would Use CarLink System	2.511	1	2.511	7.003	0.009
Interaction	0.186	1	0.186	0.518	0.473
Error	39.444	110	0.359		
Total	974.551	114			
TIME 3					
Experimental versus Control	0.189	1	0.189	0.542	0.463
Would Use CarLink System	4.110	1	4.110	11.810	0.001
Interaction	0.103	1	0.103	0.296	.587
Error	40.017	115	0.348		
Total	43.356	118			

6.3.4 Perception of Congestion

Sixty-five percent of experimental and 77.6% of control participants agree and strongly agree that congestion is a problem. (See Figure 6.14 below.) Approximately 34% of experimental and 20.7% of control participants are neutral about congestion. Not surprisingly, only one to two percent of experimental and control participants disagree and strongly disagree that congestion is a serious problem. A statistical difference was not found between the experimental and control groups (t-test = -1.963, p-value = .051).

Figure 6.14: Congestion Scale

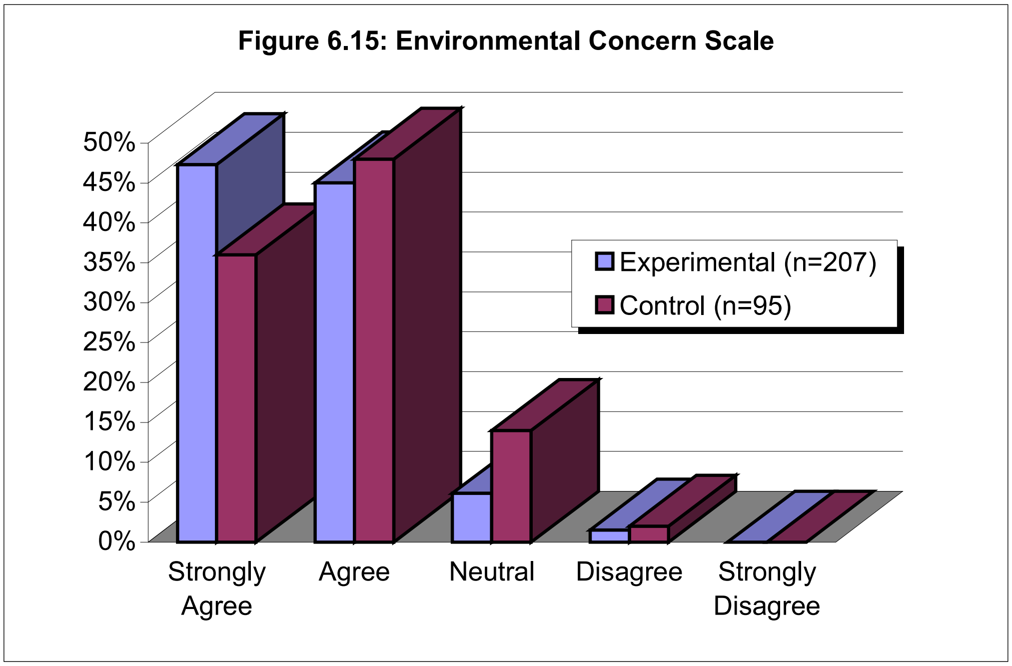


Over half of the study population perceives congestion as a problem. Congestion is often a negatively perceived attribute of auto use. Surprisingly, this attribute was not a significant predictor in any of the regression models developed for this dissertation. The ANOVA source table (below) reveals that no significant conclusions can be drawn about the relationship between the congestion scale and willingness to use CarLink. This is probably because most in the study sample believe congestion is a problem.

ANOVA Source Table: Congestion					
TIME 1					
Source	**Sum of Squares**	**df**	**Mean Square**	**F**	**Significance**
Experimental versus Control	8.673E-02	1	8.673E-02	0.218	0.642
Would Use CarLink System	2.150	2	1.075	2.701	0.071
Interaction	1.629	2	0.815	2.047	0.134
Error	44.982	113	0.398		
Total	582.111	119			
TIME 2					
Experimental versus Control	0.194	1	0.194	0.450	0.504
Would Use CarLink System	5.843E-02	1	5.843E-02	0.136	0.713
Interaction	0.507	1	0.507	1.176	0.280
Error	47.416	110	0.431		
Total	552.556	114			
TIME 3					
Experimental versus Control	0.368	1	0.368	0.861	0.355
Would Use CarLink System	2.008E-02	1	2.008E-02	0.047	0.829
Interaction	1.403E-02	1	1.403E-02	0.033	0.856
Error	49.102	115	0.427		
Total	579.000	119			

6.3.5 Perception of Environmental Concern

Of the experimental participants surveyed, 92.3% agree or strongly agree that the environment is a concern, similarly 84% of control participants have the same view. Approximately 6% of the experimental and 14% of control respondents are neutral about the environment. Only 1.5% of the experimental and 2% of control participants do not think that the environment is a concern. (See Figure 6.15 below.) A statistical difference was not found between the experimental and control groups (t-test =1.953, p-value = .052).

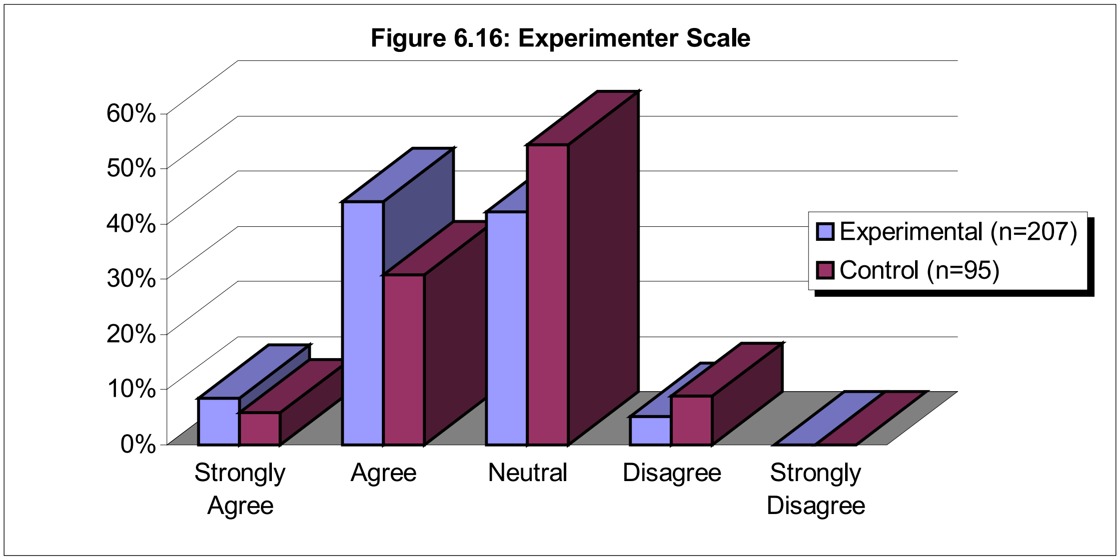


A majority of the study population is concerned with the environment. The negative environmental impact of the current transportation system is likely to be a key attribute in marketing CarLink, although it is unlikely to be a principle motivating factor. Indeed, environmental concern is a significant predictor in the CarLink stated use model. (See Chapter 7: CarLink Longitudinal Survey Results.) This is revealed by the ANOVA statistics that indicate developing significance between environmental concern and willingness to use CarLink (see ANOVA source table below). This relationship is also supported by my CarLink regression model results. See Chapter 7: CarLink Longitudinal Survey Results.)

ANOVA Source Table: Environmental Concern					
TIME 1					
Source	**Sum of Squares**	**df**	**Mean Square**	**F**	**Significance**
Experimental versus Control	5.973E-02	1	5.973E-02	0.221	0.639
Would Use CarLink System	0.679	2	0.340	1.258	0.288
Interaction	0.154	2	7.713E-02	0.286	0.752
Error	30.509	113	0.270		
Total	444.000	119			
TIME 2					
Experimental versus Control	2.955E-02	1	2.955E-02	0.108	0.744
Would Use CarLink System	1.140	1	1.140	4.149	0.044
Interaction	4.942E-02	1	4.942E-02	0.180	0.672
Error	30.232	110	0.275		
Total	427.408	114			
TIME 3					
Experimental versus Control	1.991E-02	1	1.991E-02	0.075	0.785
Would Use CarLink System	1.666	1	1.666	6.261	0.014
Interaction	0.162	1	0.162	0.609	0.437
Error	30.607	115	0.266		
Total	441.306	119			

6.3.6 “Experimenter” Perception

Over 52% of experimental and 36.8% of control participants agree or strongly agree that they like to experiment with new things. Over 40% of both groups are neutral about experimentation. Approximately 5% of experimental participants, in contrast to 8.8% of control respondents, said that they don't like to experiment. (See Figure 6.16 below.) Close to half of the study population view themselves as experimenters. Consequently, this group should probably be receptive to new ideas, such a carsharing.



A statistical difference was not identified between the experimental and control groups (t-test = 1.308, p-value = .192). It is important to note, however, that this scale had a low reliability (i.e., a Cronbach's alpha of .2161). Furthermore, it was not a significant predictor in any of the mode choice models I developed for this dissertation (see Section 6.5 and Chapter 7: CarLink Longitudinal Survey Results). This is also explained by the analysis of variance results. It is possible that experimentation has an impact on CarLink response only after the concept has been tried (e.g., the drive clinic). A significant relationship was only found between this scale and the main dependent variable in Time 3. (See ANOVA source table below.)

ANOVA Source Table: Experimenter					
TIME 1					
Source	**Sum of Squares**	**df**	**Mean Square**	**F**	**Significance**
Experimental versus Control	8.574E-02	1	8.574E-02	0.274	0.602
Would Use CarLink System	8.635E-02	2	4.317E-02	0.138	0.871
Interaction	0.288	2	0.144	0.460	0.633
Error	35.350	113	0.313		
Total	820.500	119			
TIME 2					
Experimental versus Control	0.360	1	0.360	1.173	0.281
Would Use CarLink System	0.210	1	0.210	0.686	0.409
Interaction	0.360	1	0.360	1.173	0.281
Error	33.730	110	0.307		
Total	781.188	114			
TIME 3					
Experimental versus Control	8.940E-02	1	8.940E-02	0.299	0.585
Would Use CarLink System	1.494	1	1.494	4.999	0.027
Interaction	0.141	1	0.141	0.471	0.494
Error	34.368	115	0.299		
Total	820.500	119			

6.3.7 Summary

Over 60% of total household respondents prefer to drive their personal vehicles to places they need to go, and 59.4% said they consider vehicles as a convenient way to get around. Only 27.8% of the households stated that a vehicle says a lot about them. Surprisingly, over half of the households said that they would give up their vehicle(s), if a feasible alternative was available.

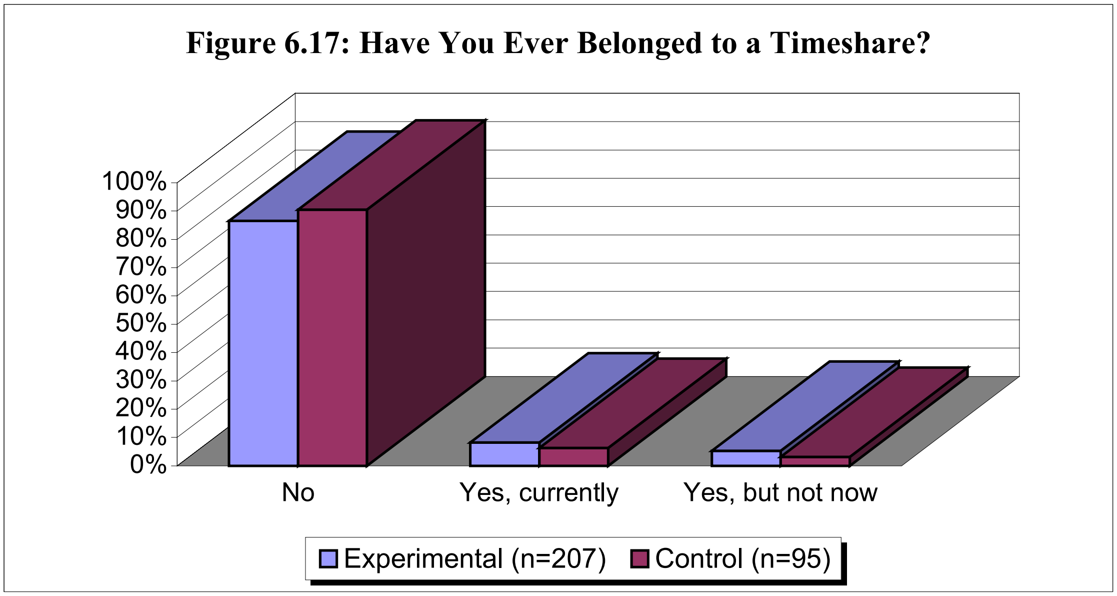
Furthermore, a majority of the study population would like to have vehicle access when needed, but do not necessarily want to own a car. Approximately 48% of the total population think that vehicles are a hassle; over 70% agree that congestion is a problem; 38% enjoy vehicles; close to 90% are concerned with the environment; and about 45% like to experiment with new ideas. The above attitudes reflect a potentially receptive audience to the carsharing concept. Nevertheless, it is important to remember that attitudes and perceptions are not necessarily reflective of action.

SECTION 6.4 OTHER ISSUES

Other variables of interest to my study include membership status in a time-share vacation program, a health or country club, and a food cooperative. These variables are of interest because they may help to explain whether individuals who participate in shared-use programs are more receptive to carsharing. Thus, I included these variables in my study.

6.4.1 Time-Share Participation

Approximately 86% experimental and 90% of control group participants reported that they have not participated in a time-share vacation program (χ^2 = 1.082, p-value = .582). A significant difference was not identified between the experimental and control groups. (See Figure 6.17 below.)



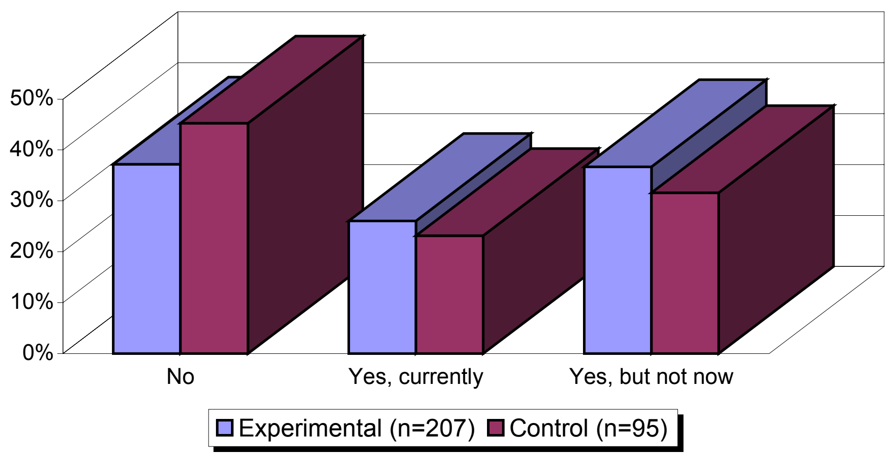
Also, a statistically significant relationship was not found for a crosstab of time-share participation and the main dependent variable. Consequently, I conclude that time-share participation is not an important predictor of carsharing interest for the study population. (See the following chi-square source table.)

Chi-Square Source Table: Timeshare				
	Experimental		**Control**	
Time	**Chi-square**	**P-value**	**Chi-square**	**P-value**
One	4.910	0.297	2.853	0.583
Two	1.197	0.550	2.517	0.284
Three	0.002	0.999	1.154	0.561

6.4.2 Health or Country Club Participation

Over 62% of experimental and 54% of control participants have belonged to a health or country club. (See Figure 6.18 below.) A statistically significant difference was not found between the experimental and control groups ($\chi^2 = 1.778$, p-value = .411).

Figure 6.18: Have you ever belonged to a health club or country club?



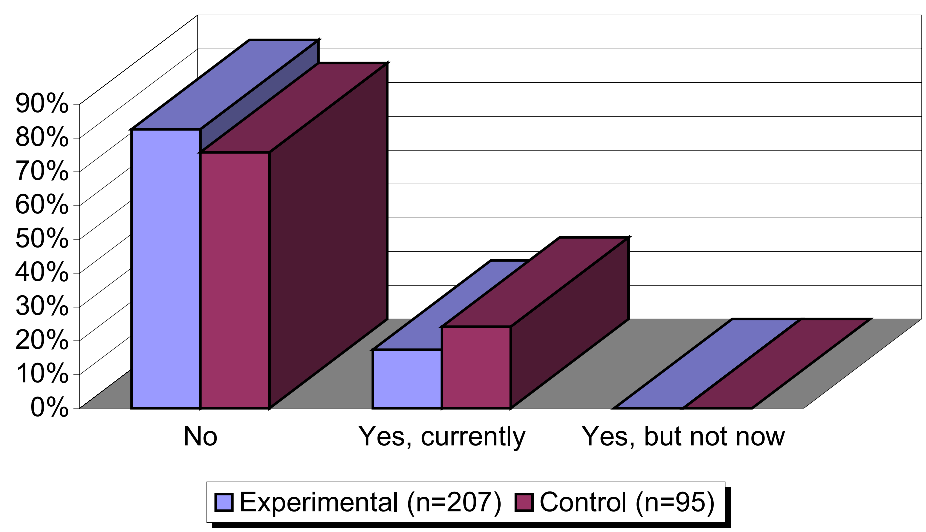
Furthermore, a statistically significant relationship was not identified for a crosstab of health or country club participation and CarLink response (see chi-square source table below). Again, I conclude that membership in a health or country club is not a significant prediction of carsharing interest.

Chi-Square Source Table: Health or Country Club				
	Experimental		Control	
Time	**Chi-square**	**P-value**	**Chi-square**	**P-value**
One	5.600	0.231	7.018	0.135
Two	0.914	0.633	6.859	0.032
Three	1.114	0.573	1.900	0.387

6.4.3 Food Cooperative Participation

Approximately 82% of experimental and 75.8% of control group respondents have never belonged to a food cooperative. (See Figure 6.19 below.) Again, a significant difference was not identified between the experimental and control groups (χ^2 = 1.926, p-value = .165).

Figure 6.19: Have You Ever Belonged to a Food Cooperative?



Lastly, a statistically significant relationship was not found for a crosstab of food cooperative participation and CarLink response (see chi-square source table below). Consequently, I conclude that participation in a food cooperative is not a significant predictor of carsharing.

Chi-Square Source Table: Food Cooperative				
	Experimental		**Control**	
Time	**Chi-square**	**P-value**	**Chi-square**	**P-value**
One	0.922	0.631	0.545	0.761
Two	2.908	0.088	2.951	0.086
Three	0.351	0.554	1.486	0.223

6.4.4 Why Not Participate in Shared-Use Programs?

Reasons that study respondents provided for not participating in one or more of the above programs include the follow. Close to 42% of total participants said that these types of services do not fit their lifestyle. Second, 42.9% said that these programs are too expensive. Third, 30% responded that the programs appear to be a hassle. Fourth, 30.7% were never approached. Fifth, 9.9% stated that they don't like the social interaction associated with such programs. Finally, 4% claim they are not interested. (See Table 6.18 below.) The experimental and control groups are not significantly different in their response (χ^2 = 5.23, p-value = .388).

Table 6.18: Why Not Participate in a Shared Resources Program?

Reason	Experimenter (n=207)	Control (n=95)	Total (n=302)
Arrangement does not suit lifestyle	41.8%	42.1%	41.9%
Too expensive	37.5%	54.7%	42.9%
Appears to be a hassle	31.3%	27.4%	30.0%
Never been approached	30.8%	30.5%	30.7%
Services are unavailable	11.1%	7.4%	9.9%
Don't enjoy this type of social interaction	10.6%	11.6%	10.9%
I'm not interested	5.8%	0.0%	4.0%
Other	4.3%	4.2%	4.3%
I don't know	1.9%	0.0%	1.3%
No time	0.0%	0.0%	0.0%

Although the crosstabs I used to explore the relationship between CarLink response and vacation, health, and food cooperative participation were not statistically significant (i.e., $p > .050$), this analysis provides useful information about program reluctance. Several of these reasons are similar to those provided for not using CarLink. In the next chapter, I focus on response to the carsharing concept over time and potential CarLink early adopters.

SECTION 6.5 MODE CHOICE MODELS

This final section focuses on current mode choice. Earlier discussions provide an overview of the individuals involved in the experimental and control groups. From this analysis, I learned that the most popular reason for an individual's current mode choice is convenience, which also encompasses the attributes of flexibility and reliability. Other important factors are personal space or freedom, cost, efficiency, and ability to relax.

Furthermore, I found that while many participants would like easy vehicle access, they do not necessarily want to own a car. Indeed, close to half of my study population thinks that *vehicles* are a *hassle*, and over 70% agree that *congestion* is a problem. In addition, only 38% really *enjoy vehicles*, and close to 90% are concerned with the *environment*. Despite these trends, approximately 80% are *satisfied* with their *current modes of transportation*. The remaining 20% are either neutral or dissatisfied with their methods. In particular, this latter group might represent potential CarLink adopters. Many of these factors likely play a role in an individual's current mode choice. My regression models indicate that *mode satisfaction* and *cost* are important to an individual's current mode choice in this study. Please see the following discussion for my mode choice regression results.

In my analysis, I developed two logistic regression models to examine the potential relationships among demographic variables, attitudes, and mode choice. I designed one for auto commuters and the other for transit commuters. However, the model results did not prove to be very helpful in expanding my understanding of explanatory mode choice variables (i.e., beyond the psychographic statistics presented in the preceding paragraph).

6.5.1 Auto Commuter Model

The first logistic model (i.e., the auto commuter) demonstrates that *mode satisfaction*, *vehicle enjoyment*, *costs*, and *attitudes toward cars* (i.e., vehicles are not essential, but I need one) are the most significant predictors in explaining the auto commuter model.

This model demonstrates that *vehicle enjoyment, mode satisfaction*, *cost,* and *attitudes toward cars* are the most significant predictors in explaining this model. All of the variable coefficients are statistically significant. This model suffers from overdispersion, resulting in a Pearson's χ^2 goodness-of-fit of 36.237. Overdispersion was not assessed for this model; however, 94.5% of observations were correctly classified. All of the variables have expected signs. A positive (or high) *vehicle enjoyment* score indicates an individual who likes to drive autos. Individuals who have a negative *mode satisfaction* score (i.e., high modal satisfaction) are auto drivers. Respondents with roundtrip commute *costs between $10 or more* drive longer distances and use autos for commuting. Finally, the statement "a motor vehicle is not essential to my lifestyle, but I would not want to be without one" is negatively associated with auto commuting because this attitude is contrary to the behavior of individuals, who commute by auto only (and rely upon them).

Respondents who said "Yes" to Auto Use (i.e., the dependent variable in the model) were 12 times more likely to have high scores on the *vehicle enjoyment* scale than respondents who said "No." Also, respondents who said "Yes" to this same dependent variable were .05 times more likely to have a negative *mode satisfaction* score (i.e., or high modal satisfaction) than respondents who said "No." Individuals who responded "Yes" were also .04 times more likely to drive long distances with roundtrip commute *costs of $10 or more* than those who said "No." Lastly, participants who said "Yes" were .01 times more likely to *rely on vehicles* for commuting than individuals who said "No." If "1" is between the lower and upper confidence bounds, the ratio is not significant. All predictors produced significant odds ratios. Results from the auto commuter model are presented in Table 6.19 (below).

Table 6.19: Auto Commuter Model Logistic Regression Results

Model	Beta	Standard Error	Significance	R
Constant	4.5553	2.8875	.1147	
Mode satisfaction	-2.8650	.8804	.0011	-.3432
Enjoyment	1.47456	.9829	.0118	.2441
Cost $10 or more roundtrip	-3.3167	1.3560	.0144	-.2337
Vehicle not essential, but need one	-4.3166	1.4539	.0030	-.3057

Hosmer and Lemeshow Goodness-of-Fit Test:
$\chi^2 = .4217$
df = 8
significance = .9999

Other Summary Statistics:
-2 Log Likelihood: 31.957
Pearson's χ^2 Goodness of Fit: 36.237
Classification Table: 94.52% correctly classified

Predictor	Odds Ratio	Lower Confidence	Upper Confidence
Enjoyment	11.88894	1.7320	81.6139
Mode Satisfaction	0.570	0.0101	0.3200
Costs of $10 or more Roundtrip	0.0363	0.0025	0.5174
Vehicle not essential, but need one	0.0133	0.0008	0.2306

6.5.2 Transit Commuter Model

The second logistic model also provides useful, yet not notable, insights. The transit commuter model reveals that the following variables are significant to transit choice: *BART fits my schedule*, *transit cost*, *mode satisfaction*, and *income between $20,000 to $50,000*.

This model demonstrates that *BART fits my schedule, transit cost, mode satisfaction*, and *income* are the most significant predictors in explaining the transit commuter model. All of the variable coefficients are statistically significant. This model suffers from a high degree of overdispersion, resulting in a Pearson's χ^2 goodness-of-fit of 243.835. Overdispersion was not assessed; however, 86.3% of observations were correctly classified. All of the variables have expected signs. *BART fits my schedule* reflects that transit is convenient for users. *Transit costs between $8 to $*10, which are reasonable for BART commuters, are associated with reasonable costs for transit ridership for the Dublin/Pleasanton region. A positive *mode satisfaction* score reflects that users are dissatisfied with current transportation modes. This result might imply that transit services need to be improved (e.g., lower costs and better feeder services). Interestingly, this is also one of the focus group findings. (See Chapter 9: CarLink Focus Group Summary.) Individuals who have a negative (or low) *vehicle hassle* score (i.e., perceive vehicles as a hassle) use transit. Finally, many households with incomes between $20,000 to $50,000, which are low to moderate for this region, use transit in this study.

Respondents who said "Yes" to Transit Use (i.e., the model's dependent variable) were 15 times more likely to have indicated that *BART fits my schedule* than respondents who said "No." Furthermore, respondents who said "Yes" to this same dependent variable were 14 times more likely to indicate *transit costs* between *$8 to $10* than respondents who said "No." Individuals who respond "Yes" to the dependent variable are four times more likely to be dissatisfied with current *modes* than those who said "No." Finally, participants who stated "Yes" to Transit use were .3 times more likely to have a low vehicle hassle score (or perceive vehicles as a hassle) than those who responded "No." Each of these variables had significant odds ratios, yet income, did not. Results from the transit commuter model are presented in Table 6.20 below.

Table 6.20: Transit Commuter Model Logistic Regression Results

Model	Beta	Standard Error	Significance	R
Constant	-3.1612	1.8724	.0913	
BART fits schedule	2.73233	.5983	.0000	.2802
Transit costs between \$8-\$10 roundtrip	2.6878	.5644	.0000	.2945
Mode satisfaction	1.3027	.3324	.0001	.2367
Vehicle hassle	-1.0660	.3720	.0042	-.1614
Income \$20,000 to \$50,000	1.1850	.5171	.0219	.1168

Hosmer and Lemeshow Goodness-of-Fit Test:
$\chi^2 = 15.7290$
df = 8
significance = .0464

Other Summary Statistics:
-2 Log Likelihood: 136.962
Pearson's χ^2 Goodness of Fit: 243.835
Classification Table: 86.34% correctly classified

Predictor	Odds Ratio	Lower Confidence	Upper Confidence
BART fits schedule	15.2321	4.7146	49.2072
\$8-\$10 roundtrip	14.6998	4.8624	44.4394
Mode satisfaction	3.67930	1.9178	7.05850
Vehicle hassle	0.34440	0.1661	0.71400
Income \$20,000 to \$50,000	3.27070	1.1870	9.01200

6.5.3 Conclusion

To summarize, the two regression models confirm that *convenience*, *cost*, *vehicle enjoyment, mode satisfaction,* and *vehicle attitudes* are key predictors of current mode choice. *Income* is also of interest although it is not a significant predictor.

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CHAPTER SEVEN: CARLINK LONGITUDINAL SURVEY RESULTS

SECTION 7.0 INTRODUCTION

The longitudinal survey was a four-month evaluation of the CarLink concept. The study design consisted of a three-part survey, including educational media (i.e., a brochure, modeling video, and drive clinic), an experimental and control group, and four focus groups. A total of 360 experimental participants received the first-phase survey packet, and 207 experimental participants completed the longitudinal study.

This chapter includes the results from the CarLink longitudinal survey. The responses reflect participant attitudes toward the CarLink concept over time. These results are used to test the two main hypotheses of this dissertation.

- ***Hypothesis One:*** An individual's response to an innovation will be positively altered by informational media (i.e., video, brochure, and drive clinic). Furthermore, individuals who are not exposed to additional information about the innovation will become increasingly negative toward it over time.

- ***Hypothesis Two:*** An individual's valuing response to an innovation's negative mobility attributes (e.g., limitations to instant mobility) will become more positive after learning more about the new technology. In contrast, an individual—unexposed to additional information about the innovation—will respond the same to negative mobility attributes across the study (i.e., his or her response will remain unchanged).

This chapter includes the following sections:

- Project participation and awareness, which includes a discussion of why individuals agreed to participate in this study, and respondents' previous and on-going awareness about carsharing throughout the survey.
- Response to the CarLink concept after each informational media, which evaluates the overall response of participants to CarLink after receiving additional information (and in the case of the control group, no further materials).
- CarLink perceived usage after each media exposure, which is the variable used to evaluate Hypothesis One. In this section, I validate the first hypothesis and the social marketing model (i.e., the behavioral adoption process). Furthermore, I assess the "Social Desirability Effect" on drive clinic participants.
- Participant realization of when they might use CarLink. After evaluating these data, I reject the social influence hypothesis, which states that an individual's decision to adopt an innovation is significantly affected by interactions with friends and family.
- CarLink attitudinal response, which includes an evaluation of the questions used to gauge respondent attitudes toward CarLink and CarLink relative to their current modes. I use the results of this analysis to test and subsequently reject the second study hypothesis.
- CarLink field test interest, which includes an early adopter profile consisting of demographic and psychographic characteristics.

SECTION 7.1 PROJECT PARTICIPATION AND AWARENESS

This section includes a discussion of the reasons why individuals decided to participate in this study, as well as some insights into participant motivations at the beginning of the survey. Furthermore, it describes respondent awareness regarding the carsharing concept at each stage in the survey process. Several survey questions helped me document and understand participants carsharing knowledge from the start of the study and whether or not respondents received any additional information about this topic (e.g., web sites or discussions with colleagues) throughout the study.

7.1.1 Why Participate in this Study?

At the beginning of this study, I queried respondents about their motivation to participate in the CarLink longitudinal survey. (Please see Table 7.1 below.) These data help explain why individuals joined the study, prior to receiving the CarLink informational media. Nineteen percent of the experimental group and 24% of control group participants were curious about trying new products. Twenty percent of experimental participants were eager to explore a transportation alternative versus 4% of control group. Eleven percent of control and 7% of experimental participants were interested in finding a less expensive transportation alternative. Finally, 7% of experimental and 7% of control respondents were interested in learning whether the CarLink system could help reduce air pollution.

Table 7.1: Why Individuals Agreed to Participate

Reason for Participating in CarLink	**Experimental (n=207)**	**Control (n=95)**	**Total (n=302)**
Curious about new products	19%	24%	20%
Eager to explore alternative	20%	4%	15%
Less expensive alternative	7%	11%	8%
Discover if system can reduce air pollution	7%	7%	7%
Other	5%	4%	5%
No response	42%	50%	45%
Total	**100%**	**100%**	**100%**

χ^2 = 12.94, p-value = .012

During phase one, a significant difference was found between the responses of the experimental and control group participants (χ^2 = 12.94, p-value = .012). This difference can be attributed primarily to one response (i.e., eager to explore an alternative transportation system), which was popular among the experimental participants and much less so among the control group. In contrast, control respondents were more concerned about finding a less expensive transportation alternative than the experimental group. However, the difference in response is much less profound for this answer. The most popular response among both groups is curiosity about new products. The experimental and control groups appear eager to explore a new transportation alternative, but for slightly different reasonings.

7.1.2 Awareness of Carsharing Concept

To develop an understanding of carsharing awareness at the start of this survey, I asked participants if they knew about carsharing before answering the initial questionnaire. (See

Table 7.2 below.) It is important to establish whether one group is more knowledgeable about a topic than another in evaluating each group's response. During the initial phase, 58.7% of experimental and 60% of control group participants said they had never heard about carsharing. I suspect that these estimates should be much higher because participants might have confused the carsharing concept with carpooling or car rental. Furthermore, some individuals might have recalled their brief introduction to the concept from the recruitment process. As expected, a significant difference was not found between the response of the experimental and control groups (χ^2 = 0.05, p-value = .825).

Table 7.2: Carsharing Awareness

Have You Ever Heard of Carsharing Before Receiving this Questionnaire?			
Response	**Experimental (n=207)**	**Control (n=95)**	**Total (n=302)**
Yes	41.3%	40.0%	40.9%
No	58.7%	60.0%	59.1%
Total	**100.0%**	**100.0%**	**100.0%**

χ^2 = 0.05, p-value = .825

During the second phase, I asked participants if they heard anything new about carsharing since the previous questionnaire. (See Table 7.3 below.) I asked this question to determine if there might be an external factor, such as social influence (e.g., discussions with friends and colleagues) affecting carsharing response over time. While 10.7% of experimental participants said they had heard something new about carsharing (i.e., before watching the video), only 2.1% of the control group said they heard something new. The majority who answered "Yes" to this question indicated they had spoken with someone about carsharing. This indicates that social interactions are occurring, as predicted by social marketing theorists.

Furthermore, these results confirm that a minority of participants from each group, particularly the control, received little additional information between the first and second phases. Again, the majority that responded "Yes" to this question indicated that they had discussed carsharing with a friend or family member. From these results, I conclude that very little external information influenced the control group. A significant difference was found between the experimental and control groups during this phase ($\chi^2 = 6.51$, p-value = .010).

Table 7.3: New Carsharing Information (Second Phase)

Have You Seen or Heard Anything New About Carsharing?			
Response	**Experimental (n=207)**	**Control (n=95)**	**Total (n=302)**
Yes	10.7%	2.1%	8.0%
No	89.3%	97.9%	92.0%
Total	**100.0%**	**100.0%**	**100.0%**

$\chi^2 = 6.51$, p-value = .010

Finally, in the third phase, 28% of experimental participants said they heard something new about carsharing (i.e., after attending the drive clinic), and only 5.3% of control respondents heard anything new. (See Table 7.4 below.) These results also confirm that the control group received very little additional information and social interaction between the second and third study phases. Again, the majority who answered "Yes" to this question indicated that they had spoken with someone about carsharing. Similar to the previous phases, these findings confirm that some social interaction is occurring.

No media stories were released on the CarLink project until after the longitudinal survey was completed. As expected, a few participants did access additional carsharing information on the Internet. A significant difference also was found between the experimental and control groups in this phase (χ^2 = 20.42, p-value = .000).

Table 7.4: New Carsharing Information (Third Phase)

Have You Seen or Heard Anything New About Carsharing?			
Response	**Experimental (n=207)**	**Control (n=95)**	**Total (n=302)**
Yes	28.0%	5.3%	20.9%
No	72.0%	94.7%	79.1%
Total	**100.0%**	**100.0%**	**100.0%**

χ^2 = 20.42, p-value = .000

SECTION 7.2: RESPONSE TO CARLINK CONCEPT

In this section, I review responses to the CarLink concept after each information media to document how reactions and understanding has changed relative to each stimulus. In each phase, participants were asked to evaluate the carsharing concept. They were given seven possible responses and could check multiple answers. Choices include:

- I am even more interested in this new concept.
- I would be very interested in trying this new mobility system.

- I would like more information.
- I do not understand how the system works.
- This concept would not fit the needs of my household today.
- This concept could fit the needs of my household in the future, but not today.
- Other.

7.2.1 Response to CarLink Concept—After Brochure

After participants reviewed the brochure, only 6.3% experimental, 10.5% control, and 7.6% of the total respondents said they did not understand the concept. However, this response might be overstated. Again, I suspect that many individuals confused carsharing organizations with car rental companies. (See Table 7.5 below[1].) Nearly 64% of experimental respondents (in contrast to 35.8% in the control group) expressed interest in trying the new system.

Table 7.5: Thoughts About CarLink After the Brochure

What Do You Think About the CarLink Concept After the Brochure?		
Response	**Experimental (n=207)**	**Control (n=95)**
I would be very interested in trying this new mobility system	63.5%	35.8%
I would like more information	60.1%	44.2%
This concept could fit the needs of my household in the future but not today	12.0%	21.1%
Other	10.6%	7.4%
This concept would not fit the needs of my household today	6.7%	31.6%
I do not understand how the system works	6.3%	10.5%

$\chi^2 = 46.36$, p-value = .000

[1] Please note that respondents were encouraged to check all applicable responses.

Another 60.1% of experimental participants (in contrast to 44.2% of the control group) wanted more information about carsharing. (Please see Chapter 4: Study Approach, for a more detailed discussion of response to each of the informational media, including additional information requests.) Less than 7% of experimental respondents (in contrast to 31.6% in the control group) said that this concept would not fit the needs of their household today, and 12% of experimental participants stated that it might meet their needs in the future (in contrast to 21.1% in the control group). There was a significant difference in the response of experimental and control groups during this initial phase (i.e., $\chi^2 = 46.36$, p-value = .000). This difference might be explained by the self-selection bias in the experimental group, described in Chapter 4.

7.2.2 Response to CarLink Concept—After Video

After experimental participants watched the video, only 1.4% said they did not understand the concept (i.e., a 4.9 percentage point decrease from the previous phase). (See Table 7.6 below[2].) Approximately 34% said they were even more interested in the concept, and 48.1% of participants expressed interest in this new mobility system. Almost 28% of experimental group participants wanted more information about carsharing, a 32.2 percentage point decrease from the previous phase. Hence, it appears that the video answered many participants' questions. Almost 16% of respondents said that this concept would not fit the needs of their household today. Finally, 17.3% stated this concept could fit the needs of their household in the future, but not today.

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[2] Please note that respondents were encouraged to check all applicable responses.

Table 7.6: Thoughts About CarLink After Video

What Do You Think About the CarLink Concept After the Video?		
Response	**Experimental (n=207)**	**Control (n=95)**
I would be very interested in trying this new mobility system	48.1%	27.4%
I am even more interested in this new concept	34.1%	15.8%
I would like more information	27.9%	35.8%
This concept could fit the needs of my household in the future but not today	17.3%	21.1%
This concept would not fit the needs of my household today	15.9%	41.1%
Other	8.2%	6.3%
I do not understand how the system works	1.4%	10.5%

$\chi^2 = 45.89$, p-value = .000

In contrast, only 10.5% of the control group said they did not understand how the CarLink system works; there was no change in response from the previous phase. Approximately 16% of the control respondents said they were even more interested in the concept. Only 27.4% responded they would be very interested in trying the concept—an 8.4 percentage point decrease from the previous phase. Even fewer requested information in this phase, i.e., 35.8% (an 8.4 percentage point decrease). This is not surprising because I expected this group to lose interest in the concept gradually over time, having not received any additional information.

Approximately 41% said this concept would not fit the needs of their household today, representing a 9.5 percentage point increase from the previous phase. This supports the first study hypothesis, which states that the control group would either remain stable or become more negative towards the concept over time. If individuals do not receive additional information after exposure to a new concept (i.e., the precontemplation phase), they are likely to lose interest or determine that the product is not applicable to their needs. Finally, 21.1% said this concept could fit the needs of their household in the future, but not today. There was a significant difference between the experimental and control groups' response in the second phase (i.e., χ^2 = 45.89, p-value = .000). This difference is likely due to the video rather than a sampling bias or other factor. (Please see discussion of sampling bias in Chapter 4: Study Approach.)

7.2.3 Response to CarLink Concept—After Drive Clinic

After the drive clinic, only 0.5% of experimental respondents said they did not understand the concept (i.e., a .9 percentage point decrease from the previous phase). (See Table 7.7, below.) Approximately 54% said they were even more interested in the concept (i.e., a 19.7 percentage point increase from the video phase), and 55.3% of participants expressed interest in this new mobility system (a 7.2 percentage point increase from the previous phase). Approximately 21% of experimental group participants wanted more information about carsharing; this is a 6.7 percentage point decrease from the previous phase. Again, it appears that the drive clinic may have answered questions for many participants.

Table 7.7: Thoughts About CarLink After Drive Clinic

What Do You Think About the CarLink Concept After the Drive Clinic?		
Response	**Experimental (n=207)**	**Control (n=95)**
I would be very interested in trying this new mobility system	55.3%	21.1%
I am even more interested in this new concept	53.8%	7.4%
This concept could fit the needs of my household in the future but not today	25.0%	29.5%
I would like more information	21.2%	34.7%
This concept would not fit the needs of my household today	13.9%	53.7%
Other	9.6%	4.2%
I do not understand how the system works	0.5%	9.5%

χ^2 = 119.5, p-value = .000

Nearly 14% said this concept would not fit the needs of their household today. It is interesting to note that there was a two percentage point decrease in response from the previous phase. I suspect this decrease reflects a better understanding of the concept as a result of the clinic and is therefore a more accurate response. However, this might also reflect that some individuals no longer think that they can use the system due to the small scale of the clinic and field test (e.g., they are unable to access vehicles from the Dublin/Pleasanton BART station, so they could not use the system) in contrast to the broader concept conveyed in the brochure and video. Unfortunately, it is impossible to separate the two possible exposure effects on concept response. Finally, 25% said the concept could fit the needs of their household in the future, but not today (i.e., a 7.7 percentage point increase from the previous phase). Again, this likely reflects the scale and specific application conveyed at the drive clinic.

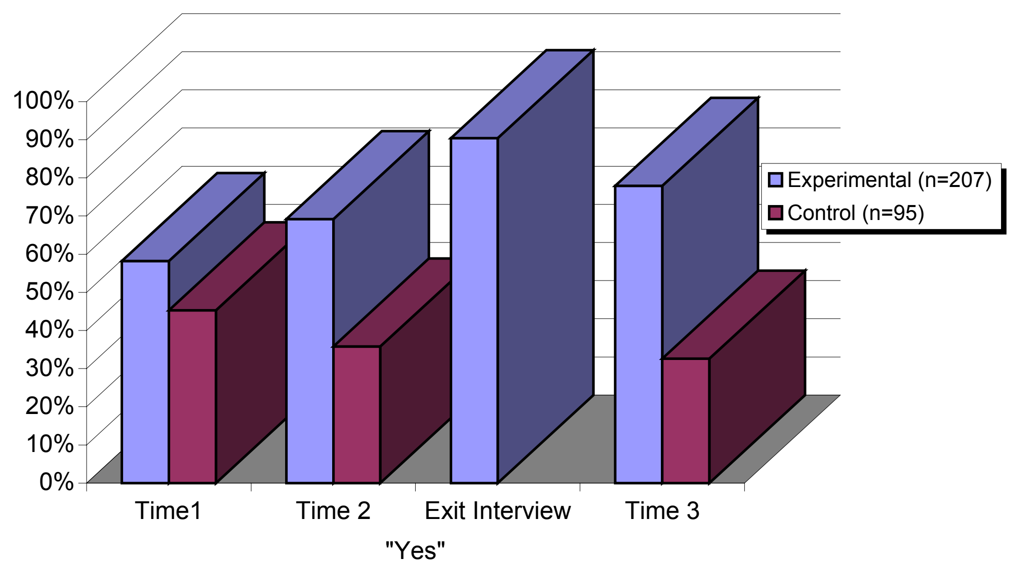
In contrast, 9.5% of the control group said they did not understand how the system works, a one percentage point decrease from the previous phase. And, only 7.4% said they were even more interested in the concept (i.e., an 8.4 percentage point decrease). Only 21.1% responded that they would be very interested in trying the concept—a 6.3 percentage point decrease from the previous phase. Even fewer requested information in this phase, i.e., 34.7% (a 1.1 percentage point decrease). This is not surprising; I expected this group to lose interest in the concept gradually over time, having not received any additional CarLink information.

Nearly 54% said this concept would not fit the needs of their household today, representing a 12.6 percentage point increase from the previous phase. This supports the first study hypothesis regarding the control group's response. Finally, 29.5% said that the concept could fit the needs of their household in the future, but not today (i.e., an 8.4 percentage point increase). There was a significant difference between the experimental and control groups' responses in the final phase (i.e., $\chi^2 = 119.5$, p-value = .000). This difference is most likely due to the educational media versus a sampling bias or other factor. (Please see discussion of sampling bias in Chapter 4: Study Approach.)

SECTION 7.3 CARLINK "USE"—A LONGITUDINAL PERSPECTIVE

I developed and administered a question in all three survey phases, to test and monitor participant response to the carsharing concept over time. The main dependent variable in this evaluation is the question, "Do you think that you would use the CarLink system?" I use these results to test the first study hypothesis, validate the social marketing model (or behavioral adoption process), and evaluate the “Social Desirability Effect.” For both the “Yes” and “No” responses, participants were provided with a series of reasons why they would (or would not) use CarLink. Participants could check multiple responses. See Figure 7.1 (below) for the results to this question for the experimental and control groups.

Figure 7.1: Would You Use CarLink?



In the first phase, I provided a carsharing informational brochure to participants. I asked respondents to review the brochure and complete a questionnaire. After reviewing the brochure, participants were asked whether or not they would use the carsharing system. Approximately 58.2% of the experimental respondents said “Yes.” It is interesting that 45.3% of the control participants responded “Yes” (i.e., 12.9 percentage points less than the experimental group). In this phase, a significant difference was found between the responses of the experimental and control groups (i.e., $\chi^2 = 5.38$, p-value = .020). Again, this difference is likely due to the self-selection bias of the experimental group as discussed in Chapter 4: Study Approach.

In the second phase, I presented the carsharing concept in a modeling video, which explained and demonstrated how CarLink could work for two households. I asked experimental participants to review the video and complete a questionnaire. After watching the video, experimental respondents were asked whether or not they would use the carsharing system. Over 69% of the participants said “Yes” (i.e., an 11.0 percentage point increase from the previous phase). In contrast, only 35.8% of control respondents said “Yes” (i.e., a 9.5 percentage point decrease). As expected, a significant difference was found between the responses of the experimental and control group (i.e., $\chi^2 = 32.99$, p-value = .000).

These findings support the first study hypothesis. In this case, the experimental group became more positive and the control more negative. It is interesting to note that the experimental group showed an increase between the first and second phases; conversely, the control group revealed an almost equivalent decrease between these two phases.

During an exit interview, following the drive clinic, I asked participants about their perceived CarLink usage: “Would You Use CarLink: A Smart Car Sharing System?” Ninety-one percent of participants responded “Yes.” The change in positive response during this phase is notable. Indeed, there was a 21.2 percentage point increase in the

"Yes" response category. Since control group respondents did not participate in the clinic, there are no corresponding data for this time.

In the final phase, I asked experimental participants to reflect on the drive clinic and complete one last questionnaire. Again, participants were asked whether or not they thought they would use CarLink. Nearly 78% of the experimental group said "Yes," whereas only 32.6% of the control responded positively (i.e., a 3.2 percentage point decrease from the previous phase). In this phase, there was a 12.5 percentage point decrease in the experimental group's positive response. This result was expected due to the "Social Desirability Effect." In this phase, a significant difference was found between the responses of the experimental and control group (i.e., χ^2 = 58.65, p-value = .000).

Although the "live" demonstration method has several advantages (e.g., hands-on experience, one-on-one interaction with participants, and reduced product uncertainty), trials have several limitations, such as the "Social Desirability Effect." With this effect, participants often provide a socially desirable response, especially during a one-on-one interview with researchers. Furthermore, trial duration cannot substitute for the results of long-term use and product experience (e.g., attitudes or perception can only provide a limited approximation of actual behavior). Finally, trials offer limited product exposure (i.e., a trial specifies a particular use or environment), which restricts participant understanding of a broader range of product applications in evaluating potential use. The novelty of participating in this clinic led to overstated reports, which is revealed in the post-clinic data (i.e., the final phase).

The overall data gathered from the longitudinal survey support Hypothesis One. The only exception to the stated hypothesis is the drop in positive response between the drive clinic and final phase. This can be explained by the “Social Desirability Effect.” In comparison, the control group did behave as predicted. Over time, this group became less positive toward CarLink usage. I attribute this effect primarily to the lack of informational media and social feedback needed to move an individual through the behavioral adoption process.

In this study, the majority of control group participants were not provided with enough CarLink information to move from precontemplation into the contemplation phase. In contrast, the experimental group received several informational media, which allowed them to assess the benefits and costs of CarLink to their lifestyle. These stimuli fostered a more positive response to this transportation alternative. Another question for this dissertation is whether study participants are inclined to move from contemplation into the “action” phase. This chapter concludes with an analysis of the 128 study participants who said that they would like to be contacted about participation in the CarLink field test and the individuals who later joined.

7.3.1 Reasons for Not Using CarLink

For my analysis, it is also important to understand why individuals are not interested in using CarLink. During each survey phase, I asked participants to specify all of the reasons they would *not* use CarLink. The list of responses include:

- I like my current set of transportation modes.
- Personal vehicles are a preferable transportation tool.
- The system is too complicated.
- I would be concerned about maintaining my privacy when using such a system.
- CarLink is too risky (e.g., I'd worry about vehicle availability, breakdowns, and a backup taxi or shuttle service).
- Other.

Over time, the response of experimental participants to each of these reasons decreased. This is not unexpected due to the increasingly positive response of this group toward CarLink, with the exception of the decrease between the clinic and the final phase. (See Table 7.8 below.)

Table 7.8: Reasons for Not Using CarLink

Why Wouldn't You Use the CarLink System?						
	Time 1		Time 2		Time 3	
Response	**Exp. (n=207)**	**Control (n=95)**	**Exp. (n=207)**	**Control (n=95)**	**Exp. (n=207)**	**Control (n=95)**
Like current mode	18.8%	26.3%	15.4%	45.3%	13.5%	51.6%
Too risky	13.9%	21.1%	9.6%	22.1%	7.7%	27.4%
Prefer personal vehicle	11.5%	16.8%	8.7%	32.6%	7.2%	35.8%
Too complicated	6.3%	8.4%	5.3%	9.5%	1.0%	20.0%
Privacy concern	6.3%	10.5%	4.8%	14.7%	2.4%	12.6%
Other	3.8%	3.2%	13.9%	17.9%	12.5%	27.4%

The most popular reason for *not* using CarLink was "Like current mode," followed by "System is too risky," and "Personal vehicles are preferable." It is interesting to note that a minority of this population thought that the system was "too complicated" to use or were concerned about “privacy” issues. These are promising results for the application of Intelligent Transportation System technologies in the future.

As expected, the control group’s response increased in each category over time. The control group ranked reasons similarly to the experimental group. Throughout the study, the control’s response to each category increased, with one exception. Privacy concerns peaked in the second phase (i.e., 15%) and decreased by two percentage points in the final phase (i.e., 13%).

7.3.2 Reasons for Using CarLink

I also explored reasons why many participants are interested in using CarLink. During each survey phase, participants who stated “Yes” to using CarLink were asked to specify all of the reasons they thought they would use it. The list of responses includes:

- I wouldn’t have to worry about parking in my neighborhood.
- I wouldn’t have to worry about insurance, maintenance, fueling, and parking.
- I wouldn’t have to pay for parking at work.
- I could walk and bike more often.
- I could save money using CarLink.
- I could take transit more often.
- I could reduce commute stress.
- I could get to work on time.

- I could have a transportation alternative that is more compatible with telecommuting because I telecommute.
- It looks like a fun way to get around.
- I could change my current way of getting around, which I don't like.
- Other.

Over time, the response of experimental participants to each of these reasons increased. This is not surprising due to the increasingly positive response of this group, with the exception of the decrease between the clinic and the final phase. For this analysis, I focus on the top six reasons. (See Table 7.9 below.)

Table 7.9: Reasons for Using CarLink

Reasons Why I Would Use the CarLink System						
	Time 1		Time 2		Time 3	
Response	**Exp. (n=207)**	**Control (n=95)**	**Exp. (n=207)**	**Control (n=95)**	**Exp. (n=207)**	**Control (n=95)**
Improve air quality	51.4%	38.9%	56.3%	22.1%	65.4%	22.1%
No insurance, vehicle, etc. hassle	43.3%	44.2%	47.1%	27.4%	53.4%	26.3%
Save money	40.4%	32.6%	37.0%	15.8%	37.5%	10.5%
Reduce commuter stress	28.8%	14.7%	33.2%	8.4%	33.7%	9.5%
Frequent transit use	27.9%	3.2%	26.4%	11.6%	34.1%	11.6%
Fun option	24.5%	18.9%	29.8%	13.7%	23.6%	11.6%

The most popular reason for using CarLink among the experimental group was to "Improve air quality," although I do not believe that this is the primary motivating factor for usage. My suspicion is based on conversations I had with participants during the drive clinic and focus groups. Indeed, participants will often provide a response that "makes them feel good" or they think a researcher wants to hear. The second and third responses seem more likely as motivating factors, i.e., "Wouldn't have to worry about insurance, vehicle hassles, etc." and "Save money," respectively. Other "top" reasons include: "Reduced commuter stress," "Frequent transit use," and "Fun option," respectively.

Not surprisingly, the experimental group's response increased in almost every category over time. The most notable exception to this is "money savings." After the first phase, the percentage of individuals providing this response dropped by 3.4 percentage points (i.e., from 40.4% in the first phase to 37.0% in the second). It is interesting to note that response to this category did increase, however, in the final phase by .5 percentage points (i.e., 37.5%). A similar effect occurred in the "Frequent transit use" category. There is a 1.5 percentage point decrease between the first and second phases (i.e., response drops from 27.9% to 26.4% in the second phase, and increases by 7.7 percentage points in the third phase). Finally, "Fun option" decreased after the first and second phases (i.e., from 24.5% and 29.8%, respectively) to 23.6% in the final phase. These effects are likely attributable to the informational media.

The control group ranked reasons for CarLink "use" less similarly than the experimental group. For instance, the control group ranked vehicle hassle above air quality in my study, which seems logical. They also ranked the last three reasons differently. The fourth most important reason is that CarLink looks like a "Fun option," followed by "Reduced commuter stress," and "Frequent transit use." Over time, the response to each category decreased, with two exceptions. Reduced commuter stress and frequent transit use demonstrated different patterns. Response to reduced stress dropped by 6.3 percentage points between the first and second phases (i.e., from 14.7% to 8.4%), but increased by 1.1 percentage points between the second and third phases (i.e., 8.4% to 9.5%). This is an interesting effect since the control group did not receive any additional media after the brochure. Furthermore, response to frequency of transit use increased between the first and second phases (i.e., from 3.2% to 11.6%) and remained stable between the second and final phases. These findings support that CarLink is perceived to be associated with transit and reduced commute stress, even for the control who received limited information. This suggests that the transit linkage to CarLink is evident and is considered to be an important attribute by many.

7.3.3 When Participants Realized They Might Use CarLink

To help document the role and impact of the media (and social influence) on the behavioral adoption process, I also asked individuals who positively responded to CarLink usage, when they realized they might use CarLink. Response categories include: during study recruitment, after reading the brochure, while completing this questionnaire, while completing the previous questionnaire, when talking with a friend, when watching the video, or while attending the drive clinic. Participants were instructed to check only one response. (See Table 7.10 below.)

Table 7.10: When Did You Realize You Might Be Able to Use This Service?

Response	Time 1		Time 2		Time 3	
	Exp. (n=207)	**Control (n=95)**	**Exp. (n=207)**	**Control (n=95)**	**Exp. (n=207)**	**Control (n=95)**
During recruitment	21.2%	3.1%	20.2%	5.3%	25.0%	4.2%
When read the brochure	18.3%	17.9%	12.1%	18.8%	15.4%	12.6%
When filled out this questionnaire	14.9%	11.6%	4.3%	3.2%	1.0%	3.2%
When talked with a friend about CarLink	1.4%	1.1%	1.4%	3.2%	0.5%	1.1%
When watched the video	N/A	N/A	17.8%	N/A	15.4%	N/A
When attended the drive clinic	N/A	N/A	N/A	N/A	16.7%	N/A
When filled out the questionnaire last time	N/A	N/A	9.6%	8.4%	1.0%	1.1%
When spoke with someone from CarLink	0%	0%	0.5%	0%	3.4%	0%
No response	44.2	66.3	34.1	61.1	21.6	77.8
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

During phase one, 21.2% of experimental participants stated they realized that they might be willing to use CarLink during the recruitment process, versus only 3.1% of control participants. Almost equivalent percentages, 18.3% of experimental and 17.9% of control, of respondents said that they realized they might use CarLink while reading the brochure. Approximately 15% of experimental participants stated that they realized they might use CarLink while completing the brochure questionnaire, in contrast to 11.6% of control participants. Finally, a much smaller percentage of participants, 1.4% of experimental and 1.1% of control, responded that they realized they might use CarLink while talking with a friend about it. This demonstrates that the social interaction effect may be less significant than expected by social marketing theorists for CarLink.

In the second phase, 20.2% (a decrease of one percentage point) experimental participants said they realized they might be willing to use CarLink during the recruitment process, versus 5.3% (an increase of 2.2 percentage points) of control participants. After watching the video, 12.1% of experimental participants responded that they realized they might use CarLink while reading the brochure—a decrease of 6.2 percentage points. This decrease is expected, once the video was reviewed by experimental participants. In contrast 18.8% of control participants (a 0.9 percentage point increase) responded that the brochure had influenced their attitude toward CarLink. As expected, 17.8% of experimental participants realized they might be willing to use CarLink while watching the video. Only 4.3% of experimental participants realized this while completing the second questionnaire, versus 3.2% of control participants (a decrease of 8.4 percentage points). Only 1.4% of experimental and 3.2% of control participants responded while talking with a friend about it. Finally, almost equivalent percentages, 9.6% of experimental and 8.4% of control, responded while completing the brochure questionnaire.

After the final phase, 25% (an increase of 4.8 percentage points) of experimental participants realized they might use CarLink during the recruitment process, versus 4.2% (a decrease of 1.1 percentage points) of control participants. After attending the drive clinic, 15.4% of experimental participants (an increase of 3.3 percentage points) responded while reading the brochure; another 15.4% (a decrease of 2.4 percentage points) attributed this to the video and 16.7% responded that the drive clinic affected their response. In contrast 12.6% of control participants (an increase of 6.2 percentage points) responded that the brochure had influenced their attitude toward CarLink.

Only 1% of experimental participants stated they realized they might be willing to use CarLink while completing the final questionnaire (a decrease of 8.6 percentage points), versus 1.1% of control participants (a 7.3 percentage point decrease from the second phase). Less than 1% of experimental participants said they might use CarLink when talking with a friend (a 0.9 percentage point decrease from the previous phase). Similarly, only 1.1% of control participants said they realized they might use CarLink when talking with a friend (a 2.1 percentage point decrease from the previous phase). Finally, 3.4% of experimental participants indicated they might use CarLink while talking with someone from the CarLink project.

For the experimental group, the recruitment process was the point at which most realized they would be willing to use CarLink. This implies that these individuals may already have been interested in exploring a transportation alternative and only needed a little additional information to aid them in moving from the precontemplation phase to contemplation or even action. A more interesting result, however, is that the brochure, video, and drive clinic all appear to be significant in helping individuals decide whether or not they might use CarLink. Finally, the second questionnaire also played a notable role in participant realization. During the second phase, 9.6% of experimental participants reported they realized they might use CarLink while completing this survey instrument.

In contrast, the recruitment process did not play as significant a role for the control group. The most notable stimuli were the brochure and the second questionnaire for this group. These responses are logical since the control group only received the brochure and had several weeks to consider the carsharing concept by the time they completed the second questionnaire. It appears that the informational media and the question/answer process are effective devices for aiding target adopters in considering an innovation.

SECTION 7.4 CARLINK ATTITUDINAL RESPONSE

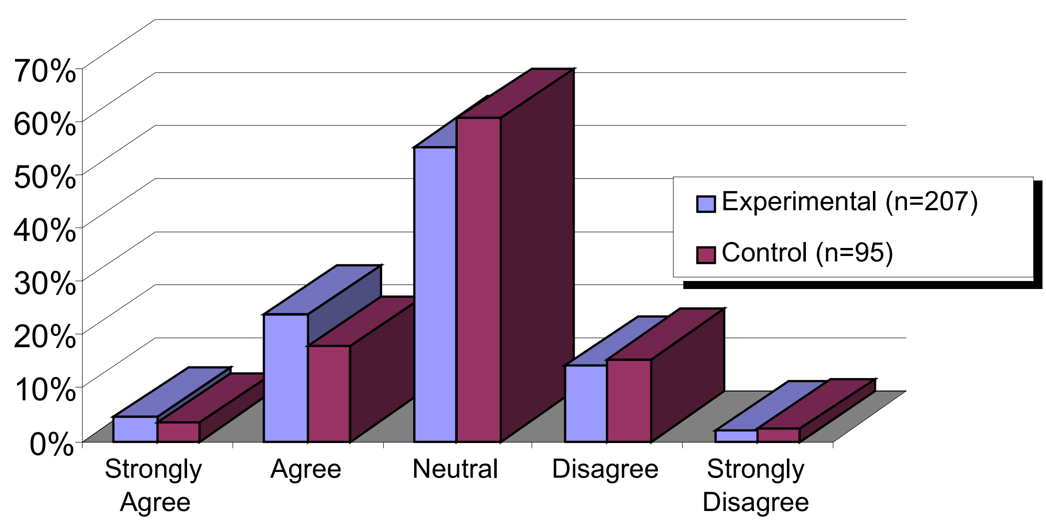
For this dissertation, I also created two dependent variable scales to help evaluate changes in CarLink response over time. These scales consisted of a series of questions that evaluated a range of modal attributes for CarLink and CarLink relative to current modes. The first is called “CarLink Satisfaction”, and the second is “CarLink Relative” to current modes. As mentioned in Chapter 4, each of these scales have high reliabilities or Cronbach’s alpha scores. Furthermore, I used the CarLink Satisfaction question to test my second study hypothesis.

7.4.1 CarLink Satisfaction

Respondents were asked to evaluate whether or not they thought CarLink would satisfy a number of modal attributes (e.g., gets me to work on time, allows me to be spontaneous, etc.). Participants were asked to respond to 13 statements using a five-point Likert type scale (ranging from strongly agree to strongly disagree). CarLink Satisfaction was calculated for all three phases of this survey. See Chapter 4: Study Approach, for a more detailed discussion of this scale.

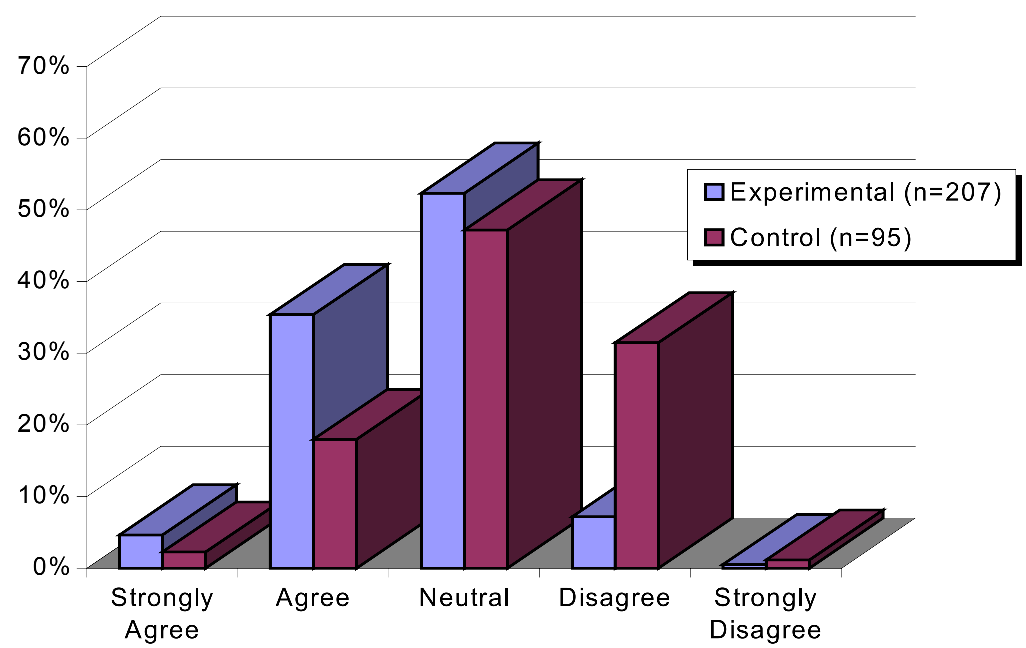
During each study phase, I asked participants to evaluate how CarLink would meet their household's current lifestyle goals and needs. (See Figure 7.2 below.) In the first phase, 28.4% of the experimental participants agreed or strongly agreed that CarLink would satisfy their transportation needs. Furthermore, 55.3% were neutral about CarLink. In contrast, 21.5% of the control participants agreed or strongly agreed that CarLink could meet their lifestyle goals, and 60.7% were neutral. In this phase, a t-test value of .721 and p-value of .471 were calculated, which means that the scale results for the experimental and control groups were not significantly different for the initial study phase. These results seem logical because both groups received the brochure and identical survey instruments.

Figure 7.2: CarLink Satisfaction (First Phase)



As expected, a significant change was observed between the response of the experimental and control groups in the second phase. (See Figure 7.3 below.) After watching the video, 40% of experimental participants agreed or strongly agreed that CarLink would satisfy their transportation needs (i.e., an 11.6 percentage point increase), and 52.3% were neutral (i.e., a three percentage point decrease from the previous phase).

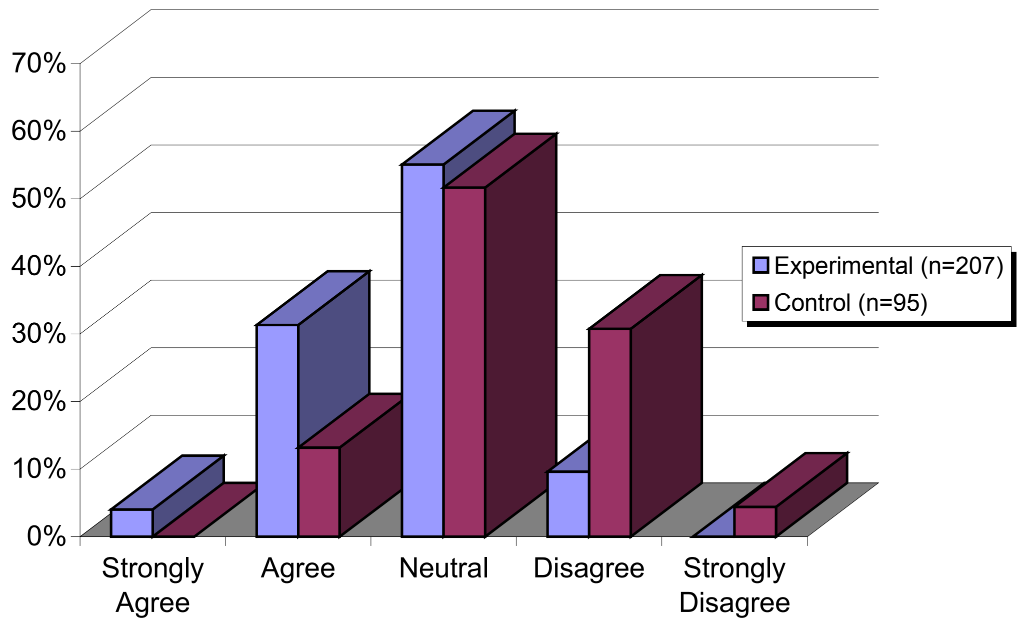
Figure 7.3: CarLink Satisfaction (Second Phase)



As expected, the response of those who agreed or strongly agreed in the control group decreased in the second phase to 20.2%—a 1.3 percentage point decrease. The percentage of neutral respondents decreased, as well, to 47.2% (i.e., a 13.5 percentage point decrease). Many respondents shifted from a positive to a neutral response. Furthermore, 32.6% of control participants disagreed or strongly disagreed that CarLink could meet their lifestyle goals—a 19.1 percentage point increase from the previous phase. Hence, this group became more negative towards CarLink during the second phase. In this phase, a t-test value of 4.795 and p-value of .000 were calculated. This means the scale results are significantly different for the two groups. Again, these results seem logical because the control group did not receive additional informational during this phase.

In the final phase, slightly different changes were observed. (See Figure 7.4 below.) In the experimental group, only 35.3% agreed or strongly agreed that CarLink would satisfy their transportation needs (i.e., a 4.7 percentage point decrease from the previous phase). Approximately 55.1% were neutral (i.e., a 2.8 percentage point increase from the second phase), and 9.6% disagreed or strongly disagreed that CarLink would meet their needs. In this phase, individuals became more neutral or negative toward the CarLink system. I attribute this shift to the drive clinic, where individuals received even more information about how CarLink works. Consequently, this final scale is likely to be more representative of perceived CarLink satisfaction than the previous phases.

Figure 7.4: CarLink Satisfaction (Third Phase)



Again, the control group became increasingly negative towards CarLink modal satisfaction. In the third phase, only 13.2% agreed or strongly agreed that CarLink would satisfy their lifestyle goals (i.e., a 7.0 percentage point decrease from the second phase). Moreover, 35.2% disagreed or strongly disagreed that CarLink would meet their needs—a 2.6 percentage point increase from the previous phase, and 51.6% were neutral (i.e., a 4.4 percentage point increase). After the brochure introduction the control group became increasingly negative toward the CarLink system. In the final phase, a t-test value of 5.879 and p-value of .000 were calculated. The scale results are significantly different for the two groups. Again, these results appear logical since the control group did not receive any additional media after the first study phase.

A repeated measures MANOVA test was also run (i.e., a two by three design), using Wilks' Lambda. This test is used to simultaneously examine CarLink satisfaction and the control versus experimental variables over the three study phases. By only looking at the individual t-test values for each time period, it is possible to misjudge overall significance because they do not account for a relationship among the study phases. The ANOVA source table below shows a highly significant F value for the effect time has on this variable (i.e., the media exposures affected CarLink satisfaction response) as well as the interaction between time and the group identification (i.e., experimental versus control group participation). These results also support Hypothesis One and validate the behavioral adoption process.

MANOVA SourceTable: CarLink Satisfaction				
Effect	**Wilks' Lambda**	**Hypothesis df**	**Error df**	**Significance**
Time	0.949	2	249	0.001
Time by Group Identification	0.944	2	249	0.001

7.4.1.1 CarLink Negative Attributes—Change Over Time

To test my second hypothesis, I examined changes in response to negative modal attributes included in the CarLink satisfaction scale, described above. The second hypothesis states that an individual's response to an innovation's mobility limitations (e.g., reduced spontaneity) will be altered by the educational material.

This analysis did not reveal a positive change in the negatively perceived attributes among experimental participants. In fact, there were a few cases in which the control and experimental groups became more negative over time. Two attributes in particular were rated negatively by study participants: *allows for spontaneity* and *response to an emergency*. Observed changes in these factors do not support this study hypothesis nor do they indicate that any particular media device was significantly more powerful than another in altering negative perception. The video and drive clinic, however, may have provided enough information to prevent a significant change in the experimental group's initial response toward the *emergency response* attribute.

During phase one, 41.7% of the experimental participants responded that they were neutral about whether CarLink *allows for spontaneity*, and 30.1% said they disagreed or strongly disagreed with this statement. Approximately 38.5% of the control group said that they were neutral about this CarLink attribute, and 41.8% disagreed or strongly disagreed that CarLink *allowed for spontaneity.* In phase one, a χ^2 value of 5.22 and p-value of .500 were calculated, revealing no statistical difference between the experimental and control groups. This is logical because both groups received the brochure. (See Figures 7.5 to 7.7. below.)

In the second phase, 40.4% of experimental respondents were neutral (i.e., a 1.3 point decrease from the previous phase), and 33.5% disagreed or strongly disagreed (i.e., a 3.4 point increase). In the control group, however, there was 10 percentage point increase in individuals who did not believe that CarLink *allows for spontaneity*. In this phase, a χ^2

value of 7.88 and p-value of .100 were calculated. Again, there was no statistical difference between the experimental and control groups.

In the third phase, 34.8% of experimental participants chose a neutral response (i.e., a 5.6 percentage point decrease), and 39.7% responded they disagreed or strongly disagreed (i.e., a 6.2 percentage point increase). In contrast, in the control group there was a 15 percentage point increase in individuals who disagreed that CarLink *allows for spontaneity*. In the final phase, a χ^2 value of 23.44 and p-value of .005 were calculated. Thus, a statistical difference was found between the experimental and control groups for this phase. These findings support that differences in perception became much more pronounced in the final phase. This is not unexpected because the control group did not receive additional information for evaluating this CarLink feature.

To summarize, the control group became increasingly negative toward the statement *allows for spontaneity* (i.e., a 25 percentage point total increase in respondents who disagree or strongly disagree). The experimental group also became negative, but much less so in comparison, throughout the survey (i.e., a 9.8 percentage point increase in negative perception). Clearly, this attribute represents a barrier to CarLink adoption. Given these results, I suspect that altering perceptions toward negative innovation attributes may be difficult, if not impossible, to overcome without participant experience. Nevertheless, it is interesting to note that the experimental group's response was much less negative than that of the control.

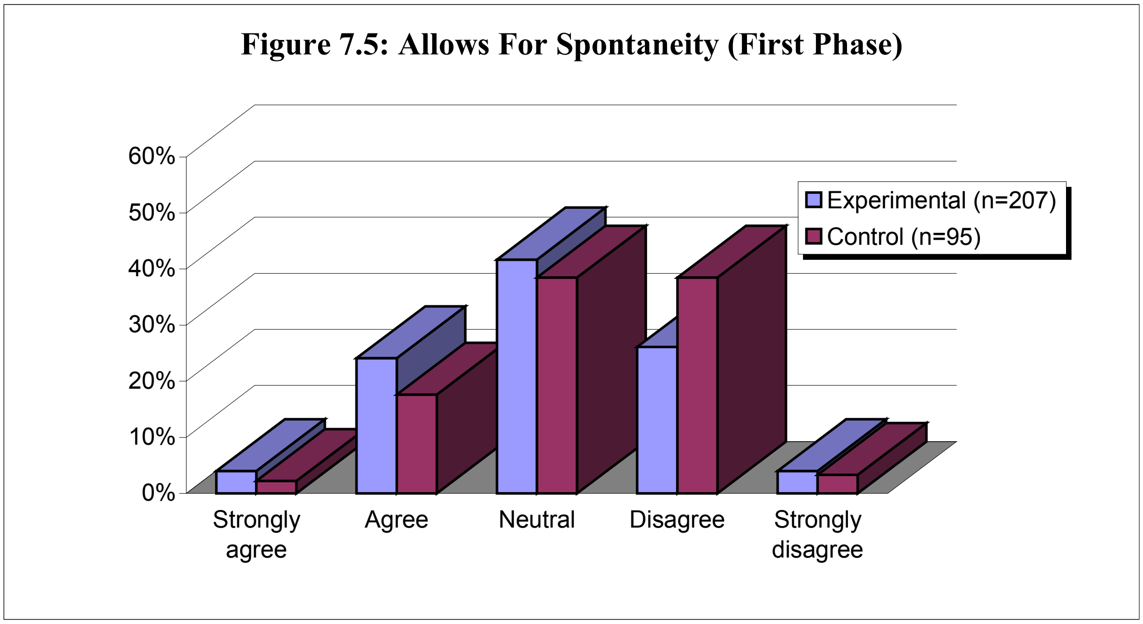


Figure 7.5: Allows For Spontaneity (First Phase)
60%
50%
40%
30%
20%
10%
0%
Experimental (n=207)
Control (n=95)
Strongly agree
Agree
Neutral
Disagree
Strongly disagree

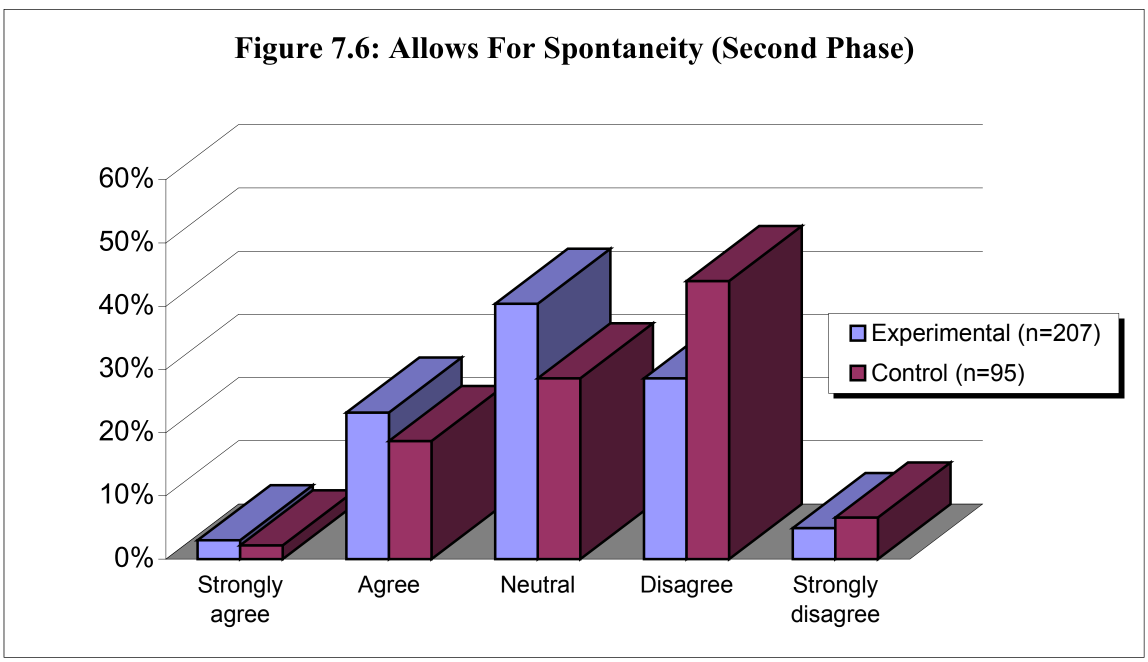
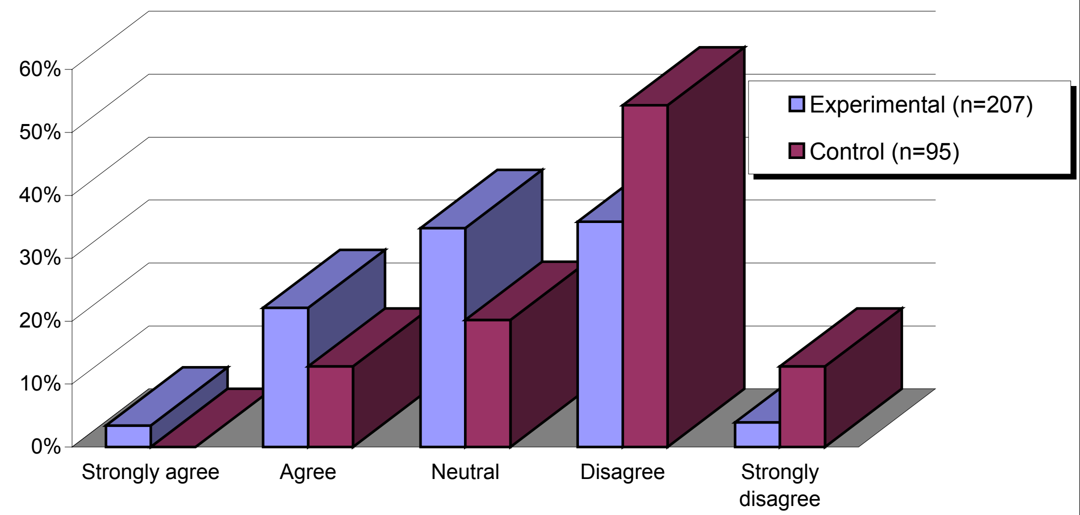


Figure 7.6: Allows For Spontaneity (Second Phase)
60%
50%
40%
30%
20%
10%
0%
Experimental (n=207)
Control (n=95)
Strongly agree
Agree
Neutral
Disagree
Strongly disagree

Figure 7.7: Allows For Spontaneity (Third Phase)



Toward the second attribute, *emergency response*, the control group became more negative over time, particularly during the second study phase. In contrast, the experimental group remained relatively stable, although more negative throughout. (See Figures 7.8 to 7.10 below.)

During the first phase, 34.2% of experimental participants stated they were neutral about whether or not CarLink allows for *quick response to an emergency*, and 50.3% disagreed or strongly disagreed. The control group was primarily negative (i.e., 58.3%) and neutral (i.e., 36.3%). A χ^2 value of 6.912 and p-value of .140 were calculated for this phase, indicating no significant difference between the experimental and control groups after receiving the informational brochure.

In the second phase, 49.5% of experimental respondents disagreed or strongly disagreed (i.e., a 0.8 percentage point increase) that CarLink allows for *emergency response*, and 39.6% chose the neutral response (i.e., a 5.4 percentage point increase). Thus, the experimental group remained relatively stable during the second phase. In contrast, the control group became even more negative (i.e., 72.5% disagreed that CarLink allowed for *emergency response*—a 14.2 percentage point increase from the previous phase), and 18.7% chose the neutral response (i.e., a 17.6 percentage point decrease). In phase two, a χ^2 value of 16.844 and p-value of .005 were calculated. This significant value indicates that the video may have supplied enough information to allow the experimental group to remain relatively stable in their opinion toward *emergency response*.

In the final phase, 51.2% of experimental participants responded that they disagreed or strongly disagreed (i.e., a 1.7 percentage point increase), and 35.6% were neutral (i.e., a four percentage point decrease). Among the control group, there was only a slight increase in negative response (i.e., 73.4%—only a 0.9 percentage point increase), and 24.5% were neutral (i.e., a 5.8 percentage point increase). A χ^2 value of 17.552 and a significant p-value of .005 were calculated. This may indicate that the drive clinic provided enough information to prevent a significant change in participant response. Based on these results, I suspect that it may be difficult to alter perceptions toward this attribute without participant experience. Again, it is interesting to note that the experimental group remained relatively stable and only became slightly more negative toward this attribute over time, in contrast to the control group, who became much more negative primarily during the second study phase.

Figure 7.8: Emergency Response (First Phase)

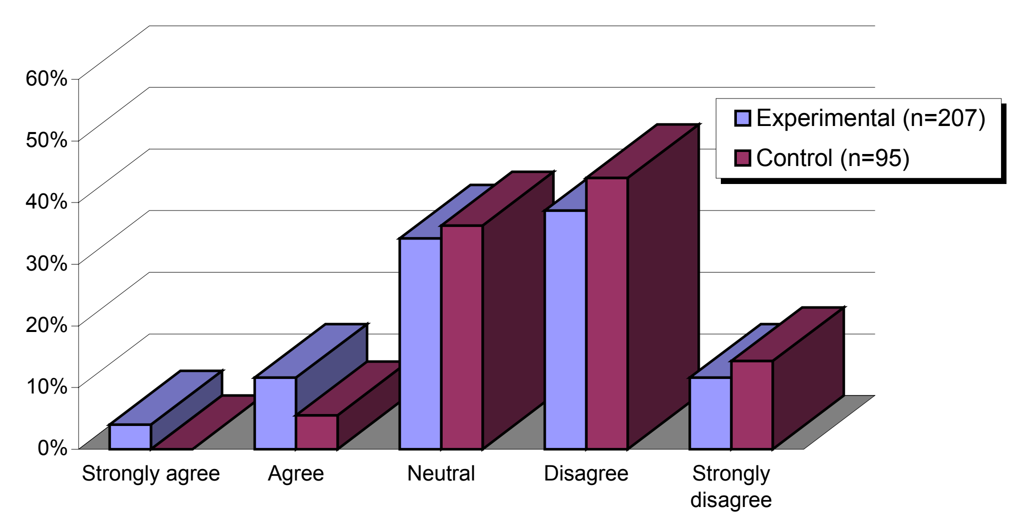


Figure 7.9: Emergency Response (Second Phase)

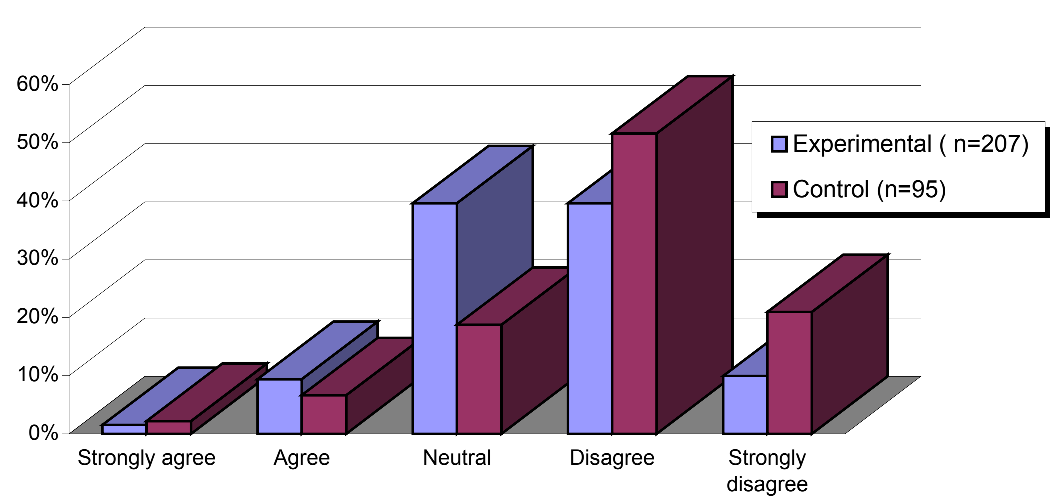
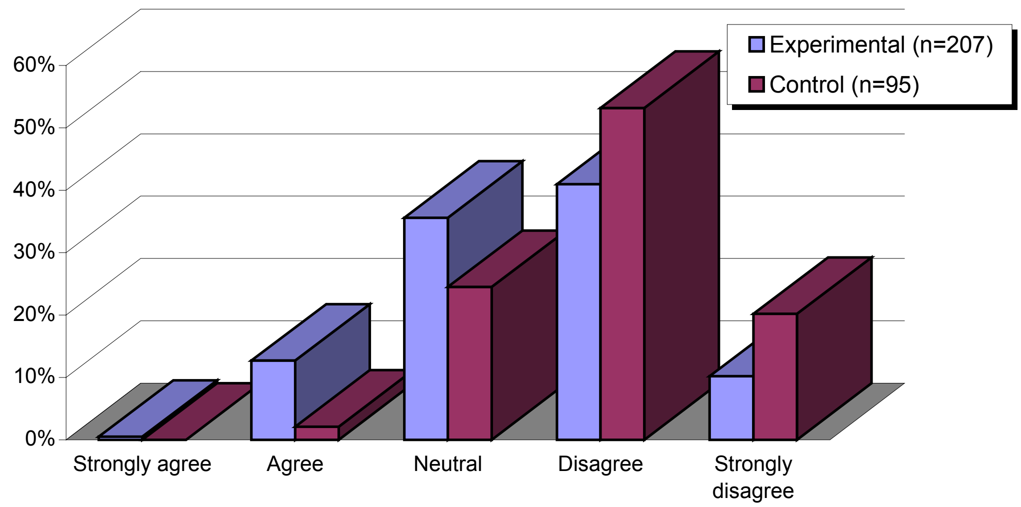


Figure 7.10: Emergency Response (Third Phase)



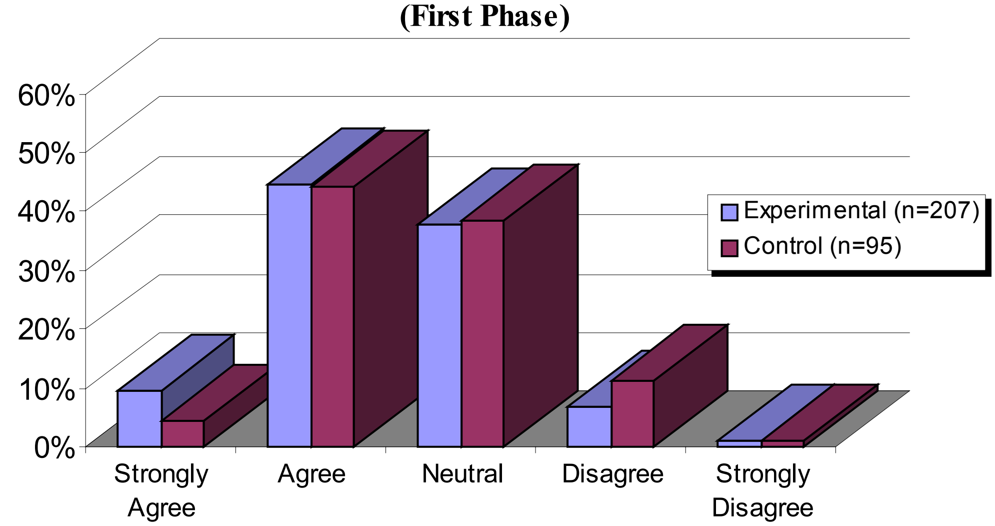
To summarize, both of these attributes are potentially significant barriers to CarLink adoption. At the time of this survey, respondents had no "real" experience with CarLink to evaluate risks. Consequently, such attributes may need to be addressed through experience alone. Nevertheless, these barriers should receive more attention in future informational media to aid the target market in evaluating the costs and benefits of these factors in adoption.

7.4.2 CarLink Relative to Current Modes

It is important to develop an understanding of how participants view CarLink relative to their current modes. This comparison is relevant to the contemplation phase of the behavioral adoption process. To measure such a comparison, I asked participants to contrast CarLink to their current ways of getting around. Respondents were asked to provide the response that best expressed their opinion on a five-point Likert-type scale (ranging from strongly agree to strongly disagree) to ten statements. (See Chapter 4.0: Study Approach, for a more detailed description of this scale.)

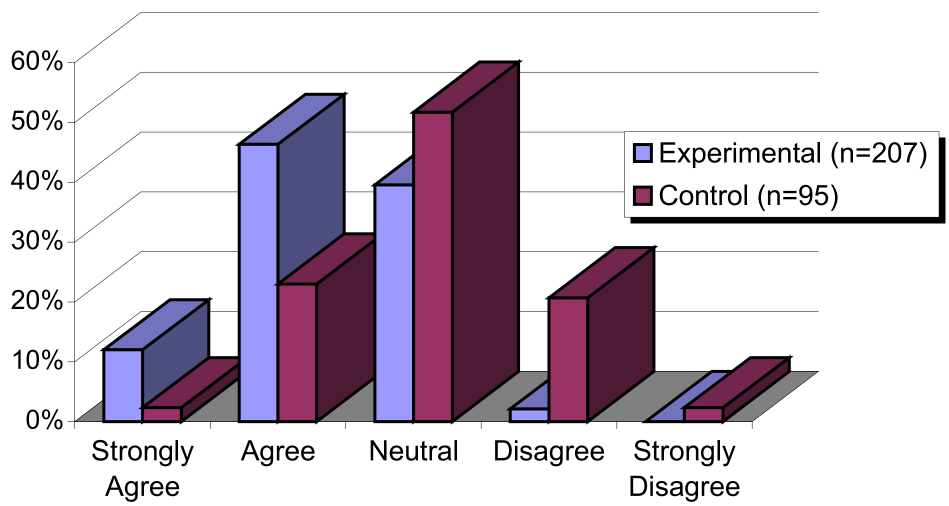
In the first phase, 54.3% of the experimental participants agreed or strongly agreed that CarLink compared favorably to their current modes. (See Figure 7.11 below.) Furthermore, 37.8% were neutral about CarLink. In contrast, 48.8% of control participants agreed or strongly agreed that CarLink was comparable, and 38.6% were neutral. In this phase, a t-test value of 1.589 and p-value of .113 were calculated, which means that the scale results for these groups are not significantly different. These results seem logical because both groups received the brochure.

Figure 7.11: CarLink Relative to Current Modes (First Phase)



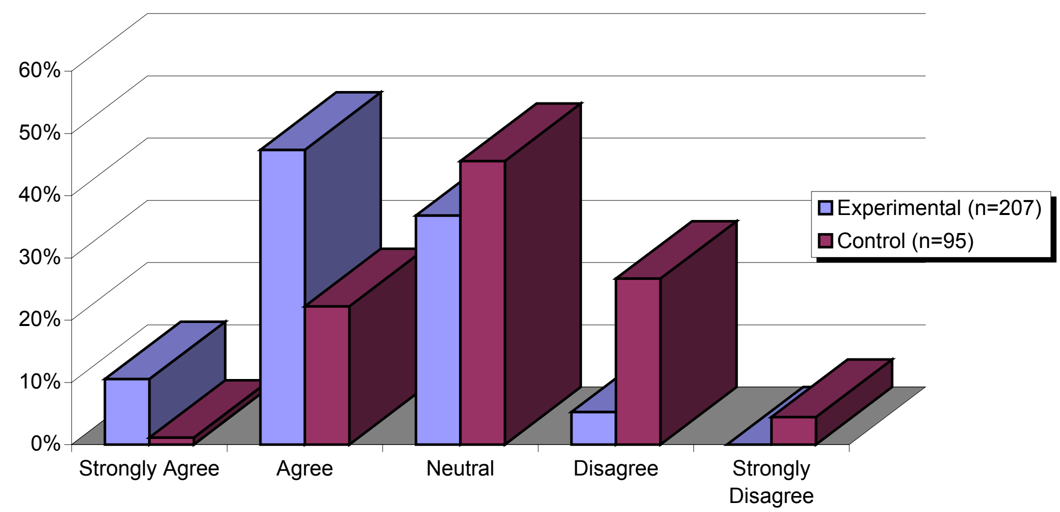
As expected, a significant change was observed between the response of the experimental and control groups in the second phase. (See Figure 7.12 below.) After watching the video, 58.4% of experimental participants agreed or strongly agreed that CarLink was comparable to their current modes (i.e., a 4.1 percentage point increase), and 39.6% were neutral (i.e., a 1.8 percentage point increase from the previous phase).

Figure 7.12: CarLink Relative to Current Modes (Second Phase)



As expected, the response of control participants who agreed or strongly agreed decreased in the second phase to 25.3%—a 23.5 percentage point decrease. The percentage of neutral respondents increased to 51.7% (i.e., a 13.9 percentage point increase). Many respondents shifted from a positive to a neutral or negative response. Furthermore, 23% of control participants disagreed or strongly disagreed that CarLink was comparable to their current modes—a 10.4 percentage point increase from the previous phase. Thus, this group became more negative towards CarLink in the second phase. In this phase, a t-test value of 7.195 and p-value of .000 were calculated. The scale results are significantly different for the two groups. Again, these findings are logical because the control group did not receive additional media.

Figure 7.13: CarLink Relative to Current Modes (Third Phase)



In the final phase, I observed some small-scale changes. (See Figure 7.13 below.) In the experimental group, only 57.9% agreed or strongly agreed that CarLink was comparable to their current modes (i.e., a 0.5 percentage point decrease from the previous phase). Approximately 37% were neutral (i.e., a 2.6 percentage point decrease from the second phase), and 5.3% disagreed or strongly disagreed that CarLink was comparable to their current modes. Hence, individuals became slightly more neutral or negative toward the CarLink system during this phase. I suspect that this shift can be attributed to the drive clinic, where individuals received even more information about how the system works. Consequently, this final scale is more likely to be representative of CarLink comparisons than the previous phases for the experimental group.

Not surprisingly, the control group became increasingly negative. In the third phase, 23.3% agreed or strongly agreed that CarLink was comparable (i.e., a two percentage point decrease from the second phase). Moreover, 31.1% disagreed or strongly disagreed that CarLink was comparable—an 8.1 percentage point increase from the previous phase—and 45.6% were neutral (i.e., a 6.1 percentage point decrease). After the brochure, the control group became increasingly negative toward the CarLink system. In the final phase, t-test value of 7.124 and p-value of .000 were calculated, which means that the scale results are significantly different for the two groups. Again, these results seem logical because the control group did not receive additional media.

A repeated measures MANOVA test was then calculated (i.e., a two by three design), using Wilks' Lambda to examine how CarLink attitudes were affected by each phase and group identification. Both F values are significant, indicating that the type of media were important for determining respondent attitudes (see MANOVA source table below). These results support Hypothesis One and validate the behavioral adoption process.

MANOVA Source Table: CarLink Relative				
Effect	**Wilks' Lambda**	**Hypothesis df**	**Error df**	**Significance**
Time	0.961	2	249	0.039
Time by Group Identification	0.952	2	249	0.048

SECTION 7.5 CARLINK USER MODEL

For this analysis, I developed a logistic regression model (i.e., the CarLink user model) to determine the relationship among demographic variables, attitudes, and CarLink stated usage for individuals who indicated that they would use CarLink. These results were helpful in explaining the most significant variables to potential CarLink use.

This model demonstrates that *experimental vs. control group, mode satisfaction*, and the *environment* are the most significant predictors in explaining the CarLink user model. All of the variable coefficients, except *vehicle hassle*, were statistically significant. This model suffers from a high degree of overdispersion, resulting in a Pearson's χ^2 goodness-of-fit of 155.539. Overdispersion was not assessed for this model. However, all other indicators show that individuals who received more informational media were more likely to say they would use CarLink. Furthermore, 81.8% of observations were correctly classified. All of the variables had the expected signs. A positive mode satisfaction score indicates modal dissatisfaction and CarLink interest. A negative (or low) vehicle hassle score indicates that autos are perceived as a hassle and CarLink is appealing. Similarly, a negative (or low) environmental score indicates concern for the environment and a CarLink positive response.

Respondents who said “Yes” to “Do you think that you would use CarLink?” (i.e., the dependent variable in this model) were five times more likely to be members of the *experimental group* than respondents who said “No.” Also, respondents who said “Yes” to this same dependent variable were two times more likely to have a positive *mode satisfaction* score (i.e., or modal dissatisfaction) than respondents who said “No.” Lastly, participants who said “Yes” were .4 times more likely to have a low environmental score (i.e., high concern for the environment) than individuals who said “No.” Each of these variables had significant odds ratios. If “1” is between the lower and upper confidence bounds, the odds ratio is not significant. Results from the CarLink User model are presented in Table 7.11 (below).

To summarize, this model confirms that *informational media* (or experimental vs. control group study participation), *mode satisfaction,* and *environmental concern* are key predictors of stated CarLink usage. *Vehicle hassle* is also of interest.

Table 7.11: CarLink User Model Logistic Regression Results

Model	Beta	Standard Error	Significance	R
Constant	6.6726	17.8199	.7081	
Experimental vs. control	1.6145	.4828	.0008	.2249
Mode satisfaction	.8291	.3630	.0224	.1331
Environment	-.8193	.4905	.0454	-.1015
Vehicle hassle	-.6535	.3452	.0583	-.0934

Hosmer and Lemeshow Goodness-of-Fit Test:
$\chi^2 = 7.8688$
df = 8
significance = .4464

Other Summary Statistics:
-2 Log Likelihood: 137.410
Pearson's χ^2 Goodness of Fit: 155.539
Classification Table: 81.76% correctly classified

Predictor	Odds Ratio	Lower Confidence	Upper Confidence
Experimental vs. control	5.0252	1.9506	12.9462
Mode satisfaction	2.2912	1.1249	4.6669
Environment	0.4408	0.1975	0.9835
Vehicle Hassle	0.5202	0.2645	1.0233

SECTION 7.6 CARLINK FIELD TEST—WHO JOINED?

This final section includes a discussion of the study respondents who indicated they would like to participate in a field test of CarLink in the Dublin/Pleasanton area. Furthermore, it includes an evaluation of those who joined the field test from the longitudinal survey. Finally, it describes a profile of potential CarLink early adopters, which I developed from sociodemographic and psychographic data I collected form individuals who expressed interest in joining the CarLink field test, became members, or both.

7.6.1 Respondents Interested in CarLink Field Test Participation

In the last section of the final survey, I asked respondents if they would be interested in participating in a CarLink field test in the Dublin/Pleasanton area. The field test provides an opportunity for individuals who participated in the longitudinal survey to move from the contemplation phase of the behavioral adoption process to the “action” stage. Furthermore, by asking individuals if they would like to join the field test, I gathered data that allowed me to contrast these results to those of the main dependent variable in my study, i.e., “Do you think that you would use CarLink?”

In the final phase of the longitudinal survey, 77.9% of experimental (n=161) and 32.6% of control respondents (n=31) said they would use the CarLink system. In contrast, only 53.6% of experimental (n=111) and 17.8% of control participants (n=17) indicated that they would be interested in participating in the CarLink field test. The total number interested in joining the field test is lower than that indicated by the main dependent variable in this study. It is likely that the final percentages (i.e., for field test participation) provide a more accurate picture of the initial adopter rates for the targeted market segments included in this study.

7.6.2 Individuals Participating in the CarLink Field Test

After the survey was completed, I contacted individuals who indicated they would be interested in the field test. Individuals were able to enroll in CarLink, if they met the following program requirements:

- Homeside User, those who can use the Dublin/Pleasanton BART station to commute to work.
- Workside Commuters User, individuals who can commute via BART and work at LLNL.
- Day User, those who work at LLNL.

If an individual did not have a match with one of the three user groups, I was unable to enroll them in the field test. Consequently, the target market cannot be accurately assessed by the actual number of participants who joined the CarLink field test. However, an approximation of the potential market and an early adopter profile can be derived from these findings. Unfortunately, a majority of interested participants did not meet the criteria for program participation.

Interestingly, no one from the control group was able to join the field test. This might reflect their limited exposure to CarLink informational media. Please note that the CarLink regression model (Section 7.5: CarLink User Model, earlier) indicates that experimental participants (n=31) are five times more likely to choose CarLink.

Also, many were unable to pay the $200 monthly fee to participate. This is because several households currently own two or more vehicles. Twenty-eight percent of experimental participants who wanted to be contacted to join the field test became members. These individuals (i.e., from the longitudinal survey) represent 61% of the field test population. An additional 20 individuals[3] joined the field test (i.e., who did not participate in the survey), primarily in the Homeside User and Workside Commuter groups. These individuals represent the other 39% of the field test population.

7.6.3 Profile Characteristics of Those Interested in Field Test Participation

Next, I examined many of the sociodemographic and psychographic characteristics of the individuals who expressed interest in the field test, as well as those that joined the CarLink program (i.e., 139 individuals[4]). I compiled these data to create a profile of the early target market for the CarLink system. These data indicate the following characteristics:

- Approximately 50% of those interested in participating in the CarLink field test belong to two- to three-member households.
- An equal number of men and women expressed interested in CarLink participation during the longitudinal survey. In the actual field test, however, 60% of participants are male and 40% are female.
- A majority of those interested in CarLink participation are married (i.e., approximately 70%).
- The majority of participants (i.e., about 90%) are between the ages of 24 to 64. Approximately 56% percent are 24 to 40 years of age, and 39% are between 41 to 64.

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[3] Please note that I only have baseline data for 11 of the 20 new participants. Nine of the new members did not complete the baseline survey instrument.
[4] This includes only 11 of the 20 new field test participants due to missing data from 9 of these members.

- Approximately 60% of those interested in CarLink participation have a Bachelor's or Master's degree.
- Approximately 50% of those interested in CarLink participation live in a large- or medium-sized city. (A large city is greater than 250,000 individuals and a medium city is greater than 50,000, but less than 250,000 individuals.)
- The majority of the individuals interested in CarLink participation (i.e., approximately 60%) have a household income over $50,000 per year.
- Approximately 20% of participants interested in the CarLink program are currently dissatisfied with their current transportation modes. This result is contrary to what I expected. I thought more would be dissatisfied with their current modes.
- Approximately 60% of individuals interested in CarLink participation agree or strongly agree that vehicle maintenance is a hassle (i.e., vehicle hassle scale).
- As expected, only 20 % of the participants interested in the CarLink program strongly agree or agree that they find vehicle use enjoyable (i.e., vehicle enjoyment score).
- Approximately 60% of those interested in the CarLink program strongly agree or agree that congestion is a serious problem (i.e., congestion score).
- Approximately 50% of those interested in CarLink participation agree or strongly agree that the environment is a concern (i.e., environmental concern scale).
- Approximately 80% of those interested in CarLink participation agree or strongly agree that they like to experiment with new ways of doing things (i.e., experimenter scale).

CHAPTER EIGHT: CARLINK DRIVE CLINIC SUMMARY

SECTION 8.0 INTRODUCTION

In September 1998, I organized and conducted an eight-day drive clinic at the Dublin/Pleasanton BART station as the final educational stimulus for the CarLink longitudinal survey. I employed this survey design to help assess the "Social Desirability Effect,[1]" resulting from the clinic.

To assist with the clinic demonstrations and interviews, I trained and managed several CarLink researchers. These researchers contacted participants and encouraged them to attend the drive clinic with other household members. One hundred and seventy-one households[2] (or a total of 232 individuals) attended the clinic for approximately one hour as part of the final study phase. This clinic offered participants a chance to see and try the CarLink system, as well as interact with researchers.

According to Magill *et al.* (1981), seeing how an innovation works can reduce uncertainty and minimize perceived risks. Furthermore, "[I]nformation that is obtained through personal communication often is more effective in influencing people than information obtained through the mass media" (Kotler *et al.,* 1989). "Social" innovations that entail

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[1] The "Social Desirability Effect" is the tendency of participants to overstate a socially desirable position, especially in the presence of researchers.
[2] One to two individuals participated from each household.

complexity, testability, and high-involvement behaviors[3], in particular, are most amenable to personal communication in the adoption process (Kotler *et al*., 1989).

Despite the possible benefits of a trial, there has been little published data on the effectiveness of this method because it is infrequently used, and the results are often proprietary (Golob and Gould, 1998). Golob and Gould used a trial of electric vehicles to better understand this method as a source of reliable transportation and market data. Similar to this dissertation, Golob and Gould used both pre- and post-trial panel survey data and travel diaries to explore how trials affect participant perception of an innovation.

Although this method has several advantages (e.g., hands-on experience, one-on-one interaction with participants, and reduced product uncertainty), trials have several limitations, such as bias or the social desirability effect. Furthermore, a brief trial cannot substitute for the results of a longer-term product experience (e.g., attitudes or perceptions expressed at a clinic can only provide limited approximation of actual behavior). In addition, trials offer limited product exposure (i.e., the trial emphasizes a particular use or environment), which restricts participant understanding of a broader range of product attributes and applications. Golob and Gould have found that "the novelty of participating in an [electric vehicle] trial does lead to exaggerated reports of use" (Golob and Gould, 1998, p. 452).

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[3] Complex social innovations are ones in which individuals perceive a risk, seriously contemplate the option before acting, and often seek the advice of others prior to adoption.

In this dissertation, the drive clinic included an opportunity for participants to use a contactless smart card to open a key box that assigns user keys and a chance to drive a compressed natural gas (CNG) vehicle. The opportunity to observe and use such technologies (as well as interact with researchers) offers the public more information and experience from which to evaluate potential product usage and value. Prior to the clinic, I trained several researchers on the exit interview procedures and questionnaire. Each was instructed to follow question wording and order exactly and to precisely record participant responses.

During the clinic, researchers showed participants how to use the CarLink key management system and took them for a short test drive. Participants were encouraged to ask questions about the CarLink system and vehicles during their drive. At the same time, researchers recorded these questions on an in-vehicle query checklist. I prepared this checklist in anticipation of participant questions and concerns. (Please see Appendix II for a copy of the drive clinic instruments, as well as pictures from the event.) Researchers also reported any additional concerns and remarks from the test drive on this query. After returning their vehicle key to the CarLink system manager, respondents participated in an exit interview in which they discussed their views on CarLink, including how much they might pay for such a system. These data are useful for targeting potential users and understanding customer concerns and requirements. From the longitudinal questionnaires and participant interviews I was able to identify key usage issues for individuals who might use the system, as well those who might not.

By this time, study participants had been exposed to CarLink economic data that were included in the brochure and video. In both, CarLink hourly costs were contrasted to those of a private automobile, rental car, and taxi. On an hourly basis, CarLink was the least expensive option (i.e., \$2.50 to \$5.00 per hour). At the clinic, participants received new information about the CarLink field test, including pricing details. Individuals learned that:

- Homeside Users would pay approximately \$200 per month for CarLink vehicle use on evenings and weekends;
- Workside Commuters (i.e., commuting between rail and office) would likely pay about \$60 per month per vehicle (which could be split among a carpool); and
- Day Users would pay \$1.50 per hour and between \$ .10 to \$ .30 per mile for usage.

I extrapolated the Day Usage rates from willingness-to-pay input collected from the earlier longitudinal survey questionnaires. Homeside User and Workside Commuter pricing estimates were developed based on the minimum revenue needed to support CarLink service operations. Based on these economic data (i.e., the brochure, video, and field test costs), drive clinic participants again answered the main study question: "Do you think that you would use the CarLink system?"

This chapter includes five main sections. First, I present the drive clinic purpose. Next, I describe the research methodology. Third, I provide an overview of the most frequently asked questions from the clinic. Fourth, I present a summary of the in-vehicle query that lists and ranks participant questions in the order of expressed importance, as well as the conditions under which certain questions were asked. Fifth, I summarize the exit interview findings. In this, I include a list of exit interview questions ranked in order of frequency asked. Finally, I conclude with a summary of participant concerns, which are qualitatively organized by respondent disposition: typical, innovative/early adopter (i.e., those most likely to accept a new product or idea), and more skeptical. Described here are the CarLink concerns that I attribute to each of these groups. This report reflects the drive clinic data and the impressions of myself and other CarLink researchers from a post-clinic session. The in-vehicle query, exit interview questionnaire, and photos from the event are included in Appendices II and IV.

SECTION 8.1 DRIVE CLINIC PURPOSE

The drive clinic was the final informational stimulus in the CarLink longitudinal survey. The purpose of the clinic was to offer participants an opportunity to see and test the CarLink system, as well as to discuss the concept with researchers. We found that many of the participants could not realistically envision the CarLink system working in their lives and community until they attended the clinic. I suspect that one-on-one interaction in combination with hands-on experience are critical to providing a more complete user understanding of the system. I used the survey to document and explore the impact of the final CarLink stimulus (i.e., the drive clinic) on participant perceptions. The longitudinal study results support my hypothesis that the clinic had noticeable effects on participant understanding and interest.

SECTION 8.2 DRIVE CLINIC METHODOLOGY

When the participants arrived at the drive clinic, they were greeted by a researcher and directed to the CarLink smart key manager. Participants were given a CarLink smart card and asked to enter the appropriate PIN (personal identification number) onto the keypad located on the key box. Each participant followed the instructions listed on the display screen, which direct users to remove a set of keys (i.e., an ignition and a smart key) and close the door. Participants walked to the car corresponding to their assigned keys. At this time, researchers provided participants with some additional information regarding the system (e.g., explanations of the CNG cars, where the tanks are located, etc).

Once inside the vehicle, researchers explained that the smart key (obtained from the key manager) must be inserted into the immobilizer port to the left of the steering wheel for logging each user onto the on-board computer and releasing the vehicle for use. Once participants successfully logged onto the system, the vehicles were taken for a brief test drive. During their drive, participants were encouraged to ask questions about CarLink, particularly concerns they might have about using the system.

After the test drive, participants walked to the key box where they used their smart card to return the CarLink vehicle keys. Next, respondents participated in an exit interview led by a CarLink researcher. Researchers asked questions listed on an exit interview questionnaire and recorded participant responses. Once complete, participants received their final survey packet, which they took home to complete over the next few weeks. This packet included the final questionnaire, similar to the previous instruments, and a CarLink trip diary for recording three consecutive days of personal travel.

SECTION 8.3 IN-VEHICLE QUERY: TOP TEN QUESTIONS ASKED

The following is a list, ranked in order of expressed importance (for a list of 35 questions), of the ten most frequently asked questions from the in-vehicle test drive and CarLink system demonstration. The top ten represent over 63% of the total questions asked (i.e., 593 of a total of 934 questions fall into the top ten). Percentages reflect the number of households who asked a question from the total households attending the drive clinic. A list of the top ten questions and discussion, where applicable, follows.

1. Where are the lots going to be located? (62.6%)

    Most drive clinic participants were concerned about this issue. Along with cost, this is one of the most significant factors to participants' stated system use. Most concluded that CarLink lots must be located within a "reasonable" distance of their homes and workplaces to make the system a feasible transportation alternative. One researcher found that individuals who lived in hilly regions also wanted CarLink lots to be located close to their homes to minimize their walking distance.

2. How much is the system going to cost? (56.7%)

   This was one of the top three concerns of drive clinic participants, particularly those who were more skeptical about system feasibility. Individuals were very interested in whether or not this system could save them money. Most wanted to know how they would be charged for use (i.e., per mile, per minute, or both); what membership costs would be; and what payment options would be available (e.g., debit, credit, account).

3. Who pays for insurance? (36.8%)
4. Who maintains, cleans, and fuels the vehicles? (36.3%)

   One researcher found that women, particularly, were concerned about who would be responsible for vehicle cleaning. Most participants generally seemed concerned about fueling because the drive clinic and field test vehicles are fueled with compressed natural gas (CNG).

5. What is CNG? (33.9%)
6. What happens if you need more gas when you are on the road? (28.1%)
7. What happens if there's not a car when you need one? (25.2%)

   This appeared to be an especially important concern for more skeptical participants, as well as several second household participants. (A second household participant is one who was asked to join the survey by the primary member, who originally agreed to participate in the study.)

8. What is the efficiency of the CNG Civics? (25.1%)

9. How long can we keep the car? (24.6%)

10. How do you make a reservation? (17.5%)

SECTION 8.4 IN-VEHICLE QUERY SUMMARY

The following is a list by topic of the comments and questions asked by drive clinic participants during their test drive and the overall CarLink system demonstration. Please see Appendix II for a copy of the In-Vehicle Query Check List. The topics are categorized into five areas:

1. CarLink procedures,
2. Alternative fuel vehicles and environmental impacts,
3. Cost,
4. Insurance, and
5. Accessories.

Questions asked are listed and ranked in descending order by category. These areas provide insights into several topics, concerns, and questions that participants had about the CarLink service during the drive clinic. (See Table 8.1 below.)

Table 8.1: CarLink "Drive Clinic" In-Vehicle Query Summary (171 Households)

Response Ranking	CarLink Procedures	# of Hhd. Responses	% of Hhds. Responding
1.	Where are the lots going to be located?	107	62.6%
4.	Who takes care of maintenance, cleaning, fueling?	62	36.3%
6.	What happens if you need more gas when you are on the road?	48	28.1%
7.	What happens if there is not a car when you need one?	43	25.2%
9.	How long can we keep the car?	42	24.6%
10.	How do we make a reservation?	30	17.5%
11.	What happens if the car gets into an accident?	29	17.0%
13.	Why is membership required?	27	15.8%
16.	What is the advantage of membership?	24	14.0%
17.	How far in advance do you need to make a reservation?	23	13.5%
18.	Will there be different makes and models available?	17	10.0%
19.	What kind of driving record do I need to participate?	14	8.2%
22.	What happens if I can't make it back on time when I am using the car?	12	7.0%
24.	How do you get to the station?	11	6.4%
28.	Are there age requirements?	6	3.5%
31.	Who in the household can drive a vehicle?	5	2.9%

Response Ranking	Alternative Fuel Vehicles and Environmental Impacts	# of Hhd. Responses	% of Hhds. Responding
5.	What is CNG?	58	33.9%
8.	What is the fuel efficiency?	43	25.1%
12.	Where are the gas tanks?	27	15.8%
14.	What is the cost of the Honda?	26	15.2%
15.	How do you refuel the CNG vehicles?	25	14.6%
20.	Can you rent electric vehicles?	14	8.2%
21.	What are the environmental impacts of CNG?	13	7.6%
33.	How does this system help the environment?	5	2.9%

Response Ranking	Costs	# of Hhd. Responses	% of Hhds. Responding
2.	How much does it cost?	97	56.7%
23.	Can you pay for different time increments (e.g., 10 min., 15 min., and 1 hour)?	12	7.0%
29.	Do you pay by credit card?	6	3.5%
32.	Can you pay by debit card?	5	2.9%

Response Ranking	Insurance	# of Hhd. Responses	% of Hhds. Responding
3.	Who pays for insurance?	63	36.8%

Response Ranking	Accessories	# of Hhd. Responses	% of Hhds. Responding
25.	Will child seats be available?	9	5.3%
26.	Will bike racks be available?	9	5.3%
27.	Will cell phones be available?	9	5.3%
30.	Will mapping devices be available?	6	3.5%
34.	What are the technologies involved in the CarLink system?	4	2.3%
35.	Will there be a place to keep bikes at the CarLink lot?	3	1.8%

I organized responses into five sections in the order of highest percentage totals, namely: CarLink procedures, alternative fuel vehicles, costs, insurance, and accessories. A more detailed discussion of each follows. These categories are similar to questions asked previously in the longitudinal survey. Although questions regarding CarLink procedures, costs, and accessories are similar, the drive clinic questions were more specific and directed. Furthermore, questions and interest in alternative fuel vehicles (i.e., over 20% of households inquired about this topic) was much greater at the clinic. This is likely explained by the CNG vehicle test drive and a logical effect.

8.4.1 CarLink Procedures

Of total responses, CarLink procedures represents 53.5% of total questions asked during the in-vehicle query. These questions ranged from where are the lots located (i.e., 62.6% of households asked this question, and also the most frequently asked question) to whom in a household can drive a vehicle (i.e., only 2.9% of households inquired about this). It is interesting to note that procedural questions were among those most frequently asked. Many are representative of the types of questions asked by individuals who later joined the CarLink field test. To answer many of these questions, an orientation manual was developed for individuals to read before they started participating in the CarLink field test.

I interpret interest in procedural details as follows. The brochure and video were effective devices to gain the attention of participants (i.e., the precontemplation phase of social marketing); however, these media do not provide the in-depth details needed for an individual to evaluate the impacts of innovation adoption (i.e., the second phase of Andreasen's (1995) social marketing model—contemplation). Consequently, the drive clinic provides an excellent opportunity for researchers to answer procedural questions and aid target adopters in their CarLink consideration. With more information, individuals are better able to decide whether or not they can actually participate and produce the new behaviors necessary for charsharing.

8.4.2 Alternative Fuel Vehicles and Environmental Impacts

The topic of alternative fuel vehicles and environmental impacts is the second most popular question asked during the test drive. Of the total questions asked, this topic reflects 22.6% of participant interest during this clinic segment. Questions ranged from what is CNG (i.e., 33.9% of households asked about the CarLink vehicle's fuel type) to how does this system help the environment (i.e., only 2.9% of households inquired about this). Interestingly, a majority of participants liked the idea of driving low-emission and alternative fuel vehicles, although this was not their primary focus in the CarLink system. Indeed, very few participants would use the system primarily due to the CNG vehicles. The most significant concern voiced about the CNG vehicles involved refueling (i.e., 14.6% of household asked about such procedures).

8.4.3 Costs

As expected, CarLink usage costs are an important topic. It is interesting to note, however, that this only represented 12.9% of total questions asked during the test drive. Questions ranged from: "How much does it cost?" (i.e., 56.7% of households asked this; it is also the second most frequently asked question) to "Can you pay by a debit card?" (i.e., only 2.9% of households inquired about this).

Regardless of relative ranking, household participants devoted a significant amount of attention to the issue of cost and gaining a greater understanding of the different CarLink customer packages and prices, as part of the field test. Cost will play an important role in an individual's decision to adopt a new behavior or product. During the drive clinic, the issue of cost increasingly surfaced as a key concern. This may also be representative of target adopters moving from the precontemplation into the contemplation phase.

8.4.4 Insurance

The topic of insurance ranked fourth among questions asked (i.e., 6.8% of total) during the in-vehicle query. Participants were interested in how insurance would be covered by the CarLink system. This issue is also closely related to CarLink procedures and costs. I might argue that this question is of great importance to individuals who were trying to assess the benefits and costs of such a system for their household (i.e., moving through the contemplation phase of the adoption process).

Participants also asked other insurance-related questions, such as: What happens if a CarLink vehicle is involved in an accident? Several researchers thought that individuals who asked this question could be characterized as average to skeptical participants. In contrast, the participants whom researchers described as "innovators," did not mention this issue. The reason for this could be that more innovative personalities are less interested in considering system usage risks.

Finally, households also inquired about the criteria for a "good" driving record; minimum driving age for membership; the impact of a CarLink accident on driving records; and the possibility of waiving CarLink insurance, if already insured, for a reduced rate. Many of these questions could be categorized as procedural or cost related. Again, I might argue that such questions reflect concerns addressed during the contemplation phase of the behavioral adoption process.

8.4.5 Accessories

Finally, accessories ranked last among questions asked during the in-vehicle query (i.e., only 4.9% of the total questions asked). Questions ranged from child seat availability (i.e., 5.3% of households inquired about this feature) to bike storage at CarLink lots (i.e., 1.8% of households inquired about this).

Such questions are important to individuals contemplating whether they could use the CarLink system. Again, they likely reflect the concerns of individuals who have entered the contemplation phase of the behavioral adoption process.

SECTION 8.5 EXIT INTERVIEW SUMMARY

This section summarizes exit interview responses. The exit interview was completed by 232 individuals (from the 171 households). I organized this summary into three sections: The first two provide reasons why participants may or may not use the CarLink system in the future (i.e., when it is more widespread), and the third describes responses to costs, accessories, and payment methods. Please see Appendix II for a copy of the exit interview questionnaire.

8.5.1 Use of the CarLink System in the Future

Below are the responses provided by drive clinic participants to the question: “Do you think that you would use the CarLink Smart Car Sharing System?” Approximately 91% of participants responded “Yes” to this question (i.e., 212 respondents). It is important to note, however, that when individuals stated that they would use the system, this often includes occasional system usage, as well as regular use (e.g., commuters). Furthermore, this question focuses on the CarLink concept rather than on usage in the context of price. Hence, response is likely to be overstated to this question, particularly because it was not asked with a cost range specified. Given limited economic information, 61.3% of those that responded “Yes,” thought that they might be able to save money using the CarLink system. Not surprisingly, price will play a significant role in the success of carsharing in the future.

8.5.1.1 Yes: Reasons Why (91%; 212 Participants)

The responses discussed below are ranked in the order of expressed importance for participants who stated they would use the CarLink system. Researchers encouraged participants to specify multiple reasons for CarLink usage. Percentages reported are calculated for the number of participants responding to each reason from the total who responded “Yes” to CarLink use.

The highest-rated reason for using CarLink (i.e., 83.5% or 177 participants) is that it could help respondents in their efforts to improve air quality. The second most popular response (i.e., 76.9% or 163 participants) is reduced vehicle hassle (i.e., I wouldn’t have to deal with fueling, cleaning, parking, and maintenance). The third reason is financial savings (i.e., 130 participants or 61.3% of responses). Many respondents stated that if CarLink costs were competitive with their current modes, most thought they could save money. Clearly, financial savings would be considered a positive attribute of carsharing.

The fourth reason for using CarLink is that it would facilitate access to transit (i.e., I could take transit more often). Nearly 50% (i.e., 49.5% of responses or 105 participants) focused on this potential CarLink benefit. The fifth reason is that CarLink could help reduce commute stress (i.e., 46.2% of responses or 98 participants). Forty-two percent of responses (or 89 participants) said that CarLink looked like a fun way to get around. The next reason is that CarLink might encourage respondents to walk and bike more often (i.e., 41.5% of responses or 88 participants).

The eighth reason for using CarLink is that it could offer an alternative to respondents' current ways of getting around, which they don't like (i.e., 34% of responses or 72 participants). The ninth reason is that participants could save time by using a combination of transit and CarLink (i.e., 29.5% of responses or 55 participants). The next reason is that respondents could get to work on time using the CarLink system (i.e., 14.2% of responses or 30 participants).

The eleventh reason is that participants would have access to a transportation alternative that is more compatible with telecommuting because they telecommute (i.e., 14.2% or 30 participants). The next reason is that respondents wouldn't have to pay for parking at work (i.e., 13.7% of responses or 29 participants). And the final reason is that participants would not have to worry about parking in their neighborhood (i.e., 9% of responses or 19 participants).

8.5.1.2 No: Reasons Why (9%; 20 Participants)

The responses listed below are ranked in order of expressed importance for participants who did not think that they would use the CarLink system. Participants could specify multiple reasons for not using CarLink. Again, reported percentages are calculated for the number of participants responding to each reason from the total that responded "No."

The highest-rated reason for not using CarLink (i.e., 70% or 14 participants) is that individuals like their current set of transportation modes. The second most popular response (i.e., 65% or 13 participants), also related to the first, is that personal vehicles are preferable transportation tools. Next, 25% of responses (or five participants) said that CarLink is too risky (i.e., I'd worry about vehicle availability, breakdowns, and questions about a backup taxi or shuttle service). The final reason is privacy concerns when using such a system (i.e., 15% of responses or 3 participants).

The following sections describe the response of participants to three key CarLink components: costs, payment method, and accessories. Again, responses to each of these topics are ranked in order of expressed importance.

8.5.2 Payment Methods

Responses reflect the preferences of 232 participants from the 171 households who attended the drive clinic. For the question, "Do you prefer a time rate, per mile rate, or a combination rate of time and mileage?," participants could provide only one answer. (See Table 8.2 below for participant response.) A summary of the responses follows.

Table 8.2: Payment Methods

Do You Prefer a Time Rate, Per Mile Rate, or a Combination Rate of Time and Mileage?		
Response	**Number**	**Percentage**
Combination	88	38.0%
Mileage	85	36.6%
Time Rate	36	15.5%
Choice Mileage or Time	11	4.7%

No Opinion	10	4.3%
Other	2	0.9%
Total	**232**	**100%**

1. Prefer to pay by a combination of mileage and time rate.

   Eighty-eight participants (38.0%) wanted to pay a combination rate based on mileage and time.

2. Prefer payment on a mileage basis only.

   Eighty-five participants (36.6%) also expressed an interest in paying by mileage alone.

3. Willing to pay on a time incremental basis only.

   Thirty-six participants (15.5%) wanted to pay on a time increment basis only. The majority of these participants wanted to pay in five- to fifteen-minute increments. Most said that they would be willing to pay between $5 to $10 per hour.

4. Willing to pay on a mileage or time basis.

   Eleven participants (4.7%) said that they would be willing to pay by either mileage or time; they did not have a preference. However, they prefer to be billed by only one rate to simplify the billing process. Most said that they would be willing to pay $0.10 to $0.32 per mile. No one was willing to pay over $0.35 per mile because CarLink would then cost more than a personal vehicle to operate.

5. No opinion.

Ten participants (4.3%) had no opinion about a preferred payment method.

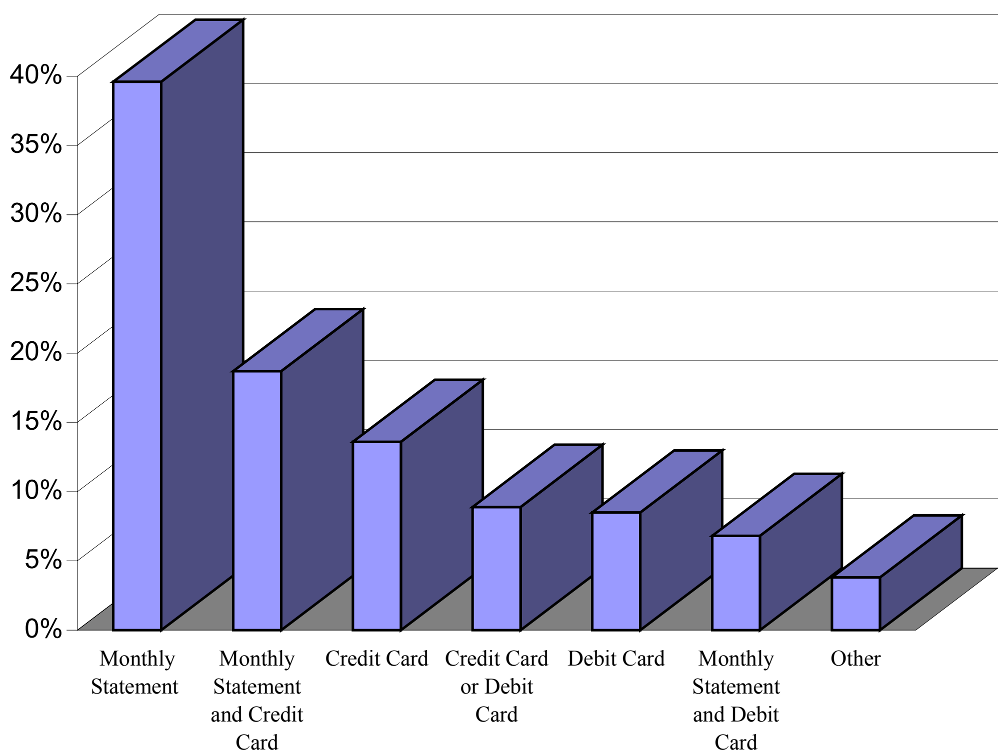
6. Other.

Two participants (0.9%) expressed interest in paying for CarLink based on mileage alone.

8.5.3 Payment Method

Some individuals provided multiple answers that were coded as follows (see Figure 8.1 below), since they were amenable to several different payment methods (i.e., either/or). Some individuals even specified that they would prefer a combination of payment methods (e.g., a monthly statement and credit card).

Figure 8.1: Payment Method



1. Account with only a monthly statement.

   There were 91 responses (39.2%) to this payment option. Many said that they would also like the key manager to produce a receipt for the total miles driven, time logged, and cost of trip, in addition to their monthly account balance.

2. Monthly statement or credit card.

   There were 44 responses (19.0%) that favored a payment system based on either a monthly statement or credit card transactions.

3. Credit card.

   There were 32 responses (13.8%) for a payment method based on credit cards only.

4. Credit or debit card.

   There were 21 responses (9.1%) that preferred either a credit or debit card payment method. Many participants would like to use such methods automatically in conjunction with the key manager system or their monthly bill.

5. Debit card.

   There were 19 responses (8.2%) for the debit card payment method only.

6. Monthly statement and debit card.

There were 16 responses (6.9%) indicating a preference for a monthly statement in addition to debit cards.

7. Other.

Other responses are categorized as “Other.” There were a total of 9 responses in this category (3.9%), namely:

- Monthly statement, credit, and debit cards (2),
- Cash (1),
- Debit card and prepaid account to draw from (1),
- Monthly statement and cash (1),
- Monthly statement and prepaid account (1),
- Monthly statement, credit card, and cash (1),
- Prepaid account (1), and
- No opinion (1).

8.5.4 Accessories

Table 8.3 (below) reflects the percentages for all exit interview participants regarding vehicle accessories (i.e., 232 individuals). Approximately 27% of participants expressed interest in CarLink vehicle accessories. Please note that Table 8.3 includes the category “No Response,” which provides the number and percentage of participants not interested in vehicle accessories (i.e., beyond standard features, such as air conditioning, heating, and a stereo).

Table 8.3: Accessories for CarLink Vehicles

What Accessories Would You Like?		
Response	**Number**	**Percentage**
Cell Phone	23	9.9%
Cell Phone and Mapping Device	16	6.9%
Mapping Device	13	5.6%
Multiple Accessories	7	3.0%
Other	3	1.3%
No Response (None)	170	73.3%
Total	**232**	**100%**

1. Cell Phone.

   Twenty-three respondents (9.9%) were interested in cell phones. Several said that they would be interested in using CarLink cell phones, if usage costs were less than a typical cell phone. This response reflects that many participants already have a cell phone, so they are less interested in a CarLink phone unless it costs less.

2. Cell Phone and Mapping Device.

   Sixteen respondents (6.9%) were interested in cell phones and mapping devices. Some said they would pay $1 to $2 per use for these accessories. Again, several individuals responded that they would like cell phone access, if usage costs were less than those of a typical phone.

3. Mapping Device.

   Thirteen respondents (5.6%) were interested in mapping devices.

4. Multiple Accessories.

Seven respondents (3.0%) were interested in accessing multiple accessories. The most popular combination of accessories (other than #2 above) includes cell phones and Internet access.

5. Other.

Three respondents (1.3%) were interested in other types of accessories, including compact disc players (2 respondents) and Internet access (1 respondent).

SECTION 8.6 CARLINK CONCERNS

Below I describe system concerns corresponding to three participant dispositions, as categorized by researchers in a qualitative, post-clinic session. General attitudes include: average, innovator/early adopter, and skeptical.

8.6.1 Average Respondents

Most participants fell into the average respondent category (i.e., people who were neither notably excited nor opposed to the system). These individuals thought they could use the system occasionally, after it became more established. This group focused on convenience and appeared to be most concerned about lot location. Overall, this group was not ready to make a significant lifestyle change (e.g., selling a personal vehicle to be replaced by the CarLink system) at least until CarLink is demonstrably reliable and convenient.

8.6.2 Enthusiastic Respondents

The greatest concerns of the innovator or early adopter group[4] are lot location and CarLink cost as compared to that of a personal vehicle. Cost is a significant issue because system use could add more expenditure to a household's budget at least until individuals feel comfortable selling one or more of their personal vehicles. Members of this group seemed willing to change their commute patterns and possibly work schedules to participate in the CarLink field test. Furthermore, they were excited to see a system like CarLink being tested in their area. Most, if not all, were environmentally conscious and liked the system because of its low impact on the environment through low-emission vehicles and increased transit access. Many of them were excited about spreading the word to their friends and co-workers (i.e., social influence). Indeed, one such participant said that she had planned a dinner party to discuss CarLink with her friends.

8.6.3 Skeptical Respondents

Many of the skeptical drive clinic participants are single and already own their own vehicle. This group's greatest concerns include convenient access to CarLink lots and access to a vehicle in an emergency or on short notice. Most of these individuals did not want to give up the convenience of their own vehicles and were reluctant to recognize potential CarLink benefits. This group tended to view CarLink as a replacement for their own vehicles rather than a tool for augmenting their current transportation mode(s). Furthermore, they seemed reluctant to make changes in their lifestyle that might sacrifice the convenience offered by personal vehicles. Nevertheless, many (if not all) of the skeptical participants thought that CarLink could work for many others, particularly those who already use public transportation.

SECTION 8.7 CONCLUSION

In summary, I found that most of the participants had a very positive view towards CarLink. Even those who did not think they would use CarLink thought it might provide a viable transportation alternative for others. Those who said they could not use CarLink, at the present time, thought they might in the future—when CarLink is fully operational and more widespread. Indeed, many expressed interest in joining CarLink when a household vehicle had to be replaced.

In addition, researchers found that most participants were somewhat skeptical about the CarLink system prior to the drive clinic. Many said that the one-on-one interaction of the clinic was critical to their understanding and confidence in the system. In this dissertation, one of my goals is to understand the level of education necessary to communicate with the public about a transportation innovation. The drive clinic proved useful in helping me evaluate the study hypotheses and other relevant theories regarding the role of education.

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[4] Individuals who seem very likely to join CarLink.

By making the clinic a very tactile experience, much of the confusion about the system seemed to disappear. Most participants said that they were now better able to envision the whole system working together. Those who previously expressed an aversion to the CarLink technology did not communicate this concern after the clinic. Furthermore, none of the participants who answered “No” to CarLink usage said that system complexity was a reason why. The primary reasons participants said they would not use the CarLink system in the future included home, work, or occupational limitations. Despite these normal lifestyle constraints, carsharing appears to have large potential in the Bay Area.

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CHAPTER NINE: CARLINK FOCUS GROUP SUMMARY

SECTION 9.0 INTRODUCTION

This chapter includes a summary of the four focus groups held in October 1998, as part of the CarLink longitudinal survey. Each group was comprised of approximately 8 to 12 participants. In my study, the focus groups were designed to provide a setting in which several individuals who participated in the longitudinal survey (i.e., both experimental and control) could gather at a later date to explore larger visions of a shared-use vehicle service in the San Francisco Bay Area. This larger image was intended to be the construction of a carsharing service, as users might imagine it in the San Francisco region. These images were built by the groups through a discussion of their experiences in the CarLink study and subsequent reflection on the concept. Through the process of building such images, participants revealed what they considered to be the essential features of these systems. These include important design elements, such as what types of vehicles are available, where they are available, how they are accessed, and how use is billed.

By constructing this image, people revealed how much they valued this new transportation service, how the value is constructed, and whether this mode in fact complements (e.g., adds riders to transit) conventional transit services. Thus, the final images produced are less important than what is revealed in the process of building those images. A “consensus” image of widespread smart, shared-use services need not emerge from such groups.

The first group consisted of participants from the CarLink control group. The other three groups were comprised of experimental participants from the CarLink study population. Experimental participants were exposed to three educational media (i.e., a brochure, video, and drive clinic). In contrast, control participants only received the brochure (and were asked to return it with their first questionnaire). Not surprisingly, participants from the experimental group were more well informed about carsharing than those from the control. For this dissertation, I was very interested in watching how the control group would respond to the carsharing concept and how their attitudes might change after watching the carsharing video during their focus group session. Similarly, I wanted to collect feedback from the experimental group to assess how their attitudes toward CarLink might have changed after the drive clinic and what features they wanted in a carsharing system.

This chapter focuses on requested CarLink features (listed in order of importance): lot location, lot features, and vehicle type. It also includes a description of billing preferences and my conclusions. Please see Appendix III for a summary of each of the four focus groups and Appendix IV for focus group photos.

SECTION 9.1 CARSHARING LOT LOCATIONS

In general, all of the focus groups thought that carsharing lots should be located where individuals could easily access them in the community. Lots at the Bay Area Rapid Transit (BART) District, the Altamont Commuter Express (ACE), ferry stations, and employment centers would facilitate access to public transportation and provide the flexibility of personal vehicles. Additionally, all of the groups thought that residential CarLink lots should be located in high-density neighborhoods to attract the highest usage. Shopping centers, college campuses, and airports—while listed as desirable by all groups—were characterized as secondary locations, which are not as critical to the initial stages of carsharing implementation. Many felt that creating a solid commuter network (i.e., transit and employment connections) of lots was essential prior to expanding CarLink to locations that accommodate personal trips (e.g., errands, travel, etc.).

Principal lot locations, listed in order of priority across the four groups, included:

- BART/ACE/ ferry,
- Employment centers,
- High-density residential areas,
- Shopping centers,
- College campuses, and
- Airports.

SECTION 9.2 CARLINK LOT FEATURES

Key lot features, listed and described in order of importance, include lockers and bike racks, security, close proximity to public transit (e.g., BART), and a wide variety of vehicles. Surprisingly, all four groups were rather insistent that CarLink provide bike racks and storage lockers for its members. Indeed, these were the most requested lot features. Lot security was also a significant issue. Numerous suggestions were made to improve lot security, such as providing good lighting, security guards, automated gates, and video cameras at key boxes.

The third key feature mentioned by the focus groups was close lot proximity to the entrance/exit of BART stations. Similarly, many felt that offering a preferred parking service at transit stations would provide an additional incentive to carsharing participation. Anecdotally, I found that the preferred, guaranteed parking provided by the CarLink field test at the Dublin/Pleasanton BART station served as a major motivating factor to CarLink participation.

Finally, providing a wide selection of vehicles at carsharing lots is another important feature. Although the above items were important to each of the focus groups, a considerable amount of attention was also directed to the overall appearance and image of CarLink, conveyed by the CarLink lots and vehicles. Vehicle cleanliness and maintenance are crucial to supporting a professional image. Consequently, public image might be considered a critical feature, particularly in strengthening CarLink acceptance.

An issue that was not as greatly voiced as I expected includes concerns about lot proximity to employment centers and neighborhoods. Only two groups (the control and one experimental) thought that lot proximity near homes and work was a primary concern. This finding is interesting in light of participants' strong preference for lots close to transit station exits/entrances. Furthermore, many longitudinal survey participants said that lot location/proximity is of utmost importance to carsharing participation. Participants also emphasized this issue at the drive clinic. Perhaps many felt that they had adequately addressed this concern at the clinic.

SECTION 9.3 VEHICLE FEATURES

Air conditioning, heating, and radios are the basic features that the groups said were the most needed in CarLink vehicles. Furthermore, emergency assistance was a significant concern for the groups. Many did not like the idea of a one-way panic button because they would not know if anyone had received their distress signal. Two-way communication was more preferrable. Some felt that providing emergency cell phones would be an attractive CarLink feature.

SECTION 9.4 ECONOMICS AND BILLING

The focus groups also demonstrated that the experimental participants had given CarLink costs a lot of thought. After reviewing the proposed field test costs (i.e., $200/month for Homeside Users; $60/month for Workside Commuter (can be split by carpoolers); and $1.50/hour and $.10/mile for Day Users), all participants generally agreed that these prices were reasonable. Many participants thought that there was even the potential to save money with this new system. Surprisingly, the control group was willing to pay more for such a service than the experimental groups.

Most felt that a fair way to charge for CarLink would be a combination of mileage and time. This billing practice might balance out for individuals who keep vehicles longer, but drive shorter distances, and those who drive longer distances but immediately return the vehicles. In several focus groups, a reduced-price commuter package (i.e., an inclusive monthly fee) was proposed. Participants also expressed interest in corporate-sponsored programs and packages (e.g., at employment centers). Overall, I found participants were interested in several product attributes other than cost, such as improved transit access and reduced driving time and environmental impact.

SECTION 9.5 CONCLUSION

Response to the CarLink concept was quite positive across the focus groups and even more notable among the experimental participants. This conclusion reinforces my findings regarding the role of social marketing and learning, particularly informational media. Overall, many of the negative responses expressed focused on transit services rather than on CarLink. In fact, many felt that if transit systems could be improved, CarLink would be a great complement.

As expected, I found the control group participants rather skeptical about CarLink throughout the first half of the session. Having received very little information about the CarLink system, I anticipated this group would have many CarLink questions and concerns. After voicing their concerns, however, many focused on several positive CarLink attributes, and the group's attitudes generally improved.

Initially, the CarLink video did little to improve the control group's CarLink response. Many participants said that CarLink might work for others but not for them. In addition, the video sparked many logistical concerns for the group, such as questions about costs, insurance, maintenance, system reliability, and management. It also appears that the video prompted participants to think more carefully about the system and their concerns. I suspect the video helped to revitalize the interests of many of the participants toward CarLink—a group that had become increasingly negative toward this concept throughout the survey.

In contrast, I found the experimental groups, particularly the Lawrence Livermore National Laboratory (LLNL) group, much more enthusiastic about the CarLink system. The attitudes of the experimental participants were markedly different from the control, at least initially. Having received several informational media and an opportunity to discuss their concerns at the drive clinic, these individuals were much more accepting of the concept. In general, they tended to focus on the positive aspects of CarLink rather than negative ones.

It is noteworthy, however, that control group was willing to pay a higher hourly rate and flat commuter fee than the three experimental focus groups. This difference might be explained by group dynamics (i.e., certain members of the control group led others to accept the values stated by a few participants). It may also reflect the limited exposure of the control group to the CarLink system (i.e., this group did not "test" the system at the drive clinic). I suspect this groups' high willingness to pay reflects their limited understanding (and perhaps interest) of the concept.

These results are interesting when contrasted with Feinberg *et al*'s (1986) finding that individuals genuinely interested in joining Mobility Enterprise had a lower price elasticity. "Their upper limit and the maximum that they would pay for Mobility Enterprise was significantly lower than those who were not interested in participating" (p. 11). My findings also reflect a similar pricing response among the experimental and control groups. Even though the experimental participants were engaged and supportive of CarLink throughout the focus groups, they were much less flexible about pricing than the control group.

Although price perception is not the focus of my dissertation, financial savings and costs are important factors to this study population, particularly the experimental group. In the future, it is doubtful that any one attribute, even cost, will define the success of carsharing. Success will likely be determined by a range of attributes or factors acting in concert. For some individuals cost may play a larger role than it does for others.

Overall, the experimental focus groups were able to explore their CarLink needs and demands much earlier in the session than the control group. Control participants, who had many questions and concerns, spent over half of the session addressing these issues. After discussing them, however, they were able to positively explore the CarLink service.

Based on these results, I conclude that most potential adopters will require a significant amount of information and an opportunity to express their concerns before they use the CarLink system.

REFERENCE

Feinberg, R.A., T.L. Snuggs and S.B. Bauer (1986). Psychological Pricing and Mobility Enterprise. West Lafayette, Indiana, Department of Consumer Sciences and Retailing, Purdue University: 16 pages.

CHAPTER TEN: CONCLUSIONS

SECTION 10.0 INTRODUCTION

The purpose of my dissertation is to understand the processes by which travelers can and might accept or adapt to a transportation innovation, in response to the method of learning and presentation. I developed and examined three media for this study: an informational brochure, video, and drive clinic, which explain the CarLink system. My study examines the usefulness and effectiveness of these media over time. Second, it evaluates two dynamic response hypotheses, the "Social Desirability Effect," the social interaction effect, and the behavioral adoption process. Third, it identifies potential characteristics of CarLink early adopters. Finally, this study makes contributions to survey research methodologies and social marketing and learning theories.

A quasi-longitudinal survey was administered over a four-month period to assess dynamics in an individual's learning and valuing response to the CarLink innovation over time. This survey consisted of four questionnaires: a baseline (or initial survey) and three identical questionnaires that followed each of the educational media. After the survey was completed, four focus groups were held with study participants in October 1998, to further gauge participant perceptions and overall CarLink response.

From June to October 1998, I and several other researchers whom I directed collected response data on the CarLink system from 302 individuals (representing 212 households) in the Bay Area. These attitudinal and belief data measure change in response, which help explain the process of innovation adoption. The final sample population consisted of 207 experimental participants (154 households) and 95 control group participants (58 households). A total of 488 individuals (i.e., both experimental and control) received the initial questionnaire. Throughout my study, there were 186 dropouts (58 did not return the first questionnaire, and 128 individuals dropped out after returning the second questionnaire). To assist in evaluation and interpetation, I moderated four focus groups, consisting of three experimental groups with a total of 28 participants and one control group session with nine participants.

The data gathered were used to evaluate two “dynamic” innovation response hypotheses.

- ***Hypothesis One:*** An individual's response to an innovation will be positively altered by informational media (i.e., video, brochure, and drive clinic). Furthermore, individuals who are not exposed to additional information about the innovation will become increasingly negative toward it over time.

- ***Hypothesis Two:*** An individual’s valuing response to an innovation’s negative mobility attributes (e.g., limitations on instant mobility) will become more positive after learning more about the new technology. In contrast, an individual—unexposed to additional information about the innovation—will respond similarly to negative mobility attributes across the study (i.e., his or her response will remain unchanged).

I found that willingness to use CarLink was influenced by the amount and type of exposure, as predicted by social marketing and learning theories. For example, many individuals who only read the brochure lost interest over time, while a large majority of those who read the brochure, watched the video, and participated in the clinic, stated that they would use CarLink. I documented the process by which individuals moved through definable stages in the behavior adoption process (or the social marketing model).

This chapter includes the following eight sections:

- Effectiveness of informational media in conveying the carsharing concept and impacts on understanding;
- Results of the first study hypothesis and validation of the behavioral adoption model and "Social Desirability Effect;"
- Test of social interaction effect;
- Results of second study hypothesis;
- Focus group results;
- Early target adopter profile;
- Future research; and
- Study contributions.

SECTION 10.1 INFORMATIONAL MEDIA

To help test my hypotheses, I developed several CarLink informational media to explore and monitor change in an individual's response. Change is unlikely to result from the mere promotion of a product's benefits. Consequently, I focused on methods of presentation and learning to examine response dynamics. In this effort, I tried to develop media that attracted study participants and encouraged learning.

Social marketers argue that understanding the learning process is critical. Knowledge can help marketers develop and schedule information streams during opportune stages, such as precontemplation, contemplation, action, or maintenance. Since this dissertation examines participant response to the carsharing concept rather than an actual service, my analysis focuses primarily on the first two stages of Andreasen's social marketing model (or the behavioral adoption process).

In developing educational materials, marketers should consider the types and amount of information distributed. At a minimum, it is important to highlight a new product's distinctiveness from other alternatives. Furthermore, it is essential to emphasize product attributes because target adopters typically evaluate satisfaction on a subset of attributes. In the brochure and video, I discussed differences between carsharing and other modes. I also described positive carsharing attributes, such as economic savings, reduced vehicle hassle, environmental benefits, and links to activity centers and other modes of transportation.

10.1.1 Brochure Findings

After participants reviewed the brochure, only 7.6% of the individuals in the total sample said they *did not understand the concept*. However, I suspect this self-reported figure is understated. Indeed, I expect that many individuals confused a carsharing organization with a car rental company. Nevertheless, it appears that the brochure was an effective device for capturing the interest of participants and introducing the shared-use vehicle concept (see Table 10.1 below).

Table 10.1: Thoughts About CarLink After Brochure

What Do You Think About the CarLink Concept After the Brochure?		
Response	**Experimental (n=207)**	**Control (n=95)**
I would be very interested in trying this new mobility system	63.5%	35.8%
I would like more information	60.1%	44.2%
This concept could fit the needs of my household in the future but not today	12.0%	21.1%
Other	10.6%	7.4%
This concept would not fit the needs of my household today	6.7%	31.6%
I do not understand how the system works	6.3%	10.5%

$\chi^2 = 46.36$, p-value = .000

After reviewing the brochure, 54% of total respondents indicated there were several *CarLink features that they did not understand*, including[1]:

- Costs (17.2%);
- Maintenance/insurance (16.3%);
- Vehicle availability (15.6%);

[1] Percentages are calculated on total respondents to this question.

- CarLink lots (13.5%);
- Getting to and from CarLink lots (8.4%);
- Reservations (3.7%); and
- Other (6.3%).

Another 60.1% of experimental participants (in contrast to 44.2% of the control group) wanted *more information* about carsharing. These requests are as follows:

- Costs (12.1%);
- Lot location (8.4%);
- Logistics (5%); and
- General information (5.9%).

Less than 7% of respondents (in contrast to 31.6% in the control group) said that this concept *would not fit the needs of their household today*, and 12% stated that CarLink might *meet their future needs* (in contrast to 21.1% in the control group). There was a significant difference in the response of experimental and control group participants in the initial phase (χ^2 = 46.36, p-value = .000). This might be attributed to the self-selection bias in the experimental group.

Even though the brochure proved helpful, over 160 comments for *improving the brochure* were collected. Not surprisingly, the brochure could be substantially improved to address the concerns and questions of target adopters. A majority of the comments focused on the brochure design and format. The "mapping" design (i.e., the brochure was the same size as a map and folded to look like one) selected was disliked by many participants. A simpler design with more detail on costs, lot location, and reservations should be developed. A question and answer format might be helpful as well.

10.1.2 Video Findings

After experimental participants reviewed the video, only 1.4% of respondents said they *did not understand the concept* (i.e., a 4.9 percentage point decrease from the previous phase). After watching the video, 22% of participants indicated that there still were *CarLink features that they did not understand*, including[2]:

- Costs (3.8%);
- CarLink lots (3.1%);
- Vehicle availability (2.3%);
- Maintenance/insurance (1.5%); and
- Reservations (1.5%).

It is important to note, however, that the percentages for each of these items decreased from those reported after the brochure phase. In addition, a new area of misunderstanding was identified (i.e., uncertainty about accessing different vehicle models, 1.5%), although only a few participants listed this response.

Approximately 34% said they were *even more interested in the concept*, and 48.1% of participants *expressed interest in this new mobility system*. Almost 28% of experimental group participants wanted *more information* about carsharing; however, there was a 32.2 percentage point decrease in this response from the previous phase. (See Table 10.2 below.) Thus, it appears that the video answered questions for many participants. Almost 16% of respondents said this concept *would not fit the needs of their household today.* Finally, 17.3% said this concept could fit the *needs of their household in the future, but not today.*

Table 10.2: Thoughts About CarLink After Video

What Do You Think About the CarLink Concept After the Video?		
Response	**Experimental (n=207)**	**Control (n=95)**
I would be very interested in trying this new mobility system	48.1%	27.4%
I am even more interested in this new concept	34.1%	15.8%
I would like more information	27.9%	35.8%
This concept could fit the needs of my household in the future but not today	17.3%	21.1%
This concept would not fit the needs of my household today	15.9%	41.1%
Other	8.2%	6.3%
I do not understand how the system works	1.4%	10.5%

$\chi^2 = 45.89$, p-value = .000

Furthermore, several participants (8.2.%) requested *more information* about:

- Costs (9.5%);
- Lot locations (15%);
- Vehicle availability (11%); and
- Maintenance and insurance (3.6%).

[2] Again, percentages are calculated on the total respondents who answered this question.

Fewer individuals requested information about costs in this phase; however, there was a 6.6 percentage point increase in information about lot locations (i.e., from 8.4% to 15%). In addition, 11% requested information about vehicle availability, and 3.6% wanted more about vehicle maintenance and insurance. I suspect this increase in informational requests regarding lot locations, vehicle availability, maintenance, and insurance reflects an increased interest in where and how these services might be located and operated. The video does not provide specific detail about locations, vehicles, and operations; rather, it provides a few scenarios that demonstrate individuals using the CarLink service. This overall increase in questions asked might suggest that many individuals are moving from the precontemplation phase of the behavioral adoption process into the contemplation phase (i.e., they have begun to assess the benefits and costs of usage). Hence, a more detailed video addressing all of these questions might be useful in the future.

More than 70 comments for *improving the video* were collected from the experimental group. Although the video could be improved to address the concerns and questions of potential adopters, it was better received overall than the brochure. A majority of the comments focused on the need for *more information* about services, costs, and vehicle availability. A more updated video design was also suggested, with more examples, different music, and a new narrator. Only a few (i.e., 2.8%) said the video was too complicated. Indeed, 32% reported that the video was well done and had no other suggestions.

In contrast, only 10.5% of the control group said that they *did not understand how the CarLink system works*; there was no change in response from the previous phase. Approximately 16% of the control respondents said that they were *even more interested in the concept.* Only 27.4% responded that they would be *very interested in trying the concept*—an 8.4 percentage point decrease from the previous phase. Even fewer respondents requested *more information* in this phase, i.e., 35.8% (an 8.4 percentage point decrease). I expected this group to gradually lose interest in this concept since they did not receive any further information.

Approximately 41% said this concept *would not fit the needs of their household today*, which represents a 9.5 percentage point increase from the previous phase. This supports the first study hypothesis that the control group would either remain stable or become more negative towards the concept over time. If individuals do not receive additional media after being exposed to a new concept (i.e., the precontemplation phase), they are highly likely to lose interest or determine that a product is not applicable to their needs. Finally, 21.1% said this concept could fit the *needs of their household in the future*, *but not today*. There was a significant difference in the response of experimental and control group participants in the second phase (χ^2 = 45.89, p-value = .000). This difference is likely due to the educational media versus a sampling bias or other factor. To summarize, the video was well received and appeared to be more effective than the brochure in describing the carsharing concept. In the future, a video should be developed to provide more information about CarLink services, costs, and vehicle availability. An updated design is also recommended, with more examples, different music, and another narrator.

10.1.3 Drive Clinic Findings

After experimental participants attended the drive clinic, only 0.5% of individuals said they *did not understand the overall concept* (i.e., a 0.9 percentage point decrease from the previous phase). After attending the clinic, 8.3% of respondents indicated that they still *did not understand some CarLink features,* namely:

- Costs (4.2%);
- Availability (3.3%);
- CarLink lots (1.1%); and
- Other (3.2%), including lots, insurance, refueling, and reservations.

While the level of understanding increased in most areas for the experimental group, there was a 0.4 percentage point decrease in cost understanding and a one percentage point decrease in vehicle availability understanding after the clinic. I hypothesize that this change reflects confusion over the field test—the next research step, which was described to participants at the drive clinic. The field test differs from the CarLink concept presented in the brochure and video because it is deployed on a significantly reduced scale, with fewer lots and vehicles than was conveyed in the informational media. Approximately 54% said they were *even more interested in the concept* (i.e., a 19.7 percentage point increase from the video phase), and 55.3% of participants expressed *interest in this new mobility system* (i.e., a 7.2 percentage point increase from the previous phase). Approximately 21% of experimental group participants wanted *more information* about carsharing; this is a 6.7 percentage point decrease from the previous phase. (See Table 10.3 below.)

Table 10.3: Thoughts About CarLink After Drive Clinic

What Do You Think About the CarLink Concept After the Drive Clinic?		
Response	**Experimental (n=207)**	**Control (n=95)**
I would be very interested in trying this new mobility system	55.3%	21.1%
I am even more interested in this new concept	53.8%	7.4%
This concept could fit the needs of my household in the future but not today	25.0%	29.5%
I would like more information	21.2%	34.7%
This concept would not fit the needs of my household today	13.9%	53.7%
Other	9.6%	4.2%
I do not understand how the system works	0.5%	9.5%

χ^2 = 119.5, p-value = .000

Nearly 14% said this concept *would not fit the needs of their household today*—a two percentage point decrease from the previous phase. I suspect this is a result of the clinic, which reflects a better understanding of the concept and a more accurate response. Or, it might reflect that some individuals no longer think they could use the system due to the small scale of the clinic and field test (in contrast to the broader concept conveyed in the brochure and video). It is impossible to separate these two effects, however, on concept response. Finally, 25% said the concept *could fit the needs of their household in the future, but not today* (i.e., a 7.7 percentage point decrease from the previous phase).

In contrast, 9.5% of the control group said they *did not understand how the system works*, i.e., a one percentage point decrease from the previous phase. And, only 7.4% said they were *even more interested in the concept* (i.e., an 8.4 percentage point decrease). Only

21.1% responded that they would be *very interested in trying the concept*—a 6.3 percentage point decrease from the previous phase. Even fewer requested *more information* in this phase, i.e., 34.7% (a 1.1 percentage point decrease). As expected, this group gradually lost interest in the concept over time.

Nearly 54% said this concept *would not fit the needs of their household today*, which represents a 12.6 percentage point increase from the previous phase. This supports my first study hypothesis that the control group will either remain stable or become more negative towards the concept over time. If individuals do not receive additional media after exposure to a new concept (i.e., the precontemplation phase), they are highly likely to lose interest or determine that a product is not applicable to their needs. Finally, 29.5% said that the concept *could fit the needs of their household in the future, but not today* (i.e., an 8.4 percentage point increase). There was a significant difference in the response of experimental and control group participants in the final phase (χ^2 = 119.5, p-value = .000). This difference is most likely due to the educational media versus a sampling bias or other factor. To summarize, the drive clinic appears to be a highly effective device for demonstrating the carsharing concept. However, it has two limitations. The first is the "Social Desirability Effect," an overstated positive response to the concept. The second is the limited scale of the trial demonstration and how this might affect an individual's evaluation of whether or not they could use such a system in the future.
Furthermore, several participants (9.6%) requested *more information* about the following:

- Costs (9.0%);
- Lot locations (15%);

- Vehicle availability (12%); and
- Maintenance and insurance (4.0%).

Overall, these percentages remained relatively stable between the video and drive clinic phases, with a slight increase in informational requests regarding vehicle availability (i.e., one percentage point) and maintenance and insurance (i.e., 0.4 percentage point).

I suspect these requests remained stable after the video because many service details were still not available nor presented to participants (i.e., the clinic tested response to the concept versus an actual product). This is a limitation of all the informational media in my study. It is impossible to provide a very detailed description of services that do not exist yet. Nevertheless, it is still critical to gather response data to design and develop CarLink services and educational media. This experiment demonstrates that individuals often respond to a concept with many unanswered questions, and this affects overall response.

Another potential limitation of the drive clinic is that it demonstrated a specific application of CarLink in the Dublin/Pleasanton region. For many, the clinic may have provided a great deal of useful information for evaluating CarLink (perhaps because the sample target lives and works in this area). However, for others, the limited "trial" scale may have confused those who thought a broader system would not be available in the future. Hence, it is difficult—if not impossible—to separate the possible impacts of this media on the survey population. This is why an actual field test, consisting of multiple lots, vehicles, and transit stations, would provide a more accurate test of the target market for this service.

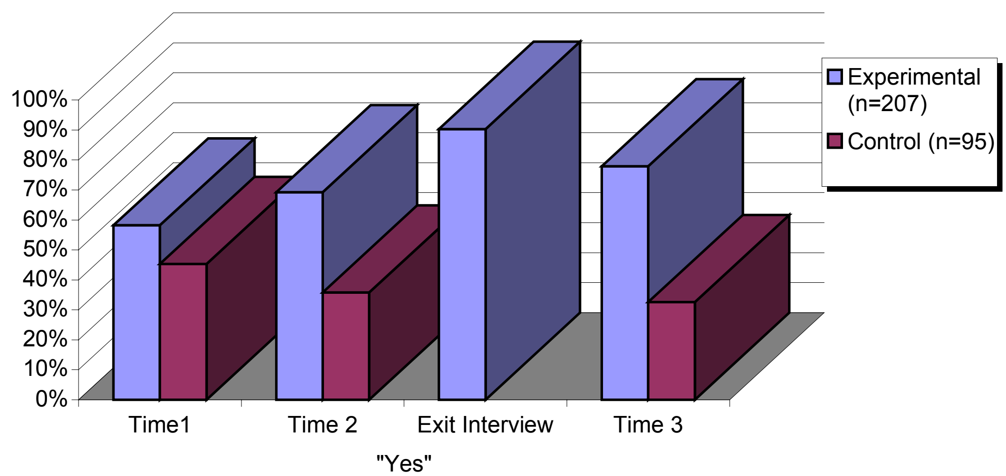
Only 57 comments for *improving the drive clinic* were collected from the experimental group. Although the drive clinic may have addressed many participant questions and concerns from earlier phases, a large number of individuals asked similar questions to those after the video. This implies that more detailed and specific information is necessary for the drive clinic. A majority of the comments about the drive clinic focused on the need for more detailed information about services, costs, and vehicle availability. Several disliked the vehicle test drive itself. Others requested that more accessories (e.g., receipts) be incorporated into the clinic to further demonstrate the system. Finally, several commented on the clinic design suggesting that other interviewers be used, provide longer participant appointment times, and allow participants to drive the CNG vehicles on the freeway to get a better feel for acceleration. It is interesting to note that 86 positive comments were received, including: good drive clinic; no suggestions for improvement; liked the interviewers; and enjoyed test drive.

Despite the above concerns about the informational media, these stimuli provided a significant amount of input for designing carsharing marketing materials in the future. These suggestions can be used to improve informational devices, making them more helpful to target adopters as they move through the behavioral adoption process.

SECTION 10.2 FIRST HYPOTHESIS FINDINGS

To test and monitor participant response to the CarLink concept over time, I developed a question—administered in all three phases—to measure this response. One question served as the main dependent variable in this evaluation: “Do you think that you would use the CarLink system?" (See Figure 10.1 below.)

Figure 10.1: Would You Use CarLink?



In the first phase, I presented the carsharing concept in an informational brochure. I asked respondents to review the brochure and complete a questionnaire. Approximately 58.2% of the experimental respondents said “Yes.” It is interesting to note that 45.3% of the control group individuals responded “Yes.” In the initial phase, a significant difference was found between the responses of the experimental and control groups ($\chi^2 = 5.38$, p-value = .002).

In the second phase, I presented the carsharing concept in a modeling video, which explained and demonstrated how CarLink could work for two households. I asked experimental participants to review the video and complete a questionnaire. Over 69% of the participants said “Yes.” In contrast, only 35.8% of control respondents said “Yes.” In this phase, a significant difference was found between the responses of the experimental and control group (χ^2 = 32.99, p-value = .000).

These findings support the first study hypothesis: experimental participants will become more positive to the concept in response to educational media, and the control’s response will become more negative or remain stable over time. In my study, the experimental group became more positive and the control more negative. The experimental group only showed an 11 percentage point increase between the first and second phases; in contrast, the control group revealed a 9.5 percentage point decrease between these two phases. Consequently, it appears that the video was an effective tool for increasing CarLink positive awareness. This stimulus may also have assisted many participants in moving from the precontemplation phase into the contemplation phase of the behavioral adoption process.

After attending the drive clinic, I again asked participants about CarLink use in an exit interview. Over 90% of the participants said “Yes.” The positive response change revealed during this phase is most significant. Indeed, there was a 21.2 percentage point increase in the “Yes” response category during the clinic. Since control group respondents did not participate in the clinic, there is no corresponding data for them.

It appears that the drive clinic is an effective tool for increasing positive awareness of the CarLink concept. Nevertheless, this response appears to be overstated (i.e., the Social Desirability Effect). Indeed, there was a 12.5 percentage point decrease in the experimental group's response during the final questionnaire. In addition, this stimulus may have helped move many participants from precontemplation into the contemplation phase and, for some, into the "action" phase of the behavioral adoption process.

During the final phase, I asked experimental participants to reflect on the clinic and complete a questionnaire. Again, respondents were asked whether or not they thought they would use CarLink. Nearly 78% of the experimental group said "Yes," whereas only 32.6% of the control responded positively (i.e., a 3.2 percentage point decrease from the previous phase). As mentioned, however, there was a significant decrease in the experimental group's positive response in the final phase. This change in response supports my assessment of the social desirability effect, indicating an overstated response from the clinic. During this phase, a significant difference was found between the responses of the experimental and control group (χ^2 = 58.65, p-value = .000).

The overall data gathered from the longitudinal survey supports my first study hypothesis and validates the behavioral adoption process. The only exception to this hypothesis is the drop in positive responses between the drive clinic and final phase for the experimental group. In contrast, the control group behaved as predicted. Over time, the control group became less positive toward CarLink use. I attribute this effect to the lack of educational media and feedback needed to move an individual through the behavioral adoption process described by social marketing theorists.

In summary, control group participants did not receive the information and feedback needed to move from precontemplation into the contemplation phase. In contrast, the experimental group received educational media throughout, which allowed them to assess the benefits and costs of CarLink for their lifestyle and fostered a positive response among many toward this transportation alternative. In fact, many indicated in their final questionnaire that they would be interested in joining the CarLink field test (i.e., 77.9% of the experimental group in contrast to 32.6% of the control).

Finally, results from the CarLink satisfaction and CarLink relative scales over time are similar to those for the main dependent variable in this study. The experimental group became more positive toward CarLink between the first and second study phases on both these scales. However, there was a slight drop in positive response after the drive clinic.

10.2.1 Reasons for Using CarLink

Individuals who responded “No” to the main dependent variable in my study also provided a set of reasons why they would not use CarLink. Similarly, individuals who answered “Yes” listed the reasons why they would use CarLink.

Reasons for not using CarLink include:

- Like current mode,
- Too risky,
- Prefer personal vehicles,
- Too complicated,
- Privacy concerns, and
- Other. (See Table 10.4 below.)

Table 10.4: Reasons for Not Using CarLink

Why Wouldn't You Use the CarLink System?						
	Time 1		Time 2		Time 3	
Response	**Exp. (n=207)**	**Control (n=95)**	**Exp. (n=207)**	**Control (n=95)**	**Exp. (n=207)**	**Control (n=95)**
Like current mode	18.8%	26.3%	15.4%	45.3%	13.5%	51.6%
Too risky	13.9%	21.1%	9.6%	22.1%	7.7%	27.4%
Prefer personal vehicle	11.5%	16.8%	8.7%	32.6%	7.2%	35.8%
Too complicated	6.3%	8.4%	5.3%	9.5%	1.0%	20.0%
Privacy concern	6.3%	10.5%	4.8%	14.7%	2.4%	12.6%
Other	3.8%	3.2%	13.9%	17.9%	12.5%	27.4%

The top six reasons for using CarLink include:

- Improve air quality,
- No insurance, etc. hassles,
- Save money,
- Reduce commuter stress,
- Frequent transit use, and
- Fun option. (See Table 10.5 below.)

Table 10.5: Reasons for Using CarLink

Reasons Why I Would Use the CarLink System						
	Time 1		**Time 2**		**Time 3**	
Response	**Exp. (n=207)**	**Control (n=95)**	**Exp. (n=207)**	**Control (n=95)**	**Exp. (n=207)**	**Control (n=95)**
Improve air quality	51.4%	38.9%	56.3%	22.1%	65.4%	22.1%
No insurance, vehicle, etc. hassle	43.3%	44.2%	47.1%	27.4%	53.4%	26.3%
Save money	40.4%	32.6%	37.0%	15.8%	37.5%	10.5%
Reduce commuter stress	28.8%	14.7%	33.2%	8.4%	33.7%	9.5%
Frequent transit use	27.9%	3.2%	26.4%	11.6%	34.1%	11.6%
Fun option	24.5%	18.9%	29.8%	13.7%	23.6%	11.6%

Furthermore, the logistic regression models I developed for this dissertation indicate that individuals are more likely to choose CarLink (i.e., “Yes” to the main dependent variable) when individuals are exposed to Carlink informational media (i.e., experimental vs. control group participation), concerned with the environment, and dissatisfied with their current modes. Reasons that individuals select their current modes (i.e., autos and transit) include vehicle enjoyment, modal satisfaction, cost, and convenience.

SECTION 10.3 TEST OF SOCIAL INTERACTION EFFECT

To test the social interaction effect, I asked individuals when they realized they might be able to use CarLink. Response categories include (one response only):

- During study recruitment;
- After reading the brochure;
- While completing this questionnaire;
- While completing the previous questionnaire;

- When talking with a friend;
- When watching the video; or
- While attending the drive clinic.

During phase one, 21.2% of experimental participants said that they realized they might be willing to use CarLink during the recruitment process, versus 3.1% of control participants. Approximately 18% of experimental and 17.9% of control participants responded that they realized they might use CarLink while reading the brochure. Approximately 15% of experimental participants realized this while completing the brochure questionnaire, versus 11.6% of control participants. Finally, a much smaller percentage of respondents, that is, 1.4% of experimental and 1.1% of control said they realized this while talking with a friend. This demonstrates that the social interaction effect may be less significant than expected to action or adoption. (See Table 10.6 below.)

Table 10.6: When Did You Realize You Might Be Able to Use This Service?

Response	Time 1		Time 2		Time 3	
	Exp. (n=207)	**Control (n=95)**	**Exp. (n=207)**	**Control (n=95)**	**Exp. (n=207)**	**Control (n=95)**
During recruitment	21.2%	3.1%	20.2%	5.3%	25.0%	4.2%
When read the brochure	18.3%	17.9%	12.1%	18.8%	15.4%	12.6%
When filled out this questionnaire	14.9%	11.6%	4.3%	3.2%	1.0%	3.2%
When talked with a friend about CarLink	1.4%	1.1%	1.4%	3.2%	0.5%	1.1%
When watched the video	N/A	N/A	17.8%	N/A	15.4%	N/A
When attended the drive clinic	N/A	N/A	N/A	N/A	16.7%	N/A
When filled out the questionnaire last time	N/A	N/A	9.6%	8.4%	1.0%	1.1%
When spoke with someone from CarLink	0%	0%	0.5%	0%	3.4%	0%
No response	44.2	66.3	34.1	61.1	21.6	77.8
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

In the second phase, 20.2% (i.e., a decrease of one percentage point) of experimental participants said they realized they might use CarLink during the recruitment process, versus 5.3% of control participants (i.e., an increase of 2.2 percentage points). After watching the video, 12.1% of experimental participants responded while reading the brochure, a decrease of 6.2 percentage points. In contrast, 18.8% of control participants said that the brochure influenced their attitudes toward CarLink, an increase of 0.9 percentage point. As expected, 17.8% of experimental participants stated while watching the video. Only 4.3% of experimental participants responded while completing the second questionnaire, versus 3.2% of control participants (i.e., a decrease of 8.4 percentage points). Only 1.4% of experimental and 3.2% of control participants reported while talking with a friend. Finally, 9.6% of experimental and 8.4% of control respondents said while completing the brochure questionnaire.

After the final phase, 25% of experimental participants said that they realized they might use CarLink during the recruitment process (i.e., an increase of 4.8 percentage points), versus 4.2% of control participants (i.e., a decrease of 1.1 percentage points). After attending the drive clinic, 15.4% of experimental participants (i.e., an increase of 3.3 percentage points) stated while reading the brochure; another 15.4% (i.e., a decrease of 2.4 percentage points) attributed this to the video; and 16.7% said that the clinic affected their response. In contrast 12.6% of control participants (i.e., an decrease of 6.2 percentage points) reported that the brochure had influenced their attitude toward CarLink.

Only 1% of the experimental participants said that they realized they might be willing to use CarLink while completing the final questionnaire (i.e., a decrease of 8.6 percentage points), versus 1.1% of control participants (i.e., a 7.3 percentage point decrease from the second phase). Less than 1% of experimental participants said they might use CarLink when talking with a friend (i.e., a 0.9 percentage point decrease from the previous phase). Similarly, only 1.1% of control participants reported when talking with a friend (i.e., a 2.1 percentage point decrease from the previous phase). Close to 3.4% of experimental participants responded while talking with someone from CarLink.

To summarize, the recruitment process was the point at which most experimental participants realized they might use CarLink. This implies that for individuals who are already interested in finding a transportation alternative, very little additional information may be needed to aid them in moving from precontemplation to contemplation or action. The more interesting result, however, is that the CarLink media appear to have influenced participants in deciding that they might use CarLink. Finally, the second questionnaire helped approximately 9.6% of experimental participants reach this realization.

In contrast, the recruitment process was not nearly as significant for the control group. The most notable devices for this group were the brochure and second questionnaire. These responses are logical because this group only received the brochure and had several weeks to think about the carsharing concept by the second phase. Thus, it appears that the educational media and the question/answer process are effective devices for aiding target adopters in considering an innovation.

SECTION 10.4 SECOND HYPOTHESIS FINDINGS

To test my second hypothesis, I examined changes in response to negative modal attributes included in the CarLink satisfaction scale. The second hypothesis states that an individual's response to an innovation's mobility limitations or constraints (e.g., reduced spontaneity) will be altered by learning, particularly by the type of media (e.g., brochure versus drive clinic).

This analysis did not reveal a positive change in the negatively perceived attributes among the experimental group. Thus, I reject the second hypothesis. Indeed, there were a few cases in which the experimental and control groups became more negative over time. Two attributes in particular were identified by participants as CarLink limitations: *allows for spontaneity* and *response to an emergency*. Findings for both these attributes do not support my hypothesis nor do they indicate that any particular media was significantly more powerful than another in altering negative perception. The video and drive clinic, however, may have provided enough information to prevent a significant change in the experimental group's initial response toward the *emergency response* attribute.

Over time, the control group became increasingly negative to the attribute *allows for spontaneity.* The experimental group also became negative, but much less so in comparison, throughout the survey. Clearly, this attribute represents a potential barrier to adoption. I suspect that such obstacles may be difficult, if not impossible, to overcome without experience. Nevertheless, it is interesting to note that the experimental group's response was much less negative than that of the control.

The control group also became more negative over time, particularly during the second study phase, with respect to the second attribute (i.e., *emergency response*). In contrast, the experimental group's response remained relatively stable, although slightly negative throughout.

To summarize, both of these attributes are potentially significant barriers to CarLink adoption. At the time of this survey, respondents had no "real" experience from which to evaluate risks. Such attributes may need to be addressed through experience primarily. Nevertheless, researchers should pay more attention to these barriers in future informational media to assist target adopters in evaluating the costs and benefits of these attributes in innovation adoption.

SECTION 10.5 FOCUS GROUPS

Overall, response to the CarLink concept was quite positive across all four focus groups, and most notable among the experimental groups. This reinforces my finding that the experimental group is more positive toward the CarLink concept due to the informational media. Many of the negative responses expressed by participants focused on transit services rather than on the CarLink system. In general, participants thought if transit systems were improved, CarLink would be a great complement.

As expected, I found the control focus group participants were rather skeptical about the CarLink system throughout most of the session. Having received very little information about the CarLink system, I anticipated these individuals would have many questions and comments regarding the concept during the focus group session. However, after voicing many of their concerns or dislikes about CarLink and available transportation options, many described CarLink positively. Throughout the session, the control group's attitudes generally improved, and they offered several constructive suggestions.

Initially, the CarLink video did little to increase the control focus group's attitudes toward the system. Many participants listed reasons why it might work for others but not them. Furthermore, the video seemed to spark many logistical questions for the group. After the video, many started questioning costs, insurance, maintenance, system reliability, and management (issues that they had not discussed earlier in any detail). Thus, it appears that additional education about the CarLink system prompted participants to think more thoughtfully about the system, their concerns, and whether or not these issues would prevent them from using such a system. I might argue that the CarLink video helped revitalize the interests of these participants, many of whom had become increasingly negative toward the concept.

In contrast to the control group, I found the experimental focus groups, particularly the Lawrence Livermore National Laboratory (LLNL) participants, much more enthusiastic about the CarLink system throughout the session. Having received several educational media and an opportunity to discuss their concerns at the drive clinic, I expected them to be more accepting of the concept. The experimental groups tended to focus on the positive aspects of the CarLink system. The experimental participants' attitudes were markedly different than those of the control, at least initially.

I expect that the drive clinic played a critical role in the CarLink adoption process because it allowed participants an opportunity to experiment and discuss their questions and concerns. Based on the results of the control focus group, I expect that potential adopters will require a significant amount of information and an opportunity to ask questions before they are inclined to incorporate CarLink into their transportation mix.

SECTION 10.6 EARLY TARGET ADOPTER PROFILE

In the final questionnaire, I asked participants if they would be interested in joining the CarLink field test in the Dublin/Pleasanton region. The field test provides an opportunity for individuals who participated in the longitudinal survey to move from the contemplation phase of the behavioral adoption process into the "action" stage.

In the final phase of the longitudinal survey, 77.9% of experimental (n=161) and 32.6% of control respondents (n=31) said they would use the CarLink system. In contrast, only 53.6% of experimental (n=111) and 17.8% of control participants (n=17) indicated that they would be interested in participating in the CarLink field test. Not surprisingly, the number interested in joining the field test was lower than that reflected by this study's main dependent variable.

After the survey was completed, I contacted individuals who indicated they were interested. If they had a match with one or more of the program groups, individuals were able to enroll in CarLink:

- Homeside Users, those who use Carlink vehicles to drive from home to the Dublin/Pleasanton BART station and then take transit to work.

- Workside Commuters, individuals who commute between BART and LLNL using a CarLink car.
- Day Users, individuals who work at LLNL and use a CarLink vehicle during the day.

If an individual did not have a match with one of these groups, I was unable to enroll them in the field test. Many interested did not meet the criteria for program participation (e.g., they do not work at LLNL) or were unable to join the program due to costs. Nevertheless, participants who expressed interest in joining the field test (i.e., 42% of total survey population) can provide an early profile of potential target adopters among the study sample.

Interestingly, no one from the control group was able to join the field test. Twenty-three percent of participants, who requested that we contact them about field test participation, became members. Ten percent of the total survey population actually joined the field test, and 15% of experimental participants joined. It is likely that these percentages (i.e., 10 to 15%) provide a more accurate picture of the initial target adopter rates, given program eligibility and cost requirements. Since my sample is comprised of individuals who agreed to participate in this treatment, self-selection permits reasonable generalization to the target population (i.e., individuals that live and work in the Dublin/Pleasanton region) (Singleton *et al.*, 1993).

Longitudinal survey participants comprise 59% of the field test population. An additional 20 individuals later joined the field test (i.e., they did not participate in the survey), primarily as Homeside Users and Workside Commuters. They represent the other 41% of the field test population.

I examined many of the sociodemographic and psychographic characteristics of the individuals (i.e., n=139[3]) who expressed interest in the field test and those who joined the program. I compiled these data to create an early target profile for the CarLink system in the East Bay. This profile is as follows:

- Approximately 50% of those interested in participating in the CarLink field test belong to two- to three-member households.
- An equal number of men and women expressed interested in CarLink participation during the longitudinal survey. In the actual field test, however, 60% of participants are male and 40% are female.
- A majority of those interested in CarLink participation are married (i.e., approximately 70%).
- The majority of participants (i.e., approximately 90%) are between the ages of 24 to 64. About 56% percent are 24 to 40 years of age, and 39% are between 41 to 64.
- Approximately 60% of those interested in CarLink participation have a Bachelor's or Master's degree.
- Approximately 50% of those interested in CarLink participation live in a large- or medium-sized city. (A large city is greater than 250,000 individuals and a medium city is greater than 50,000, but less than 250,000 individuals.)

[3] I only had data for nine of the 20 new field test participants.

- The majority of the individuals interested in CarLink participation (i.e., approximately 60%) have a household income over $50,000 per year.
- Approximately 20% of participants interested in the CarLink program are currently dissatisfied with their current transportation modes. This result is contrary to what I would have expected. I thought more would be dissatisfied with their current modes.
- Approximately 60% of individuals interested in CarLink participation agree or strongly agree that vehicle maintenance is a hassle.
- As expected, 20% of the participants interested in the CarLink program strongly agree or agree that vehicles are enjoyable.
- Approximately 60% of those interested in the CarLink program strongly agree or agree that congestion is a serious problem.
- Approximately 50% of those interested in CarLink participation agree or strongly agree that the environment is a concern.
- Approximately 80% of those interested in CarLink participation agree or strongly agree that they like to experiment with new ways of doing things.

It is interesting to note that many of the above profile characteristics are comparable to those of early carsharing adopters in Europe. Differences are reflected in the areas of gender, income, and land use. In Europe, there are more male participants than women. The overall profile results indicate an equal interest among men and women. However, in the CarLink field test this same relationship holds. It will be interesting to observe U.S. carsharing organizations over time to determine whether or not this initial trend, found in the CarLink field test, continues.

Second, in Europe, participants tend to have lower incomes, which is typically explained by the lower average age of carsharing members. In this study, a majority of the households earn over $50,000 a year. This difference can be explained by the region of California in which the study is conducted, as well as the interest of older individuals. Another difference is related to land use. In Europe, carsharing is primarily an urban phenomenon. In my study, CarLink is tested in a medium to large-size city. This model was established to support "reverse" commute travel patterns. Hence, it is difficult to contrast community patterns in this dissertation to those common in Europe.

SECTION 10.7 FUTURE RESEARCH

Future research is needed in the following areas related to social marketing theory and smart carsharing. These areas include a study of:

- The effects of social impacts (e.g., friends and family) on the diffusion process. Individuals do not make decisions to adopt a new technology in isolation. Frequently, individuals are moved to make these decisions in part as a result of social influence.

- Individuals' response to different informational media. More research is needed to investigate responsiveness of various target market groups. Variability in educational media ordering, using an experimental design, would be a logical next step and build on my study results.

- A longer-term and broader application of a smart carsharing demonstration project. The results of this survey alone cannot be used for policymaking decisions. Hence, an expanded field test is the next step. Trials are likely a critical component in innovation success, so target adopters can evaluate risks and product attributes. Trials can provide insights into innovation problems and successes. They can also illustrate concept deployment for those interested in pursuing similar alternatives.

- Role of positive feedback on an individual's choice to use a transportation innovation, such as CarLink. A mobility center, where individuals obtain information about carsharing services, ask questions, test smart system technologies, and get feedback on whether or not an option might work for them should be tested in future demonstrations. Mobility centers may prove to be a powerful tool in moving individuals from the contemplation phase of the behavioral adoption process into "action" and "mainenance."

- Efforts to educate study participants on the actual cost of car ownership and those of new transportation alternatives, such as CarLink. In addition, more research is needed to investigate how service "value" and willingness to pay might change over time.

SECTION 10.8 STUDY CONTRIBUTIONS

This dissertation provides methodological, theoretical, and empirical contributions to the transportation field. It contributes to human travel behavior methodology, specifically in the area of dynamic behavioral analysis as this study exposed households to the carsharing concept and evaluates response over time (e.g., CarLink satisfaction).

Further, this dissertation contributes to survey research methodology, first, by developing new methods (e.g., new scales for measuring perceptions toward transportation and response to educational media). Second, it evaluates the results and effectiveness of these scales in capturing dynamics in response to a transportation innovation over time.

Additionally, a theoretical contribution is made to social learning and social marketing theory. These contributions result from the methodology's longitudinal design and empirical examination and validation of the behavioral adoption model and social interaction effects. Specifically, this study exposes individuals to learning media that facilitate behavioral adoption from the precontemplation phase to the contemplation phase for many study participants. Furthermore, it takes a smaller percentage of the participants, i.e., 10 to 15%, through the action phase of the adoption process. In addition, contributions are gleaned from my comparison of the various methodological approaches (e.g., educational media and questionnaires and focus groups) used throughout this dissertation. Finally, analyses of study hypotheses provide valuable insights into the behavioral adoption process and the Social Desirability Effect.

The empirical contribution is an assessment of normative and behavioral responses to the CarLink concept. The insights gained from this study of response dynamics can be used by the public and private sectors in assessing the demand for smart carsharing and other related technologies.

REFERENCE

Singleton, R.A., B.C. Straits and M.M. Straits (1993). Approaches to Social Research. New York, NY, Oxford University Press.

APPENDIX I

CARLINK LONGITUDINAL QUESTIONNAIRES

SMART CARLINK INITIAL QUESTIONNAIRE

Instructions: This questionnaire should be completed by **the individual who agreed to participate in this study on behalf of your household**. A *household* is defined as a group of individuals who live together and share household resources. Roommates/housemates, who share a vehicle, constitute a household in this study.

PART A
PREVIOUS EXPERIENCE

In this section, we would like to know about any previous experience that you may have had with car sharing and other new technologies.

1. What is your name?____

2. Have you ever heard of car sharing before receiving this questionnaire?

❏ Yes. ❏ No. (Please go to question 3.)

If **yes,** from what sources? Check **all** that apply:

❏ Friend or colleague
❏ Newspaper, magazine, or other print media
❏ TV/radio spot
❏ Internet
❏ Household member
❏ Recruit announcement for this study
❏ Other, please specify:____

3. Have you heard of alternative fuel vehicles?

❏ Yes. ❏ No. (Please go to question 4.)

If **yes**, from what sources? Check **all** that apply.

❏ Friend or colleague
❏ Newspaper, magazine, or other print media
❏ TV/radio spot
❏ Internet
❏ Household member
❏ Other, please specify:____

4. Have you heard of "intelligent transportation systems," such as vehicle location system, automatic collision warning systems, or automated highway?

❑ Yes ❑ No. (Please go to question 5.)

If **yes**, from what source? Check that **all** apply.

❑ Friend or colleague
❑ Newspaper, magazine, or other print media
❑ TV/radio spot
❑ Internet
❑ Household member
❑ Other, please specify:______________________________________

5. With respect to your attitudes and experience with the personal computer, please check the response that best expresses your opinion.

	Strongly disagree	*Disagree*	*Neutral*	*Agree*	*Strongly agree*	*N/A*
I feel at ease when I am around computers.	❑	❑	❑	❑	❑	❑
I need many hours of training before I feel comfortable with computers.	❑	❑	❑	❑	❑	❑
Computers are beyond the understanding of a typical person.	❑	❑	❑	❑	❑	❑
It takes me years to feel at ease operating my own computer at work.	❑	❑	❑	❑	❑	❑

6. Why did you agree to participate in this study? Please check the most important reason.

❑ I am curious about new products and technology.
❑ I am eager to explore a transportation alternative.
❑ I would like access to a vehicle for personal business during the day.
❑ Transit stops are located too far from my home or office.
❑ I am looking for a transportation alternative to reduce the cost.
❑ I would like to find out if this system can help reduce air pollution.
❑ Other, please specify:______________________________________

PART B
YOUR TRIP CHARACTERISTICS

In this section, we would like to know about your everyday trip making: the types of trips you make, what transportation modes you use, etc.

1. How many commuters, including yourself, are there in your household? (A commuter is defined as an individual who travels three to five days per week for work.) ______________________________

2. How do you usually commute to work? Please check the modes you use more than two days a week.

   ❏ Drive alone ❏ Carpool/Vanpool
   ❏ Bus ❏ BART
   ❏ Bike ❏ Walk
   ❏ Other, please specify:____

3. How long does it take you to get to work (one way)? ________________minutes

4. Do you know the closest transit (e.g., bus, BART) station or stop to your home?

   ❏ No. (Please go to question 5.)
   ❏ Yes. Please specify the name of the station/stop: ____________________

   What is the name of the transit service provided at this station or stop?

   ____

   How far do you live from this transit station or stop? ______________ miles.

5. Do you know the closest transit (e.g., bus, BART) station or stop to your workplace?

   ❏ No. (Please go to question 6.)
   ❏ Yes, please specify the name of the station/stop:_______________________

   Is this station or stop served by the same transit service as the station or stop nearest your home?

   ❏ No. ❏ Yes.

   How far is your workplace from this transit station or stop? _________ miles

6. Do any of the commuters in your household use Bay Area Rapid Transit (BART) to commute?

   ❏ No. (Please go to question 7.) ❏ Yes. (Please go to question 8.)

7. If **no**, what are the three most important reasons for not choosing BART? Please check the **top three** reasons.

❑ A BART station is not located close enough to my home.
❑ A BART station is not located close enough to my work site.
❑ I don't know how to use BART.
❑ Service is too infrequent.
❑ My schedule is variable.
❑ I need my car during the day.
❑ Too expensive.
❑ I like to commute by myself.
❑ I don't feel safe using public transit.
❑ Other, please specify:____

8. If **yes**, what are the three most important reasons for choosing BART? Please check the **top three** reasons.

❑ A BART station is close to my home or work site.
❑ The BART service schedule fits my schedule.
❑ Cost savings.
❑ Traffic congestion.
❑ Time savings.
❑ It's convenient.
❑ The household vehicles are being used by other commuters in the household.
❑ Safety/personal security when using BART.
❑ BART's on-time reliability.
❑ BART's comfort and cleanliness.
❑ Other, please specify: ____

9. Do you park for free at your workplace if you drive to work?

❑ Yes ❑ No ❑ Not applicable

10. Is it difficult to find parking at your workplace?

❑ Yes ❑ No ❑ Not applicable

11a. How much does it cost you, on average, for the **entire round trip** to get to and from work. Please calculate for whichever transportation modes you use.

Driving to and from work (including parking)?

❑ Not applicable
❑ Less than $1 ❑ $3 - 5.99 ❑ $8 - 9.99
❑ $1 - 2.99 ❑ $6 - 7.99 ❑ $ 10 or more

Please continue this question on the next page.

Carpooling to and from work (including parking)?

❑ Not applicable
❑ Less than $1 ❑ $3 - 5.99 ❑ $8 - 9.99
❑ $1 - 2.99 ❑ $6 - 7.99 ❑ $10 or more

Riding **public transit** to and from work?

❑ Not applicable
❑ Less than $1 ❑ $3 - 5.99 ❑ $8 - 9.99
❑ $1 - 2.99 ❑ $6 - 7.99 ❑ $10 or more

11b. Please show how you calculate the figure(s) above.

____
____
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____
____
____
____
____

PART C
YOUR HOUSEHOLD ACTIVITIES AND TRANSPORTATION TOOLS (SUCH AS CARS AND TRANSIT)

In this section, we will ask you information about your household transportation tools, such as the vehicle types, parking, how you usually use your vehicles, etc.

1. Please check all of your transportation options, which you use on a regular basis to accomplish your weekly activities (i.e., more than two to three days per week), including bicycles, transit, and motor vehicles,

❑ Bicycle ❑ Walking
❑ Bus ❑ Rail
❑ Own motor vehicle ❑ Carpool/vanpool
❑ Borrowed car ❑ Rental car
❑ Airplane ❑ Other, please specify:_________________

2. Does your household own at least one motor vehicle?

❑ No.
Why? Please check **only one** - the most important one.

- ❑ Cannot afford one.
- ❑ Nobody in the household can drive.
- ❑ Don't need one.
- ❑ Too old to drive.
- ❑ Not interested in driving.
- ❑ Other, please specify:_________________

*(Please go to question 5a on the next page if you checked **No**.)*

❑ Yes.

Please describe the motor vehicles your household now leases or owns. Please include all cars, vans, pickup trucks, and motorcycles.

No.	**Type**	**Year made**	**Make**	**Model**	**Own or Lease**	**New or used**	**Year of purchase**	**Fuel type**
1	***Car***	***1991***	***VW***	***GTI***	***Own***	***New***	***1991***	***Gas***
1								
2								
3								
4								

Please continue on the following table. Please note that the order of vehicles should be the same in these two tables.

No.	What is the ownership status of your vehicle: fully paid off, financed through a loan, personally leased, or leased/furnished by employer?	Current mileage	Miles driven during a year	Whom did you buy/lease the vehicle from ?
1				
2				
3				
4				

3. My household vehicle costs me approximately $______________ per year per vehicle (on average) to operate, including gasoline, licensing, insurance, maintenance, and parking.

4. Where do you **regularly** park your household vehicle(s)? Please check **all applicable** responses.

❑ On the street
❑ On my property (e.g., garage)
❑ In a shared parking lot (e.g., apartment complex lot)
❑ Other, please specify: ____

5a. Consider the next vehicle you believe your household might acquire. How soon do you believe your household would buy or lease your next vehicle?

❑ Within the next 6 months
❑ Between 6 months and 1 year from now
❑ Between 1 and 2 years from now
❑ Between 2 and 5 years from now
❑ More than 5 years from now

5b. How do you think you would pay for this vehicle?

❑ Buy ❑ Lease ❑ Haven't decided yet

5c. Please complete the following statement in a way that **best** describes what you would use your next vehicle for. Please check **all** that apply.

We would buy this vehicle to:

❑ Commute to work or school on a regular basis.
❑ Drive children or other non-drivers to activities.
❑ Drive business clients and associates.
❑ Run business errands.
❑ Take weekend and vacation trips.
❑ Haul large loads.
❑ Other, please specify: ____

5d. Of the vehicles your household now owns, which one will this new vehicle likely replace?

❑ None. It will be our first vehicle.
❑ None. It will be an addition to our household vehicle fleet.
❑ Vehicle 1 in the table of question 2 on the previous page.
❑ Vehicle 2 in the table of question 2 on the previous page.
❑ Vehicle 3 in the table of question 2 on the previous page.
❑ Vehicle 4 in the table of question 2 on the previous page.

6. How often is a household vehicle available to you when you want it?

❑ Never
❑ Almost never
❑ Sometimes
❑ Often
❑ Almost always
❑ Always

7. How many trips per week do you make for each of the following activities?

(A *trip* is defined as a one-way nonstop movement from one point to another using the same transportation mode. Please note that each stop ends a trip no matter how long it is.)

	None	*Less than once a week*	*1-2 times a week*	*3 or more times a week*
Commuting to work	❑	❑	❑	❑
Work-related activities	❑	❑	❑	❑
Shopping	❑	❑	❑	❑
Medical/dental appointment	❑	❑	❑	❑
Eating out/going for takeout	❑	❑	❑	❑
Entertainment/recreation /social activities	❑	❑	❑	❑
Taking others where they need to go	❑	❑	❑	❑
Errands (e.g., post office)	❑	❑	❑	❑
Other, please specify: ______________________	❑	❑	❑	❑

8. How often do you make trips using the following means of travel?

	None	*1-3 times a month*	*4-7 times a month*	*8 or more times a month*
In a household vehicle	❑	❑	❑	❑
On a bus	❑	❑	❑	❑
BART/other rail	❑	❑	❑	❑
Walking/jogging/bicycling	❑	❑	❑	❑
Telecommuting *(Telecommuting means a person works from home a center near home one or more days a week.)*	❑	❑	❑	❑
Other means, please specify: ______________________	❑	❑	❑	❑

9. For the following statements, please check the response that best expresses your opinion.

My current ways of getting around…

	Strongly Disagree	*Disagree*	*Neutral*	*Agree*	*Strongly Agree*
Gets me to work on time.	❑	❑	❑	❑	❑
Is enjoyable to me.	❑	❑	❑	❑	❑
Allows me to store important items (e.g., sunglasses, shopping bags).	❑	❑	❑	❑	❑
Fits my budget.	❑	❑	❑	❑	❑
Allows me to be spontaneous.	❑	❑	❑	❑	❑
Helps me go everywhere.	❑	❑	❑	❑	❑
Allows me to visit friends when I want.	❑	❑	❑	❑	❑
Gives me a sense of freedom.	❑	❑	❑	❑	❑
Helps me do my shopping.	❑	❑	❑	❑	❑
Makes me feel safe.	❑	❑	❑	❑	❑
Gives me a sense of independence.	❑	❑	❑	❑	❑
Says a lot about who I am.	❑	❑	❑	❑	❑
Is great for my lifestyle needs.	❑	❑	❑	❑	❑
Allows me to quickly respond to an emergency.	❑	❑	❑	❑	❑
Is comfortable.	❑	❑	❑	❑	❑

10. The following statements are the same as listed in question 8. This time we would like to know how important they are for you to choose your current transportation modes to access your daily activities.

My current ways of getting around...

	Major Reason	*Minor Reason*	*N/A or Don't Know*
Gets me to work on time.	❑	❑	❑
Is enjoyable to me.	❑	❑	❑
Allows me to store important. items (e.g., sunglasses, shopping bags).	❑	❑	❑

	Major Reason	*Minor Reason*	*N/A or Don't Know*
Fits my budget.	❑	❑	❑
Allows me to be spontaneous.	❑	❑	❑
Helps me go everywhere.	❑	❑	❑
Allows me to visit friends when I want.	❑	❑	❑
Gives me a sense of freedom.	❑	❑	❑
Helps me do my shopping.	❑	❑	❑
Make me feel safe	❑	❑	❑
Gives me a sense of independence.	❑	❑	❑
Says a lot about who I am.	❑	❑	❑
Is great for my lifestyle needs.	❑	❑	❑
Allows me to quickly respond to an emergency.	❑	❑	❑
Is comfortable.	❑	❑	❑

11. What don't you like about your current way of getting around? Please check the top three reasons. (❑ Not applicable. I like my ways of getting around.)

❑ The cost is too high.
❑ Parking is a hassle.
❑ Waste too much time in traffic.
❑ Vehicle maintenance is a hassle.
❑ Seating is not comfortable.
❑ I don't have enough private space.
❑ I often don't get to work on time.
❑ It's not flexible enough because of my variable schedule.
❑ It doesn't allow me to use my time productively.
❑ I can't go shopping, pick up other household members or do other things on the way to and from work.
❑ My vehicle frequently breaks down.
❑ Other, please specify: ____

12. What do you like about your current way of getting around?

____

____

____

____

____

13. What would you like to do more of if your transportation means would allow you?

____

____

____

____

____

14. How essential to your lifestyle is a household motor vehicle? Please check *one* box.

- ❑ Essential. I would not want to be without one.
- ❑ A motor vehicle is not essential to my lifestyle, but I would not want to be without one.
- ❑ A motor vehicle is useful, but I would consider getting rid of at least one of the household vehicles if public transportation was better.
- ❑ It would not take much for me to get rid of my motor vehicle.

15. How do you feel about driving? Please check **one** box.

- ❑ I generally like driving.
- ❑ Generally, I don't like driving under any conditions.
- ❑ I do not enjoy driving in cities, but I do enjoy driving in the countryside.
- ❑ I don't drive, because ____

16. What communication devices do you use when you are not in the office? Please check **all** the items that apply.

- ❑ Phone/Fax
- ❑ Cell phone
- ❑ Pager
- ❑ Internet/computer
- ❑ Other, please specify:____

PART D
YOUR VIEWS ON A VARIETY OF ISSUES

In this section, we would like to know your opinions on a number of issues related to your activities and trip making. Remember your opinions are extremely important, even if you are not familiar with some of the topics mentioned.

For the following statements, please check the response that can best express your opinion.

	Strongly Disagree	*Disagree*	*Neutral*	*Agree*	*Strongly Agree*
1. Finding a parking space is a real hassle.	❏	❏	❏	❏	❏
2. I like driving alone.	❏	❏	❏	❏	❏
3. I am willing to reduce my auto use to improve transportation and air quality.	❏	❏	❏	❏	❏
4. I like to experiment with new ways of doing things.	❏	❏	❏	❏	❏
5. I use transit when it goes where I want to go.	❏	❏	❏	❏	❏
6. I am willing to drive an electric or other clean-fuel vehicle to improve air quality.	❏	❏	❏	❏	❏
7. I have to admit that the type of car I own says a lot about who I am.	❏	❏	❏	❏	❏
8. Car maintenance is a hassle.	❏	❏	❏	❏	❏
9. We can find cost-effective technological solutions to the problem of air pollution.	❏	❏	❏	❏	❏
10. I prefer to drive my personal vehicle to places I need to go.	❏	❏	❏	❏	❏
11. Environmental problems are the biggest crisis and challenge of our times.	❏	❏	❏	❏	❏
12. Congestion on the roads is something one has to live with.	❏	❏	❏	❏	❏

		Strongly Disagree	*Disagree*	*Neutral*	*Agree*	*Strongly Agree*
13.	To me, a car is nothing more than a convenient way to get around.	❑	❑	❑	❑	❑
14.	It is time to change the way we live in order to solve environmental problems.	❑	❑	❑	❑	❑
15.	A smog check is a real hassle.	❑	❑	❑	❑	❑
16.	If possible, I would like to change from driving to work alone to some other transportation modes. (❑ Not applicable.)	❑	❑	❑	❑	❑
17.	Traffic growth is a serious problem.	❑	❑	❑	❑	❑
18.	The roadways are congested due to too many vehicles on the road.	❑	❑	❑	❑	❑
19.	Traffic fumes are a major contributor to global warming, smog, and other environmental problems.	❑	❑	❑	❑	❑
20.	Automobiles mean personal freedom.	❑	❑	❑	❑	❑
21.	If friends and neighbors reduced their driving, I would follow their example.	❑	❑	❑	❑	❑
22.	I wouldn't give up my own vehicle(s) even if there is a feasible alternative.	❑	❑	❑	❑	❑
23.	I would like a job that doesn't require that I keep learning new skills.	❑	❑	❑	❑	❑
24.	I always follow a manufacturer's warnings regarding how to use a product.	❑	❑	❑	❑	❑
25.	I would rather rent or lease a car than buy my own vehicle.	❑	❑	❑	❑	❑
26.	I'd be willing to ride a bike or transit to work in order to reduce air pollution. (❑ I do now.)	❑	❑	❑	❑	❑
27.	The costs of owning a car are higher than the benefits.	❑	❑	❑	❑	❑

PART E
GENERAL INFORMATION

In this section, we ask for some information about you and your household. Your responses will help us better understand each individual's travel decision. Your answers are confidential.

1. How many members (including yourself) are there in your household? _________

2. Are you... ❑ female ❑ male

3. What is your current marital status?

❏ Single ❏ Married ❏ Separated ❏ Divorced ❏ Widowed

4. What is your age?

❏ 23 or younger ❏ 24-40 ❏ 41-64 ❏ 65-74 ❏ 75 or older

5. What is the last level of school that you completed?

❏ Grade school
❏ Some high school
❏ Graduated high school
❏ Some college
❏ Associate's Degree
❏ Bachelor's Degree
❏ Some graduate school
❏ Master's Degree
❏ Ph.D. or higher
❏ Other, please specify:____

6. What is your employment status?

❏ Full-time employed
❏ Part-time employed
❏ self-employed
❏ Currently unemployed
❏ Retired
❏ Other, please specify:_____________________

7. Which category best describes your occupation (even if you are unemployed or retired)?

❏ Homemaker
❏ Manager/administrator
❏ Service/repair
❏ Clerical/administrative support
❏ Sales
❏ Professional/technical
❏ Production/construction/crafts
❏ Other, please specify:_____________________

8. Do you have a driver's license? ❑ Yes ❑ No

9. How many other members of your household have a driver's license? __________

10. Please indicate the number of your household members (including yourself) that fall into the different age groups listed below.

____persons 0-5 years old ____persons 19-23 _____persons 65-74

____persons 6-15 ____persons 24-40 _____persons 75 or older

____persons 16-18 ____persons 41-64

11. Do you rent or own your home?

❑ Rent ❑ Own ❑ Other, please specify:______________

12. Please describe the type of community you live in.

❑ Large city (population is 250,000 or more.)
❑ Medium city (population is between 50,000 and 250,000.)
❑ Small city (population is under 50,000.)
❑ Suburb of a large city
❑ Suburb of a medium city
❑ Rural area
❑ Others, please specify: ____

13. What was your household's 1997, pre-tax income?

❑ Under $10,000
❑ $10,000 - $19,999
❑ $20,000 - $49,999
❑ $50,000 - $79,999
❑ $80,000 - $109,999
❑ More than $110,000
❑ Decline to respond

Thank you for completing this preliminary questionnaire. Now, please go to the other enclosed envelope to review the informational material and complete the second questionnaire.

SMART CARLINK BROCHURE QUESTIONNAIRE

Instructions:

1. *You should find two brochure questionnaires in the packet. These two brochure questionnaires should be completed by two household members.*
2. *The enclosed brochure accompanies this questionnaire.*
3. *The questionnaire contains two sections. The first section is Part A: Previous Experience. The second section is from Part B through Part E. Please complete the first section **before** reviewing the brochure. Please complete the rest of the questions **after** reading the brochure.*

PART A
PREVIOUS EXPERIENCE

1. What is your first name?____

2. Do you use rental cars?

   ❏ No. (Please go on to question 3.)
   ❏ Yes.
   Please check **one** box for the typical number of times per year you rent cars for each reason that applies.

	None	*Once a year or less*	*Once a month or less*	*Once a week or less*	*More than once a week*
For work-related travel	❏	❏	❏	❏	❏
For personal use at home	❏	❏	❏	❏	❏
For vacation travel	❏	❏	❏	❏	❏

3. Have you or any other member of your household ever borrowed a vehicle from anyone outside your household in the last two years?

   ❏ No. (Please go on to question 4.)
   ❏ Yes.

   Please check **all the applicable** boxes for the reason(s) why the person has borrowed a vehicle.

   ❏ Did not own a car.
   ❏ Car was in the shop for repairs.
   ❏ Visitor from out of town needed to borrow car.
   ❏ Other, please specify: ____

Next, we will ask you a few questions related to your previous experience. Please select the applicable answer(s) and fill in the line at the end of each question.

4. Have you ever belonged to:

   a. A time share vacation program or other shared-property arrangement (e.g., a ski or beach house)?

      ❏ No.
      ❏ Yes, I am currently a member.
      ❏ Yes, but I am no longer a member now.

   b. A health club or country club/resort?

      ❏ No.
      ❏ Yes, I am currently a member.
      ❏ Yes, but I am no longer a member now.

   c. A local food cooperative?

      ❏ No.
      ❏ Yes, I am currently a member.
      ❏ Yes, but I am no longer a member now.

5a. If you selected “**No”** in one or more of the questions listed in question 4 above, please choose **all of the applicable** reasons why you have not joined the organization(s).

❏ I do not enjoy the social interaction associated with this type of program.
❏ It is too expensive.
❏ It seems like a hassle.
❏ This type of arrangement does not suit my lifestyle.
❏ I have never been approached to join such an arrangement.
❏ None of these services are available in my area.
❏ Other, please specify:____

5b. If you selected “**Yes, I am currently a member”** for one or more of the questions listed in question 4, please choose **all the applicable** reasons why you are currently a member.

❏ I enjoy the social interaction associated with this type of program.
❏ The services provided are guaranteed.
❏ It reduces the hassle of vacationing, recreation and/or shopping.
❏ There is a financial advantage.
❏ I like supporting a local organization.
❏ This type of arrangement suits my lifestyle
❏ Other, please specify:____

5c. If you selected “**Yes, but I am no longer a member**” for one or more of the questions listed in question 4, please choose **all of the applicable** reasons why you are not currently a member

- ❑ I did not enjoy the social interaction associated with this type of program.
- ❑ I thought that the services provided would be guaranteed, but they were not.
- ❑ I thought it would reduce the hassle of planning vacations, exercising, and/or shopping, but it did not.
- ❑ I didn’t use the resource(s) enough to justify the expense.
- ❑ It was too expensive.
- ❑ This type of arrangement did not suit my lifestyle.
- ❑ Other, please specify:____

6. Have you ever car pooled to work?

- ❑ No. (Please go to question 7a.)
- ❑ Yes, I **currently** car pool to work. (Please go to question 7b.)
- ❑ Yes, but I **no longer** carpool. (Please go to question 7c.)

7a. Please check **all of the applicable** boxes for the reason(s) why you’ve never car pooled.

- ❑ I need a vehicle available to me all day.
- ❑ My schedule is too variable (e.g., often I must stay late at work).
- ❑ It seems like a hassle to ride to work with others.
- ❑ It is not suitable to my lifestyle.
- ❑ I have not heard about any car pools that I could join.
- ❑ I never have access to a business vehicle to conduct business during the day.
- ❑ Other, please specify: ____

7b. Please check **all of the applicable** boxes for the reason(s) why you currently carpool.

- ❑ I can get to work more quickly by taking advantage of High Occupancy Vehicle (HOV) lanes.
- ❑ It reduces my transportation bills.
- ❑ I can make more productive use of my time.
- ❑ My household has a limited number of vehicles.
- ❑ I have access to a business vehicle to conduct business during the day.
- ❑ I don’t like to drive because it is stressful.
- ❑ It is expensive to park at work.
- ❑ It is difficult to find parking at work.
- ❑ I don’t like taking transit.
- ❑ I don’t have a car.
- ❑ I am doing my part to reduce congestion.
- ❑ I am doing my part to reduce air pollution.
- ❑ Other, please specify: ____

7c. Please check **all of the applicable** boxes for the reason(s) why you do not currently car pool.

❑ It takes a lot longer to get to work.

❑ I like driving alone.

❑ I enjoy having my own space and time when I drive in my own vehicle.

❑ Congestion really isn't a problem in my area, so it is not necessary.

❑ I no longer have access to a business vehicle to conduct business during the day, so I need to drive to work.

❑ I didn't have a car to drive to work, but I now have access to one.

❑ Carpooling is no longer suitable to my lifestyle.

❑ I need to stay late or leave early often enough that carpooling is not practical.

❑ It is a hassle to coordinate meeting times with other carpool members.

❑ There were no longer enough members to maintain my carpool.

❑ I changed my job, and there was no longer a carpool available to me.

❑ I changed my job, and now I need to drive to work myself.

❑ Other, please specify: ____

8. In addition to carpooling to work, have you ever car pooled for any other types of trips?

❑ No.

❑ Yes.

Please check **all of the applicable** boxes that apply.

❑ Shopping

❑ Driving kids to activities

❑ Weekend trips

❑ Vacation

❑ Other, please specify:____________________________________

Next, please review the CARLINK brochure. After you finish reviewing the brochure, please return to this questionnaire and answer the remaining questions.

PART B
CARLINK GENERAL IMPRESSIONS

1. What do you think about the CarLink concept now that you have reviewed the brochure? Please check **all of the applicable** boxes.
   - ❑ I would be very interested in trying this new mobility system.
   - ❑ I would like more information.
   - ❑ I do not understand how the system works.
   - ❑ This concept would not fit the needs of my household today.
   - ❑ This concept could fit the needs of my household in the future, but not today.
   - ❑ Other, please specify: ____

2. Do you have any questions about the CarLink system? Please list them below:

____

____

____

____

____

____

____

____

____

PART C
DO YOU THINK THERE IS A NEED FOR CARLINK?

1. Do you think that you would use CarLink: A Smart Car Sharing System?
   - ❑ No. I do not think that I would use the CarLink system because... (Please check **all** that apply.)
     - ❑ The system is too complicated.
     - ❑ I like my current set of transportation modes.
     - ❑ CarLink is too risky (e.g., I'd worry about vehicle availability, breakdowns, and a backup taxi or shuttle service).
     - ❑ I would be concerned about maintaining my privacy when using such a system.
     - ❑ Personal vehicles are a preferable transportation tool.
     - ❑ Other, please specify: ____
   - ❑ Yes. I think I would use the CarLink system because with CarLink…(Please check **all** that apply.)
     - ❑ I could save money using CarLink.
     - ❑ I could help improve air quality.
     - ❑ I could save time by using a combination of transit and CarLink.
     - ❑ I could take transit more often.
     - ❑ I could reduce commute stress.
     - ❑ I could get to work on time.
     - ❑ I wouldn't have to worry about parking in my neighborhood.
     - ❑ I wouldn't have to pay for parking at work.
     - ❑ I wouldn't have to worry about insurance, maintenance, fueling, and parking.
     - ❑ I could walk and bike more often.
     - ❑ I could have a transportation alternative that is more compatible with telecommuting since I telecommute.
     - ❑ It looks like a fun way to get around.
     - ❑ I could get rid of my current way of getting around which I don't like.
     - ❑ Other, please specify: ____

2. For the following statements, please check the response that best expresses your opinion.

Compared to my current way of getting around, I would say that the CarLink: Smart Car-Sharing Service could…

	Strongly Agree	*Agree*	*Neutral*	*Disagree*	*Strongly Disagree*
Save me money.	❑	❑	❑	❑	❑
Save me time.	❑	❑	❑	❑	❑
Provide me with a range of vehicles.	❑	❑	❑	❑	❑
Reduce the hassles associated with personal vehicles (e.g., licensing).	❑	❑	❑	❑	❑
Help reduce congestion.	❑	❑	❑	❑	❑
Help reduce air pollution.	❑	❑	❑	❑	❑
Increase my household's transit ridership.	❑	❑	❑	❑	❑
Complement my current lifestyle needs.	❑	❑	❑	❑	❑
Complement my future lifestyle needs.	❑	❑	❑	❑	❑
Complement my current way of getting around.	❑	❑	❑	❑	❑

3. For the following statements, please check the response that best expresses your opinion about how CarLink could meet your household's current lifestyle needs and goals?

	Strongly Agree	*Agree*	*Neutral*	*Disagree*	*Strongly Disagree*
CarLink is great for other people, but it is not compatible with my current lifestyle goals.	❑	❑	❑	❑	❑
Owning a car is better than CarLink.	❑	❑	❑	❑	❑
Continuous maintenance of vehicles is an attractive feature of CarLink.	❑	❑	❑	❑	❑
With CarLink, I could take transit, walk, and bike more.	❑	❑	❑	❑	❑
I don't like to "share" vehicles with others.	❑	❑	❑	❑	❑
If I had an emergency, I would not be able to depend upon CarLink.	❑	❑	❑	❑	❑

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Like many other new technologies, CarLink could really improve my lifestyle.	❑	❑	❑	❑	❑
CarLink could offer me an alternative to owning a second or third household vehicle.	❑	❑	❑	❑	❑
I don't like the idea of having to walk, bike, or drive to a CarLink lot.	❑	❑	❑	❑	❑
I enjoy driving my own vehicle.	❑	❑	❑	❑	❑
CarLink is compatible with my environmental goals.	❑	❑	❑	❑	❑
I'd prefer to spend the money on something other than a vehicle.	❑	❑	❑	❑	❑

4. Please check the response that best expresses your opinion.

I think that CarLink would...

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Get me to work on time.	❑	❑	❑	❑	❑
Be enjoyable to me.	❑	❑	❑	❑	❑
Allow me to store important items (e.g., shopping bags).	❑	❑	❑	❑	❑
Fit my budget.	❑	❑	❑	❑	❑
Allow me to be spontaneous.	❑	❑	❑	❑	❑
Help me go everywhere.	❑	❑	❑	❑	❑
Allow me to visit friends when I want.	❑	❑	❑	❑	❑
Help me do my shopping.	❑	❑	❑	❑	❑
Make me feel safe.	❑	❑	❑	❑	❑
Say a lot about who I am.	❑	❑	❑	❑	❑
Be great for my lifestyle needs.	❑	❑	❑	❑	❑

Allow me to quickly respond to an emergency.	❑	❑	❑	❑	❑
Offer comfortable seating.	❑	❑	❑	❑	❑

PART D
HELP US DESIGN A CARLINK SERVICE FOR YOUR HOUSEHOLD

1. Where would you like a CarLink lot to be available? Please check **all** that apply.

   ❑ Shopping
   ❑ Workplace
   ❑ Neighborhood
   ❑ Public transportation
   ❑ College campus
   ❑ Resorts
   ❑ Day care center
   ❑ Airport
   ❑ Other, please specify:____________________________

2. Would you require convenient access to multiple CarLink lots to use this service?

   ❑ Yes. ❑ No. ❑ Don't know.

3. How far would you be willing to walk/bike to a CarLink lot?

	1 to 2 blocks	3 to 4 blocks	5 or more blocks
Walk	❑	❑	❑
Bike	❑	❑	❑

4. What types of vehicles would you like to rent from a CarLink lot? Please check **all** that apply.

   ❑ Compact
   ❑ Mid-size Sedan
   ❑ Convertible
   ❑ Sports Coupe
   ❑ Luxury Car
   ❑ Mini-van
   ❑ Sport Utility Vehicle
   ❑ Pick-up Truck
   ❑ Other, please specify:____

5. What types of activities would you like to access using a CarLink vehicle? Please check **all** that apply.

   ❑ None
   ❑ Shopping or running errands (e.g., doctor's appointment)
   ❑ Driving kids to activities (e.g., sporting event)

- ❑ Driving to work or work-related meetings
- ❑ Vacationing
- ❑ Other, please specify:____

6. For the following statements, please check the response that best expresses your opinion.

How likely would you be to use the CarLink system if…

	Very Likely	*Somewhat Likely*	*Neutral*	*Unlikely*	*Very Unlikely*
Your travel time were reduced through CarLink?	❑	❑	❑	❑	❑
CarLink provided you with parking priorities at transit stations, home, work, and shopping centers?	❑	❑	❑	❑	❑
Transit services became more reliable?	❑	❑	❑	❑	❑
Transit services offered more comfortable seating?	❑	❑	❑	❑	❑
A CarLink site was located within one-quarter mile of your home?	❑	❑	❑	❑	❑
A CarLink site was located within one-quarter mile of your work site?	❑	❑	❑	❑	❑
CarLink was available at airports?	❑	❑	❑	❑	❑
CarLink was available in multiple cities?	❑	❑	❑	❑	❑
CarLink was available at hotels and resorts?	❑	❑	❑	❑	❑
CarLink provided you with a guaranteed ride service and a discount on your next rental?	❑	❑	❑	❑	❑
Cell phones were provided in each CarLink vehicle?	❑	❑	❑	❑	❑
Internet access was provided in each CarLink vehicle?	❑	❑	❑	❑	❑

Your CarLink transactions were automatically billed to your credit card monthly?	❑	❑	❑	❑	❑

7. What would be your biggest concerns about the CarLink system? Please check the **top three** reasons.

- ❑ Availability of a vehicle when I need one.
- ❑ A long waiting time for a CarLink vehicle.
- ❑ Availability of backup services if a CarLink vehicle breaks down or runs out of fuel.
- ❑ Too far to pick up a CarLink vehicle.
- ❑ CarLink lots do not protect me from dangerous people.
- ❑ Privacy concern with the technologies employed in the CarLink.
- ❑ CarLink vehicles are not safe (e.g., compact).
- ❑ CarLink vehicles are not reliable.
- ❑ Dirty vehicles.
- ❑ Other, please specify: ____

8. What is the maximum amount of time you'd be willing to spend to access a vehicle from a CarLink lot?

❑ Less than 5 minutes	❑ 5-10 minutes
❑ 11-15 minutes	❑ 16-20 minutes
❑ 21-25 minutes	❑ 26-30 minutes
❑ More than 30 minutes	

9. Do you have any suggestions for making CarLink more compatible with your household's needs?

____

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10. Can you think of any accessories or services that you would like to be offered in conjunction with CarLink (e.g., bike rentals, mapping directional devices, etc.)?

____

____

____

____

PART E
CARLINK SERVICE PREFERENCES

1. Please rate each of the items below on its importance to meet your household's transportation needs.

(Please Note: All CarLink services will include insurance, maintenance, fuel, cleaning, and a guaranteed ride service.)

		Extremely Important	*Important*	*Somewhat Important*	*Not Important*
A.	Number of CarLink lots available:	❏	❏	❏	❏
B.	Number of vehicle styles available:	❏	❏	❏	❏
C.	Distance to CarLink lots:				
	Within one-quarter mile from home, work, transit station, etc	❏	❏	❏	❏
	Within 1 to 2 miles from home, work, transit station, etc.	❏	❏	❏	❏
D.	Accessibility to long-term rental vehicles at CarLink lots:	❏	❏	❏	❏
E.	Accessories provided in CarLink vehicles:				
	Cell phones.	❏	❏	❏	❏
	Mapping devices.	❏	❏	❏	❏
	Internet access.	❏	❏	❏	❏
	No accessories.	❏	❏	❏	❏
F.	Price (Reflects different services and vehicle styles available. With higher rates more services and vehicles are available):				
	$2.50 to $5.00/hour and 25 cents/mile.	❏	❏	❏	❏
	$6.00 to $10.00/hour and 15 cents/mile.	❏	❏	❏	❏
	$11.00 to $20.00/hour and 10 cents/mile.	❏	❏	❏	❏

2. Would you be willing to join a CarLink program?

- ❑ Yes. When did you realize that you might be able to use this service? (Please check **one** box.)
  - ❑ During the recruitment process.
  - ❑ When I was reading the brochure.
  - ❑ When I was talking with a friend about the CarLink system.
  - ❑ When I was filling out this questionnaire.
- ❑ No. Why not? (Please check **all** that apply.)
  - ❑ CarLink is too expensive.
  - ❑ I am concerned that a CarLink vehicle wouldn't be available when I needed one.
  - ❑ I don't like the idea of sharing a car.
  - ❑ The program sounds too complicated.
  - ❑ There is no need for me to join this program.
  - ❑ I suspect it is not as convenient as my current way of getting around.
  - ❑ I would need a trial to decide.
  - ❑ Other, please specify: ___________________________________
  - ❑ Not sure.

3. Do you need more information?

____

____

____

____

4. Is there anything about the CarLink system that you don't understand?

____

____

____

Contact information:
If you have any questions concerns or comments, please contact
Susan Shaheen,
project manager,
530-752-1934
sashaheen@ucdavis.edu

The question below is optional. We are interested in learning more about what you think about the CARLINK brochure.

6. Do you have any suggestions for improving the brochure?

____

____

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Please return this questionnaire along with the second household participant's brochure questionnaire and the initial household questionnaire in the postage-paid envelope included in your study package. We appreciate your quick response and look forward to receiving your questionnaires. Your next study package will arrive in three to four weeks.

SMART CARLINK VIDEO QUESTIONNAIRE

*Instructions: This questionnaire should be completed by **the individual who agreed to participate in this study on behalf of your household.***

PART A
RECENT EXPERIENCE

In this section, we would like to know about any recent experience you may have had with car sharing and the CarLink concept since you received the last round of this survey.

1. What is your name? ____

2. If there are any changes in your mailing address, telephone numbers, or e-mail address, please provide us with this information below:

   ____

   ____

3. Have you seen or heard anything new about car sharing after receiving your first CarLink questionnaire?

   ❑1 Yes. ❑2 No. (Please go to question 4.)

   If **yes,** from what sources? Check **all** that apply.

   ❑1 Friend or colleague
   ❑2 Newspaper, magazine, or other print media
   ❑3 TV or radio spot
   ❑4 Internet
   ❑5 Household member
   ❑6 Other, please specify:____

4. Have you spoken with any friends, family members, or colleagues about the CarLink: Smart Car Sharing concept since you received the brochure?

   ❑1 Yes. ❑2 No.

   If **yes**, how many people have you spoken to about this concept?

   ❑1 1-3 ❑2 4-7 ❑3 8 or more

Next, please review the CarLink brochure that you received from the last survey packet and the enclosed video. After you finish reviewing the brochure and video, please return to this questionnaire and answer the remaining questions.

PART B
CARLINK GENERAL IMPRESSIONS

1. What do you think about the CarLink concept now that you have reviewed the video and the brochure again? Please check **all of the applicable** boxes.

   ❏1 I am even more interested in this new concept.
   ❏2 I would be very interested in trying this new mobility system.
   ❏3 I would like more information.
   ❏4 I do not understand how the system works.
   ❏5 This concept would not fit the needs of my household today.
   ❏6 This concept could fit the needs of my household in the future, but not today.
   ❏7 Other, please specify: ____

2. Did the video clarify any questions about CarLink that you had after you read the brochure?

   ____

   ____

   ____

   ____

   ____

3. Do you have any new questions about the CarLink system after watching the video?

   ____

   ____

   ____

   ____

*Now that you've had a chance to watch the CarLink video, review the brochure, and think about this concept over the past few weeks, we'd like to get a better understanding of how **your** attitudes and feelings about this system may have changed. Keeping in mind **your** preferences (e.g., features and price), please think about what types of services **you** might like to access through a CarLink system.*

PART C
DO YOU THINK YOU WOULD USE CARLINK?

1. Do you think that you would use the CarLink: Smart Car Sharing System? (Please provide **one** response **only**.)

   ❑1 No. (Please go to question 2.)
   ❑2 Yes. (Please go to question 3.)

2. I do not think that I would use the CarLink system because... (Please check **all** that apply.)

   ❑1 I like my current set of transportation modes.

   ❑2 Personal vehicles are a preferable transportation tool.

   ❑3 The system is too complicated.

   ❑4 I would be concerned about maintaining my privacy when using such a system.

   ❑5 CarLink is too risky (e.g., I'd worry about vehicle availability, breakdowns, and a backup taxi or shuttle service).

   ❑6 Other, please specify: ____

3. I think I would use the CarLink system because with CarLink… (Please check **all** that apply.)

   ❑1 I wouldn't have to worry about parking in my neighborhood.

   ❑2 I wouldn't have to worry about insurance, maintenance, fueling, and parking.

   ❑3 I wouldn't have to pay for parking at work.

   ❑4 I could walk and bike more often.

   ❑5 I could save money using CarLink.

   ❑6 I could help improve air quality.

   ❑7 I could save time by using a combination of transit and CarLink.

   ❑8 I could take transit more often.

❑9 I could reduce commute stress.

❑10 I could get to work on time.

❑11 I could have a transportation alternative that is more compatible with telecommuting because I telecommute. *(Telecommuting: A person works from home or a specialized center located near his/her home one or more days a week.)*

❑12 It looks like a fun way to get around.

❑13 I could change my current way of getting around, which I don't like.

❑14 Other, please specify: ____

4. For the following statements, please check the response that best expresses your opinion.

Compared to my current way of getting around, I would say that the CarLink: Smart Car Sharing System could…

	Strongly Agree	*Agree*	*Neutral*	*Disagree*	*Strongly Disagree*
Save me money.	❑1	❑2	❑3	❑4	❑5
Save me time.	❑1	❑2	❑3	❑4	❑5
Provide me with a range of vehicles.	❑1	❑2	❑3	❑4	❑5
Reduce the hassles associated with personal vehicles (e.g., licensing).	❑1	❑2	❑3	❑4	❑5
Help reduce congestion.	❑1	❑2	❑3	❑4	❑5
Help reduce air pollution.	❑1	❑2	❑3	❑4	❑5
Increase my household's transit ridership.	❑1	❑2	❑3	❑4	❑5
Complement my current lifestyle needs.	❑1	❑2	❑3	❑4	❑5
Complement my current way of getting around.	❑1	❑2	❑3	❑4	❑5
Complement my future lifestyle needs.	❑1	❑2	❑3	❑4	❑5

5. For the following statements, please check the response that best expresses your opinion about how CarLink could meet your household's current lifestyle needs and goals?

	Strongly Agree	*Agree*	*Neutral*	*Disagree*	*Strongly Disagree*
CarLink is great for other people, but it is not compatible with my current lifestyle goals.	❑1	❑2	❑3	❑4	❑5
Owning a car is better than CarLink.	❑1	❑2	❑3	❑4	❑5
Continuous maintenance of vehicles is an attractive feature of CarLink.	❑1	❑2	❑3	❑4	❑5
With CarLink, I could take transit, walk, and bike more often.	❑1	❑2	❑3	❑4	❑5
I don't like to "share" vehicles with others.	❑1	❑2	❑3	❑4	❑5

	Strongly Agree	*Agree*	*Neutral*	*Disagree*	*Strongly Disagree*
If I had an emergency, I would not be able to depend upon CarLink.	❑1	❑2	❑3	❑4	❑5
Like many other new technologies, CarLink could really improve my lifestyle.	❑1	❑2	❑3	❑4	❑5
CarLink could offer me an alternative to owning a second or third household vehicle.	❑1	❑2	❑3	❑4	❑5
I don't like the idea of having to walk, bike, or drive to a CarLink lot.	❑1	❑2	❑3	❑4	❑5
I enjoy driving my own vehicle.	❑1	❑2	❑3	❑4	❑5
CarLink is compatible with my environmental goals.	❑1	❑2	❑3	❑4	❑5
I'd prefer to spend money on something other than a vehicle.	❑1	❑2	❑3	❑4	❑5

6. Please check the response that best expresses your opinion.

I think that CarLink would...

	Strongly Agree	*Agree*	*Neutral*	*Disagree*	*Strongly Disagree*
Get me to work on time. (❑ Not applicable.)	❑1	❑2	❑3	❑4	❑5
Be enjoyable to me.	❑1	❑2	❑3	❑4	❑5
Allow me to store important items (e.g., shopping bags).	❑1	❑2	❑3	❑4	❑5
Fit my budget.	❑1	❑2	❑3	❑4	❑5
Allow me to be spontaneous.	❑1	❑2	❑3	❑4	❑5
Help me go everywhere.	❑1	❑2	❑3	❑4	❑5
Allow me to visit friends when I want.	❑1	❑2	❑3	❑4	❑5
Help me do my shopping.	❑1	❑2	❑3	❑4	❑5
Make me feel safe.	❑1	❑2	❑3	❑4	❑5
Say a lot about who I am.	❑1	❑2	❑3	❑4	❑5
Be great for my lifestyle needs.	❑1	❑2	❑3	❑4	❑5
Allow me to quickly respond to an emergency.	❑1	❑2	❑3	❑4	❑5
Offer comfortable seating.	❑1	❑2	❑3	❑4	❑5

PART D
CARLINK SERVICE PREFERENCES

1. Please rate each of the items below on its importance to meet your household's transportation needs.

   (Please Note: All CarLink services will include insurance, maintenance, fuel, cleaning, and a guaranteed ride service.)

	Extremely Important	*Important*	*Somewhat Important*	*Not Important*
A. Number of CarLink lots available:	❑	❑	❑	❑
B. Number of vehicle styles available:	❑	❑	❑	❑
C. Distance to CarLink lots:				
Within one-quarter mile from home, work, transit station, etc	❑	❑	❑	❑
Within 1 to 2 miles from home, work, transit station, etc.	❑	❑	❑	❑
D. Accessibility to long-term rental vehicles at CarLink lots:	❑	❑	❑	❑
E. Accessories provided in CarLink vehicles:				
Cell phones.	❑	❑	❑	❑
Mapping devices.	❑	❑	❑	❑
Internet access.	❑	❑	❑	❑
No accessories.	❑	❑	❑	❑
F. Price (Reflects different services and vehicle styles available. With higher rates more services and vehicles are available):				
$2.50 to $5.00/hour and 25 cents/mile.	❑	❑	❑	❑
$6.00 to $10.00/hour and 15 cents/mile.	❑	❑	❑	❑
$11.00 to $20.00/hour and 10 cents/mile.	❑	❑	❑	❑

PART E
CARLINK SUGGESTIONS AND CONCERNS

1a. Based on your knowledge of the CarLink system, what are your biggest concerns about the CarLink system? Please check the top **three** reasons.

- ❑1 It is too expensive.
- ❑2 Availability of a vehicle when I need one.
- ❑3 A long waiting time for a CarLink vehicle.
- ❑4 Availability of backup services if a CarLink vehicle breaks down or runs out of fuel.
- ❑5 Too far a distance to access a CarLink lot.
- ❑6 CarLink lots would not make me feel safe.
- ❑7 Privacy concern with the technologies employed in the CarLink system.
- ❑8 CarLink vehicles are not safe (e.g., compact cars).
- ❑9 CarLink vehicles are not reliable.
- ❑10 Dirty vehicles.
- ❑11 Other, please specify: ____

1b. Would any of the concerns that you expressed in question 1a (above) prevent you from joining a CarLink program?

❑1 Yes. (Please go to question 1c.) ❑2 No. (Please go to question 2.)

1c. If **yes**, what is the most important reason? Please check the **most** important one.

- ❑1 It is too expensive.
- ❑2 Availability of a vehicle when I need one.
- ❑3 A long waiting time for a CarLink vehicle.
- ❑4 Availability of backup services if a CarLink vehicle breaks down or runs out of fuel.
- ❑5 Too far a distance to access a CarLink lot.
- ❑6 CarLink lots would not make me feel safe.
- ❑7 Privacy concern with the technologies employed in the CarLink system.
- ❑8 CarLink vehicles are not safe (e.g., compact cars).
- ❑9 CarLink vehicles are not reliable.
- ❑10 Dirty vehicles.
- ❑11 Other, please specify: ____

2. Do you have any suggestions for making CarLink more compatible with your household's needs, which you did not include in your previous questionnaire?

____

____

---

3. Would you be willing to join a CarLink program? (Please provide **one** yes **or** no response.)

❑$_1$ Yes. (Please go to question 4.) ❑$_2$ No. (Please go to question 5a.)

4. When did you realize that you might be able to use this service? (Please check **one** box and go to question 6 after you've completed this question.)

❑$_1$ During the recruitment process.
❑$_2$ When I was reading the brochure.
❑$_3$ When I was watching the video.
❑$_4$ When I was talking with a friend about the CarLink system.
❑$_5$ When I was filling out the questionnaire last time.
❑$_6$ When I spoke with someone from the CarLink project.
❑$_7$ When I was filling out this questionnaire.

5a. Why aren't you willing to join a CarLink program? (Please check **all** that apply, and go to question 5b.)

❑$_1$ CarLink is too expensive.
❑$_2$ I am concerned that a CarLink vehicle won't be available when I need one.
❑$_3$ It does not fit my lifestyle needs at this time.
❑$_4$ I don't like the idea of sharing a car.
❑$_5$ The program sounds too complicated.
❑$_6$ There is no need for me to join this program.
❑$_7$ I suspect it is not as convenient as my current way of getting around.
❑$_8$ I would need a trial to decide.
❑$_9$ Not sure.
❑$_{10}$ Other, please specify: ___________________________________

5b. When did you realize that you might **not** be able to use this service? (Please check **one** box.)

❑$_1$ When I was reading the brochure.
❑$_2$ When I was watching the video.
❑$_3$ When I was talking with a friend about the CarLink system.
❑$_4$ When I was filling out the questionnaire last time.
❑$_5$ When I was filling out this questionnaire.

6. Is there anything about the CarLink system that you don't understand, which you did not include in your last questionnaire?

__The question below is optional. We are interested in learning more about what you think about the CarLink video.__

7. Do you have any comments or suggestions for improving the video?

SMART CARLINK: SECOND PHASE QUESTIONNAIRE

Instructions: This questionnaire should be completed by ***the individual who agreed to participate in this study on behalf of your household.***

PART A
RECENT EXPERIENCE

In this section, we would like to know about any recent experience you may have had with car sharing and the CarLink concept since you received the last round of this survey.

1. What is your name? ____

2. If there are any changes in your mailing address, telephone numbers, or e-mail address, please provide us with this information below:

 ____

 ____

 ____

3. Have you seen or heard anything new about car sharing after receiving your first CarLink questionnaire?

 ❑1 Yes. ❑2 No. (Please go to question 4.)

 If **yes,** from what sources? Check **all** that apply.

 ❑1 Friend or colleague
 ❑2 Newspaper, magazine, or other print media
 ❑3 TV or radio spot
 ❑4 Internet
 ❑5 Household member
 ❑6 Other, please specify:____

4. Have you spoken with any friends, family members, or colleagues about the CarLink: Smart Car Sharing concept since you received the brochure?

 ❑1 Yes. ❑2 No.

 If **yes**, how many people have you spoken to about this concept?

 ❑1 1-3 ❑2 4-7 ❑3 8 or more

5. What do you think about the CarLink concept now that you have had a chance to think about the CarLink concept over the past few weeks? Please check **all of the applicable** boxes.

❑1 I am even more interested in this new concept.
❑2 I would be very interested in trying this new mobility system.
❑3 I would like more information.
❑4 I do not understand how the system works.
❑5 This concept would not fit the needs of my household today.
❑6 This concept could fit the needs of my household in the future, but not today.
❑7 Other, please specify: ______________________________________

6. Do you have any questions about the CarLink system, which you didn't include in your last questionnaire?

____

____

____

____

____

Now that you've had a chance to think about this concept over the past few weeks, we'd like to get a better understanding of how ***your*** *attitudes and feelings about this system may have changed. Keeping in mind* ***your*** *preferences (e.g., features and price), please think about what types of services* ***you*** *might like to access through a CarLink system.*

PART B
DO YOU THINK YOU WOULD USE CARLINK?

1. Do you think that you would use the CarLink: Smart Car Sharing System? (Please provide **one** response **only**.)

   ❑1 No. (Please go to question 2.)
   ❑2 Yes. (Please go to question 3.)

2. I do not think that I would use the CarLink system because... (Please check **all** that apply.)

   ❑1 I like my current set of transportation modes.

   ❑2 Personal vehicles are a preferable transportation tool.

   ❑3 The system is too complicated.

   ❑4 I would be concerned about maintaining my privacy when using such a system.

   ❑5 CarLink is too risky (e.g., I'd worry about vehicle availability, breakdowns, and a backup taxi or shuttle service).

   ❑6 Other, please specify: ____

3. I think I would use the CarLink system because with CarLink… (Please check **all** that apply.)

   ❑1 I wouldn't have to worry about parking in my neighborhood.

   ❑2 I wouldn't have to worry about insurance, maintenance, fueling, and parking.

   ❑3 I wouldn't have to pay for parking at work.

   ❑4 I could walk and bike more often.

   ❑5 I could save money using CarLink.

   ❑6 I could help improve air quality.

   ❑7 I could save time by using a combination of transit and CarLink.

   ❑8 I could take transit more often.

   ❑9 I could reduce commute stress.

   ❑10 I could get to work on time.

   ❑11 I could have a transportation alternative that is more compatible with telecommuting because I telecommute. *(Telecommuting: A person works from home or a specialized center located near his/her home one or more days a week.)*

❑$_{12}$ It looks like a fun way to get around.

❑$_{13}$ I could change my current way of getting around, which I don't like.

❑$_{14}$ Other, please specify: ____

4. For the following statements, please check the response that best expresses your opinion.

Compared to my current way of getting around, I would say that the CarLink: Smart Car Sharing System could…

	Strongly Agree	*Agree*	*Neutral*	*Disagree*	*Strongly Disagree*
Save me money.	❑$_1$	❑$_2$	❑$_3$	❑$_4$	❑$_5$
Save me time.	❑$_1$	❑$_2$	❑$_3$	❑$_4$	❑$_5$
Provide me with a range of vehicles.	❑$_1$	❑$_2$	❑$_3$	❑$_4$	❑$_5$
Reduce the hassles associated with personal vehicles (e.g., licensing).	❑$_1$	❑$_2$	❑$_3$	❑$_4$	❑$_5$
Help reduce congestion.	❑$_1$	❑$_2$	❑$_3$	❑$_4$	❑$_5$
Help reduce air pollution.	❑$_1$	❑$_2$	❑$_3$	❑$_4$	❑$_5$
Increase my household's transit ridership.	❑$_1$	❑$_2$	❑$_3$	❑$_4$	❑$_5$
Complement my current lifestyle needs.	❑$_1$	❑$_2$	❑$_3$	❑$_4$	❑$_5$
Complement my current way of getting around.	❑$_1$	❑$_2$	❑$_3$	❑$_4$	❑$_5$
Complement my future lifestyle needs.	❑$_1$	❑$_2$	❑$_3$	❑$_4$	❑$_5$

5. For the following statements, please check the response that best expresses your opinion about how CarLink could meet your household's current lifestyle needs and goals?

	Strongly Agree	*Agree*	*Neutral*	*Disagree*	*Strongly Disagree*
CarLink is great for other people, but it is not compatible with my current lifestyle goals.	❑$_1$	❑$_2$	❑$_3$	❑$_4$	❑$_5$
Owning a car is better than CarLink.	❑$_1$	❑$_2$	❑$_3$	❑$_4$	❑$_5$

	Strongly Agree	*Agree*	*Neutral*	*Disagree*	*Strongly Disagree*
Continuous maintenance of vehicles is an attractive feature of CarLink.	❑1	❑2	❑3	❑4	❑5
With CarLink, I could take transit, walk, and bike more often.	❑1	❑2	❑3	❑4	❑5
I don't like to "share" vehicles with others.	❑1	❑2	❑3	❑4	❑5
If I had an emergency, I would not be able to depend upon CarLink.	❑1	❑2	❑3	❑4	❑5
Like many other new technologies, CarLink could really improve my lifestyle.	❑1	❑2	❑3	❑4	❑5
CarLink could offer me an alternative to owning a second or third household vehicle.	❑1	❑2	❑3	❑4	❑5
I don't like the idea of having to walk, bike, or drive to a CarLink lot.	❑1	❑2	❑3	❑4	❑5
I enjoy driving my own vehicle.	❑1	❑2	❑3	❑4	❑5
CarLink is compatible with my environmental goals.	❑1	❑2	❑3	❑4	❑5
I'd prefer to spend money on something other than a vehicle.	❑1	❑2	❑3	❑4	❑5

6. Please check the response that best expresses your opinion.

I think that CarLink would...

	Strongly Agree	*Agree*	*Neutral*	*Disagree*	*Strongly Disagree*
Get me to work on time. (❑ Not applicable.)	❑1	❑2	❑3	❑4	❑5
Be enjoyable to me.	❑1	❑2	❑3	❑4	❑5
Allow me to store important items (e.g., shopping bags).	❑1	❑2	❑3	❑4	❑5

Fit my budget.	❏1	❏2	❏3	❏4	❏5
Allow me to be spontaneous.	❏1	❏2	❏3	❏4	❏5
Help me go everywhere.	❏1	❏2	❏3	❏4	❏5
Allow me to visit friends when I want.	❏1	❏2	❏3	❏4	❏5
Help me do my shopping.	❏1	❏2	❏3	❏4	❏5
Make me feel safe.	❏1	❏2	❏3	❏4	❏5
Say a lot about who I am.	❏1	❏2	❏3	❏4	❏5
Be great for my lifestyle needs.	❏1	❏2	❏3	❏4	❏5
Allow me to quickly respond to an emergency.	❏1	❏2	❏3	❏4	❏5
Offer comfortable seating.	❏1	❏2	❏3	❏4	❏5

PART C
CARLINK SERVICE PREFERENCES

1. Please rate each of the items below on its importance to meet your household's transportation needs.

   (Please Note: All CarLink services will include insurance, maintenance, fuel, cleaning, and a guaranteed ride service.)

		Extremely Important	*Important*	*Somewhat Important*	*Not Important*
A.	Number of CarLink lots available:	❑	❑	❑	❑
B.	Number of vehicle styles available:	❑	❑	❑	❑
C.	Distance to CarLink lots:				
	Within one-quarter mile from home, work, transit station, etc	❑	❑	❑	❑
	Within 1 to 2 miles from home, work, transit station, etc.	❑	❑	❑	❑
D.	Accessibility to long-term rental vehicles at CarLink lots:	❑	❑	❑	❑
E.	Accessories provided in CarLink vehicles:				
	Cell phones.	❑	❑	❑	❑
	Mapping devices.	❑	❑	❑	❑
	Internet access.	❑	❑	❑	❑
	No accessories.	❑	❑	❑	❑
F.	Price (Reflects different services and vehicle styles available. With higher rates more services and vehicles are available):				
	\$2.50 to \$5.00/hour and 25 cents/mile.	❑	❑	❑	❑
	\$6.00 to \$10.00/hour and 15 cents/mile.	❑	❑	❑	❑
	\$11.00 to \$20.00/hour and 10 cents/mile.	❑	❑	❑	❑

PART D
CARLINK SUGGESTIONS AND CONCERNS

1a. Based on your knowledge of the CarLink system, what are your biggest concerns about the CarLink system? Please check the top **three** reasons.

❑1 It is too expensive.
❑2 Availability of a vehicle when I need one.
❑3 A long waiting time for a CarLink vehicle.
❑4 Availability of backup services if a CarLink vehicle breaks down or runs out of fuel.
❑5 Too far a distance to access a CarLink lot.
❑6 CarLink lots would not make me feel safe.
❑7 Privacy concern with the technologies employed in the CarLink system.
❑8 CarLink vehicles are not safe (e.g., compact cars).
❑9 CarLink vehicles are not reliable.
❑10 Dirty vehicles.
❑11 Other, please specify: ____

1b. Would any of the concerns that you expressed in question 1a (above) prevent you from joining a CarLink program?

❑1 Yes. (Please go to question 1c.) ❑2 No. (Please go to question 2.)

1c. If **yes**, what is the most important reason? Please check the **most** important one.

❑1 It is too expensive.
❑2 Availability of a vehicle when I need one.
❑3 A long waiting time for a CarLink vehicle.
❑4 Availability of backup services if a CarLink vehicle breaks down or runs out of fuel.
❑5 Too far a distance to access a CarLink lot.
❑6 CarLink lots would not make me feel safe.
❑7 Privacy concern with the technologies employed in the CarLink system.
❑8 CarLink vehicles are not safe (e.g., compact cars).
❑9 CarLink vehicles are not reliable.
❑10 Dirty vehicles.
❑11 Other, please specify: ____

2. Do you have any suggestions for making CarLink more compatible with your household's needs, which you did not include in your previous questionnaire?

____

____

____

3. Would you be willing to join a CarLink program? (Please provide one yes or no response.)

❑1 Yes. (Please go to question 4.) ❑2 No. (Please go to question 5a)

4. When did you realize that you might be able to use this service?

❑1 During the recruitment process.
❑2 When I was reading the brochure.
❑3 When I was talking with a friend about the CarLink system.
❑4 When I was filling out the questionnaire last time.
❑5 When I spoke with someone from the CarLink project.
❑6 When I was filling out this questionnaire.

(End of the questionnaire. Thank you.)

5a. Why aren't you willing to join a CarLink program? (Please check **all** that apply, and go to question 5b.)

❑1 CarLink is too expensive.
❑2 I am concerned that a CarLink vehicle won't be available when I need one.
❑3 It does not fit my lifestyle needs at this time.
❑4 I don't like the idea of sharing a car.
❑5 The program sounds too complicated.
❑6 There is no need for me to join this program.
❑7 I suspect it is not as convenient as my current way of getting around.
❑8 I would need a trial to decide.
❑9 Not sure.
❑10 Other, please specify: ___________________________________

5b. When did you realize that you might **not** be able to use this service? (Please check **one** box.)

❑1 When I was reading the brochure.
❑2 When I was talking with a friend about the CarLink system.
❑3 When I was filling out the questionnaire last time.
❑4 When I was filling out this questionnaire.

SMART CARLINK FINAL QUESTIONNAIRE

*Instructions: This questionnaire should be completed by **the individual who agreed to participate in this study on behalf of your household.***

PART A
RECENT EXPERIENCE

In this section, we would like to know about any recent experience you may have had with car sharing and the CarLink concept since you received the second round of this survey.

1. What is your name? ____

2. If there are any changes in your mailing address, telephone numbers, or e-mail address, please provide us with this information below:

   ____

   ____

3. Have you seen or heard anything new about car sharing after receiving your first CarLink questionnaire?

   ❑1 Yes. ❑2 No. (Please go to question 4.)

   If **yes,** from what sources? Check **all** that apply.

   ❑1 Friend or colleague
   ❑2 Newspaper, magazine, or other print media
   ❑3 TV or radio spot
   ❑4 Internet
   ❑5 Household member
   ❑6 Other, please specify:____

4. Have you spoken with any friends, family members, or colleagues about the CarLink: Smart Car Sharing concept since you received the video?

   ❑1 Yes. ❑2 No.

   If **yes**, how many people have you spoken to about this concept since you received the brochure and video?

   ❑1 1-3 ❑2 4-7 ❑3 8 or more

PART B
CARLINK GENERAL IMPRESSIONS

1. What do you think about the CarLink concept now that you have attended the drive clinic? Please check **all of the applicable** boxes.

❑1 I am even more interested in this new concept.
❑2 I would be very interested in trying this new mobility system.
❑3 I would like more information.
❑4 I do not understand how the system works.
❑5 This concept would not fit the needs of my household today.
❑6 This concept could fit the needs of my household in the future, but not today.
❑7 Other, please specify: ____

2. Did the drive clinic clarify any questions about CarLink that you had after you read the brochure and watched the video?

____

____

____

____

3. Do you have any new questions about the CarLink system after attending the clinic?

____

____

____

____

Now that you've attended the drive clinic, watched the CarLink video, reviewed the brochure, and thought about this concept over the past several weeks, we'd like to get a better understanding of how ***your*** *attitudes and feelings about this system may have changed. Keeping in mind* ***your*** *preferences (e.g., features and price), please think about what types of services* ***you*** *might like to access through a CarLink system.*

PART C
DO YOU THINK YOU WOULD USE CARLINK?

1. Do you think that you would use the CarLink: Smart Car Sharing System? (Please provide **one** response **only**.)

   ❑1 No. (Please go to question 2.)
   ❑2 Yes. (Please go to question 3.)

2. I do not think that I would use the CarLink system because... (Please check **all** that apply.)

   ❑1 I like my current set of transportation modes.

   ❑2 Personal vehicles are a preferable transportation tool.

   ❑3 The system is too complicated.

   ❑4 I would be concerned about maintaining my privacy when using such a system.

   ❑5 CarLink is too risky (e.g., I'd worry about vehicle availability, breakdowns, and a backup taxi or shuttle service).

   ❑6 Other, please specify: ____

3. I think I would use the CarLink system because with CarLink… (Please check **all** that apply.)

   ❑1 I wouldn't have to worry about parking in my neighborhood.

   ❑2 I wouldn't have to worry about insurance, maintenance, fueling, and parking.

   ❑3 I wouldn't have to pay for parking at work.

   ❑4 I could walk and bike more often.

   ❑5 I could save money using CarLink.

   ❑6 I could help improve air quality.

   ❑7 I could save time by using a combination of transit and CarLink.

   ❑8 I could take transit more often.

❑9 I could reduce commute stress.

❑10 I could get to work on time.

❑11 I could have a transportation alternative that is more compatible with telecommuting because I telecommute. *(Telecommuting: A person works from home or a specialized center located near his/her home one or more days a week.)*

❑12 It looks like a fun way to get around.

❑13 I could change my current way of getting around, which I don't like.

❑14 Other, please specify: ____

4. For **all** of the statements listed below, please check the response that best expresses your opinion.

Compared to my current way of getting around, I would say that the CarLink: Smart Car-Sharing Service could…

	Strongly Agree	*Agree*	*Neutral*	*Disagree*	*Strongly Disagree*
Save me money.	❑	❑	❑	❑	❑
Save me time.	❑	❑	❑	❑	❑
Provide me with a range of vehicles.	❑	❑	❑	❑	❑
Reduce the hassles associated with personal vehicles (e.g., licensing).	❑	❑	❑	❑	❑
Help reduce congestion.	❑	❑	❑	❑	❑
Help reduce air pollution.	❑	❑	❑	❑	❑
Increase my household's transit ridership.	❑	❑	❑	❑	❑
Complement my current lifestyle needs.	❑	❑	❑	❑	❑
Complement my future lifestyle needs.	❑	❑	❑	❑	❑
Complement my current way of getting around.	❑	❑	❑	❑	❑

5. For **all** of the statements listed below, please check the response that best expresses your opinion about how CarLink could meet your household's current lifestyle needs and goals.

	Strongly Agree	*Agree*	*Neutral*	*Disagree*	*Strongly Disagree*
CarLink is great for other people, but it is not compatible with my current lifestyle goals.	❑1	❑2	❑3	❑4	❑5
Owning a car is better than CarLink	❑1	❑2	❑3	❑4	❑5
Continuous maintenance of vehicles is an attractive feature of CarLink.	❑1	❑2	❑3	❑4	❑5
With CarLink, I could take transit, walk, and bike more often.	❑1	❑2	❑3	❑4	❑5
I don't like to "share" vehicles with others.	❑1	❑2	❑3	❑4	❑5

	Strongly Agree	*Agree*	*Neutral*	*Disagree*	*Strongly Disagree*
If I had an emergency, I would not be able to depend upon CarLink.	❑1	❑2	❑3	❑4	❑5
Like many other new technologies, CarLink could really improve my lifestyle.	❑1	❑2	❑3	❑4	❑5
CarLink could offer me an alternative to owning a second or third household vehicle.	❑1	❑2	❑3	❑4	❑5
I don't like the idea of having to walk, bike, or drive to a CarLink lot.	❑1	❑2	❑3	❑4	❑5
I enjoy driving my own vehicle.	❑1	❑2	❑3	❑4	❑5
CarLink is compatible with my environmental goals.	❑1	❑2	❑3	❑4	❑5
I'd prefer to spend money on something other than a vehicle.	❑1	❑2	❑3	❑4	❑5

6. Please check the response that best expresses your opinion for **all** of the statements listed below.

I think that CarLink would...

	Strongly Agree	*Agree*	*Neutral*	*Disagree*	*Strongly Disagree*
Get me to work on time. (❏ Not applicable.)	❏1	❏2	❏3	❏4	❏5
Be enjoyable to me.	❏1	❏2	❏3	❏4	❏5
Allow me to store important items (e.g., shopping bags).	❏1	❏2	❏3	❏4	❏5
Fit my budget.	❏1	❏2	❏3	❏4	❏5
Allow me to be spontaneous.	❏1	❏2	❏3	❏4	❏5
Help me go everywhere.	❏1	❏2	❏3	❏4	❏5
Allow me to visit friends when I want.	❏1	❏2	❏3	❏4	❏5
Help me do my shopping.	❏1	❏2	❏3	❏4	❏5
Make me feel safe.	❏1	❏2	❏3	❏4	❏5
Say a lot about who I am.	❏1	❏2	❏3	❏4	❏5
Be great for my lifestyle needs.	❏1	❏2	❏3	❏4	❏5
Allow me to quickly respond to an emergency.	❏1	❏2	❏3	❏4	❏5
Offer comfortable seating.	❏1	❏2	❏3	❏4	❏5

PART D
CARLINK SERVICE PREFERENCES

1. Please think about what features you might like to have and what you might pay for a CarLink service in your community. Please rate **each** of the items below on its importance in meeting your vehicle, access, and price preferences.

   (Please Note: All CarLink services will include insurance, maintenance, fuel, cleaning, and a guaranteed ride service.)

	Extremely Important	*Important*	*Somewhat Important*	*Not Important*	*Not Acceptable*
A. Number of CarLink lots available	❑1	❑2	❑3	❑4	❑5
B. Number of vehicle styles available.	❑1	❑2	❑3	❑4	❑5v
C. Distance of CarLink lots from home, work, transit station, etc:					
Within 1 to 2 blocks	❑1	❑2	❑3	❑4	❑5
Within one-quarter mile	❑1	❑2	❑3	❑4	❑5
Within 1 to 2 miles	❑1	❑2	❑3	❑4	❑5
D. Accessibility to long-term rental vehicles at CarLink lots.	❑1	❑2	❑3	❑4	❑5
E. Accessories provided in CarLink vehicles:					
Cell phones	❑1	❑2	❑3	❑4	❑5
Mapping devices	❑1	❑2	❑3	❑4	❑5
Internet access	❑1	❑2	❑3	❑4	❑5
F. Price (Reflects different services and vehicle styles available. With higher rates more services and vehicles are available):					
\$1.50 to \$2.00/hour and 5 cents/mile (No accessories)	❑1	❑2	❑3	❑4	❑5
\$2.50 to \$5.00/hour and 10 cents/mile (Cell phone)	❑1	❑2	❑3	❑4	❑5
\$5.50 to \$10.00/hour and 10 cents/mile (Cell phone and mapping devices)	❑1	❑2	❑3	❑4	❑5

$10.50 to $20.00/hour and 10 cents/mile (Mapping devices, Internet access, and cell phone.) ❑1 ❑2 ❑3 ❑4 ❑5

PART E
CARLINK SUGGESTIONS AND CONCERNS

1a. Based on your knowledge of the CarLink system, what are your biggest concerns about the CarLink system? Please check the top **three** reasons.

❑1 It is too expensive.
❑2 Availability of a vehicle when I need one.
❑3 A long waiting time for a CarLink vehicle.
❑4 Availability of backup services if a CarLink vehicle breaks down or runs out of fuel.
❑5 Too far a distance to access a CarLink lot.
❑6 CarLink lots would not make me feel safe.
❑7 Privacy concern with the technologies employed in the CarLink system.
❑8 CarLink vehicles are not safe (e.g., compact cars).
❑9 CarLink vehicles are not reliable.
❑10 Dirty vehicles.
❑11 Other, please specify: ____

1b. Would any of the concerns that you expressed in question 1a (above) prevent you from joining a CarLink program?

❑1 Yes. (Please go to question 1c.) ❑2 No. (Please go to question 2.)

1c. If **yes**, what is the most important reason? Please check the **most** important one.

❑1 It is too expensive.
❑2 Availability of a vehicle when I need one.
❑3 A long waiting time for a CarLink vehicle.
❑4 Availability of backup services if a CarLink vehicle breaks down or runs out of fuel.
❑5 Too far a distance to access a CarLink lot.
❑6 CarLink lots would not make me feel safe.
❑7 Privacy concern with the technologies employed in the CarLink system.
❑8 CarLink vehicles are not safe (e.g., compact cars).
❑9 CarLink vehicles are not reliable.
❑10 Dirty vehicles.
❑11 Other, please specify: ____

2. Do you have any suggestions for making CarLink more compatible with your household's needs, which you did not include in your last questionnaire?

____

____

____

3. Would you be willing to join a CarLink program? (Please provide **one** yes **or** no response.)

❑1 Yes. (Please go to question 4.) ❑2 No. (Please go to question 5a.)

4. When did you realize that you might be able to use this service? (Please check **one** box and go to question 6 after you've completed this question.)

❑1 During the recruitment process.
❑2 When I was reading the brochure.
❑3 When I was watching the video.
❑4 When I attended the drive clinic.
❑5 When I was talking with a friend about the CarLink system.
❑6 When I was filling out the questionnaire last time.
❑7 When I spoke with someone from the CarLink project.
❑8 When I was filling out this questionnaire.

5a. Why aren't you willing to join a CarLink program? (Please check **all** that apply, and go to question 5b.)

❑1 CarLink is too expensive.
❑2 I am concerned that a CarLink vehicle won't be available when I need one.
❑3 It does not fit my lifestyle needs at this time.
❑4 I don't like the idea of sharing a car.
❑5 The program sounds too complicated.
❑6 There is no need for me to join this program.
❑7 I suspect it is not as convenient as my current way of getting around.
❑8 I would need a trial to decide.
❑9 Not sure.
❑10 Other, please specify: __________________________________

5b. When did you realize that you might **not** be able to use this service? (Please check **one** box.)

❑1 When I was reading the brochure.
❑2 When I was watching the video.
❑3 When I attended the drive clinic.
❑4 When I was talking with a friend about the CarLink system.
❑5 When I was filling out the questionnaire last time.
❑6 When I was filling out this questionnaire.

6. Is there anything about the CarLink system that you don't understand, which you did not include in your last questionnaire?

____

____

____

PART F
IS CARLINK IN YOUR FUTURE?

1a. Would you be interested in participating in a six-month field test of CarLink in the Dublin-Pleasanton area?

❑1 Yes. (Please go to question 1b.)
❑2 No. (Please go to question 2.)
❑3 Not sure. (Please go to question 1b.)

1b. Would you like us to contact you about a six-month field test of CarLink, beginning November 1998?

❑1 Yes. ❑2 No. ❑3 Not sure.

2. Are you interested in participating in a CarLink focus group in October 1998?

❑1 Yes. (Please provide a phone #: ( ) _________ .) ❑2 No.

The question below is optional. We are interested in learning more about what you thought about the CarLink drive clinic.

3. Do you have any comments or suggestions for improving the drive clinic?

____

____

____

____

____

SMART CARLINK: FINAL PHASE QUESTIONNAIRE

Instructions: This questionnaire should be completed by ***the individual who agreed to participate in this study on behalf of your household.***

PART A
RECENT EXPERIENCE

In this section, we would like to know about any recent experience you may have had with car sharing and the CarLink concept since you received the second round of this survey.

1. What is your name? ____

2. If there are any changes in your mailing address, telephone numbers, or e-mail address, please provide us with this information below:

   ____

   ____

   ____

3. Have you seen or heard anything new about car sharing after receiving your first CarLink questionnaire?

   ❑1 Yes. ❑2 No. (Please go to question 4.)

   If **yes,** from what sources? Check **all** that apply.

   ❑1 Friend or colleague
   ❑2 Newspaper, magazine, or other print media
   ❑3 TV or radio spot
   ❑4 Internet
   ❑5 Household member
   ❑6 Other, please specify:____

4. Have you spoken with any friends, family members, or colleagues about the CarLink: Smart Car Sharing concept since you received the brochure and your last questionnaire?

   ❑1 Yes. ❑2 No.

   If **yes**, how many people have you spoken to about this concept since you received the first and second-round questionnaires?

   ❑1 1-3 ❑2 4-7 ❑3 8 or more

5. What do you think about the CarLink concept now that you have had a chance to think about the CarLink concept even more over the past few weeks? Please check **all of the applicable** boxes.

   ❑1 I am even more interested in this new concept.
   ❑2 I would be very interested in trying this new mobility system.
   ❑3 I would like more information.
   ❑4 I do not understand how the system works.
   ❑5 This concept would not fit the needs of my household today.
   ❑6 This concept could fit the needs of my household in the future, but not today.
   ❑7 Other, please specify: ____

6. Do you have any questions about the CarLink system, which you didn't include in your last questionnaire?

   ____

   ____

   ____

   ____

   ____

*Now that you've had a chance to think about this concept even more over the past few weeks, we'd like to get a better understanding of how **your** attitudes and feelings about this system may have changed. Keeping in mind **your** preferences (e.g., features and price), please think about what types of services **you** might like to access through a CarLink system.*

PART B
DO YOU THINK YOU WOULD USE CARLINK?

1. Do you think that you would use the CarLink: Smart Car Sharing System? (Please provide **one** response **only**.)

   ❑1 No. (Please go to question 2.)
   ❑2 Yes. (Please go to question 3.)

2. I do not think that I would use the CarLink system because... (Please check **all** that apply.)

   ❑1 I like my current set of transportation modes.

   ❑2 Personal vehicles are a preferable transportation tool.

   ❑3 The system is too complicated.

   ❑4 I would be concerned about maintaining my privacy when using such a system.

   ❑5 CarLink is too risky (e.g., I'd worry about vehicle availability, breakdowns, and a backup taxi or shuttle service).

   ❑6 Other, please specify: ____

3. I think I would use the CarLink system because with CarLink… (Please check **all** that apply**.**)

   ❑1 I wouldn't have to worry about parking in my neighborhood.

   ❑2 I wouldn't have to worry about insurance, maintenance, fueling, and parking.

   ❑3 I wouldn't have to pay for parking at work.

   ❑4 I could walk and bike more often.

   ❑5 I could save money using CarLink.

   ❑6 I could help improve air quality.

   ❑7 I could save time by using a combination of transit and CarLink.

   ❑8 I could take transit more often.

   ❑9 I could reduce commute stress.

   ❑10 I could get to work on time.

   ❑11 I could have a transportation alternative that is more compatible with telecommuting because I telecommute. *(Telecommuting: A person works from home or a specialized center located near his/her home one or more days a week.)*

❑12 It looks like a fun way to get around.

❑13 I could change my current way of getting around, which I don't like.

❑14 Other, please specify: ____

4. For **all** of the statements listed below, please check the response that best expresses your opinion.

Compared to my current way of getting around, I would say that the CarLink: Smart Car Sharing System could…

	Strongly Agree	*Agree*	*Neutral*	*Disagree*	*Strongly Disagree*
Save me money.	❑1	❑2	❑3	❑4	❑5
Save me time.	❑1	❑2	❑3	❑4	❑5
Provide me with a range of vehicles.	❑1	❑2	❑3	❑4	❑5
Reduce the hassles associated with personal vehicles (e.g., licensing).	❑1	❑2	❑3	❑4	❑5
Help reduce congestion.	❑1	❑2	❑3	❑4	❑5
Help reduce air pollution.	❑1	❑2	❑3	❑4	❑5
Increase my household's transit ridership.	❑1	❑2	❑3	❑4	❑5
Complement my current lifestyle needs.	❑1	❑2	❑3	❑4	❑5
Complement my current way of getting around.	❑1	❑2	❑3	❑4	❑5
Complement my future lifestyle needs.	❑1	❑2	❑3	❑4	❑5

5. For **all** of the statements listed below, please check the response that best expresses your opinion about how CarLink could meet your household's current lifestyle needs and goals.

	Strongly Agree	*Agree*	*Neutral*	*Disagree*	*Strongly Disagree*
CarLink is great for other people, but it is not compatible with my current lifestyle goals.	❑1	❑2	❑3	❑4	❑5
Owning a car is better than CarLink.	❑1	❑2	❑3	❑4	❑5
Continuous maintenance of vehicles					

is an attractive feature of CarLink.	❑1	❑2	❑3	❑4	❑5

	Strongly Agree	*Agree*	*Neutral*	*Disagree*	*Strongly Disagree*
With CarLink, I could take transit, walk, and bike more often.	❑1	❑2	❑3	❑4	❑5
I don't like to "share" vehicles with others.	❑1	❑2	❑3	❑4	❑5
If I had an emergency, I would not be able to depend upon CarLink.	❑1	❑2	❑3	❑4	❑5
Like many other new technologies, CarLink could really improve my lifestyle.	❑1	❑2	❑3	❑4	❑5
CarLink could offer me an alternative to owning a second or third household vehicle.	❑1	❑2	❑3	❑4	❑5
I don't like the idea of having to walk, bike, or drive to a CarLink lot.	❑1	❑2	❑3	❑4	❑5
I enjoy driving my own vehicle.	❑1	❑2	❑3	❑4	❑5
CarLink is compatible with my environmental goals.	❑1	❑2	❑3	❑4	❑5
I'd prefer to spend money on something other than a vehicle.	❑1	❑2	❑3	❑4	❑5

6. Please check the response that best expresses your opinion for **all** of the statements listed below.

I think that CarLink would...

	Strongly Agree	*Agree*	*Neutral*	*Disagree*	*Strongly Disagree*
Get me to work on time. (❑ Not applicable.)	❑1	❑2	❑3	❑4	❑5
Be enjoyable to me.	❑1	❑2	❑3	❑4	❑5
Allow me to store important items (e.g., shopping bags).	❑1	❑2	❑3	❑4	❑5
Fit my budget.	❑1	❑2	❑3	❑4	❑5
Allow me to be spontaneous.	❑1	❑2	❑3	❑4	❑5

Help me go everywhere.	❏1	❏2	❏3	❏4	❏5

Allow me to visit friends when I want.	❑1	❑2	❑3	❑4	❑5
Help me do my shopping.	❑1	❑2	❑3	❑4	❑5
Make me feel safe.	❑1	❑2	❑3	❑4	❑5
Say a lot about who I am.	❑1	❑2	❑3	❑4	❑5
Be great for my lifestyle needs.	❑1	❑2	❑3	❑4	❑5
Allow me to quickly respond to an emergency.	❑1	❑2	❑3	❑4	❑5
Offer comfortable seating.	❑1	❑2	❑3	❑4	❑5

PART C
CARLINK SERVICE PREFERENCES

1. Please think about what features you might like to have and what you might pay for a CarLink service in your community. Please rate **each** of the items below on its importance in meeting your vehicle, access, and price preferences.

   (Please Note: All CarLink services will include insurance, maintenance, fuel, cleaning, and a guaranteed ride service.)

	Extremely Important	*Important*	*Somewhat Important*	*Not Important*	*Not Acceptable*
A. Number of CarLink lots available.	❑1	❑2	❑3	❑4	❑5
B. Number of vehicle styles available.	❑1	❑2	❑3	❑4	❑5
C. Distance of CarLink lots from home, work, transit station, etc:					
Within 1 to 2 blocks	❑1	❑2	❑3	❑4	❑5
Within one-quarter mile	❑1	❑2	❑3	❑4	❑5
Within 1 to 2 miles	❑1	❑2	❑3	❑4	❑5
D. Accessibility to long-term rental vehicles at CarLink lots.	❑1	❑2	❑3	❑4	❑5
E. Accessories provided in CarLink vehicles:					
Cell phones	❑1	❑2	❑3	❑4	❑5
Mapping devices	❑1	❑2	❑3	❑4	❑5

Internet access	❏1	❏2	❏3	❏4	❏5

F. Price (Reflects different services and vehicle styles available. With higher rates more services and vehicles are available):

$1.50 to $2.00/hour and 5 cents/mile (No accessories)	❏1	❏2	❏3	❏4	❏5
$2.50 to $5.00/hour and 10 cents/mile (Cell phone)	❏1	❏2	❏3	❏4	❏5
$5.50 to $10.00/hour and 10 cents/mile (Cell phone and mapping devices)	❏1	❏2	❏3	❏4	❏5
$10.50 to $20.00/hour and 10 cents/mile (Mapping devices, Internet access, and cell phone.)	❏1	❏2	❏3	❏4	❏5

PART D
CARLINK SUGGESTIONS AND CONCERNS

1a. Based on your knowledge of the CarLink system, what are your biggest concerns about the CarLink system? Please check the top **three** reasons.

❏1 It is too expensive.
❏2 Availability of a vehicle when I need one.
❏3 A long waiting time for a CarLink vehicle.
❏4 Availability of backup services if a CarLink vehicle breaks down or runs out of fuel.
❏5 Too far a distance to access a CarLink lot.
❏6 CarLink lots would not make me feel safe.
❏7 Privacy concern with the technologies employed in the CarLink system.
❏8 CarLink vehicles are not safe (e.g., compact cars).
❏9 CarLink vehicles are not reliable.
❏10 Dirty vehicles.
❏11 Other, please specify: ____________________

1b. Would any of the concerns that you expressed in question 1a (above) prevent you from joining a CarLink program?

❏1 Yes. (Please go to question 1c.) ❏2 No. (Please go to question 2.)

1c. If **yes**, what is the most important reason? Please check the **most** important one.

❏1 It is too expensive.

❑2 Availability of a vehicle when I need one.
❑3 A long waiting time for a CarLink vehicle.

❑4 Availability of backup services if a CarLink vehicle breaks down or runs out of fuel.
❑5 Too far a distance to access a CarLink lot.
❑6 CarLink lots would not make me feel safe.
❑7 Privacy concern with the technologies employed in the CarLink system.
❑8 CarLink vehicles are not safe (e.g., compact cars).
❑9 CarLink vehicles are not reliable.
❑10 Dirty vehicles.
❑11 Other, please specify: ____

2. Do you have any suggestions for making CarLink more compatible with your household's needs, which you did not include in your last questionnaire?

____

____

____

____

3. Would you be willing to join a CarLink program? (Please provide **one** yes **or** no response.)

❑1 Yes. (Please go to question 4.) ❑2 No. (Please go to question 5a.)

4. When did you realize that you might be able to use this service?

❑1 During the recruitment process.
❑2 When I was reading the brochure.
❑3 When I was talking with a friend about the CarLink system.
❑4 When I was filling out the questionnaire last time.
❑5 When I spoke with someone from the CarLink project.
❑6 When I was filling out this questionnaire.

(Please go to Part E on the following page.)

5a. Why aren't you willing to join a CarLink program? (Please check **all** that apply, and go to question 5b.)

❑1 CarLink is too expensive.
❑2 I am concerned that a CarLink vehicle won't be available when I need one.
❑3 It does not fit my lifestyle needs at this time.
❑4 I don't like the idea of sharing a car.
❑5 The program sounds too complicated.
❑6 There is no need for me to join this program.

❏7 I suspect it is not as convenient as my current way of getting around.
❏8 I would need a trial to decide.
❏9 Not sure.
❏10 Other, please specify: ___________________________________

5b. When did you realize that you might **not** be able to use this service? (Please check **one** box.)

❏1 When I was reading the brochure.
❏2 When I was talking with a friend about the CarLink system.
❏3 When I was filling out the questionnaire last time.
❏4 When I was filling out this questionnaire.

PART E
IS CARLINK IN YOUR FUTURE?

1a. Would you be interested in participating in a six-month field test of CarLink in the Dublin-Pleasanton area?

❏1 Yes. (Please go to question 1b.)
❏2 No. (Please go to question 2.)
❏3 Not sure. (Please go to question 1b.)

1b. Would you like us to contact you about a six-month field test of CarLink, beginning November 1998?

❏1 Yes. ❏2 No. ❏3 Not sure.

2. Are you interested in participating in a CarLink focus group in October 1998?

❏1 Yes. (Please provide a phone #:( ) __________ .) ❏2 No.

APPENDIX II

DRIVE CLINIC QUESTIONNAIRES

In-Vehicle Query Checklist

Researcher: ________________
Date: ___________
Time: ___________
Participant: ________________

CARLINK PROCEDURES

- ❑ What happens if I can't make it back on time when I am using the car?
- ❑ What happens if there is not a car when you need one?
- ❑ Who takes care of maintenance, cleaning, and fueling?
- ❑ What happens if you need more gas when you are on the road?
- ❑ How long can we keep the car?
- ❑ Where are the lots going to be located?
- ❑ How do you make a reservation?
- ❑ How far in advance do you need to make a reservation?
- ❑ How do you get to the station?
- ❑ Will there be different makes and models available?

CNG HONDA CIVICS

- ❑ What is the cost of the Honda?
- ❑ What is CNG?
- ❑ Where are the gas tanks?
- ❑ What is the fuel efficiency?
- ❑ What are the environmental impacts of CNG?
- ❑ How do you refuel the CNG vehicles?

INSURANCE

- ❑ Who pays for the insurance?
- ❑ What happens if the car gets into an accident?
- ❑ What kind of driving record do I need to participate?
- ❑ Who in the household can drive the vehicle?
- ❑ Are there age requirements?

COST

- ❑ What is the advantage of membership?
- ❑ Why is membership required?
- ❑ How much does it cost (per hour, per mile, or both)?
- ❑ Do you pay by credit card?
- ❑ Can you pay by debit card?
- ❑ Can you pay for different time increments?

ACCESSORIES

- ❑ Will child seats be available?
- ❑ Will bike racks be available?
- ❑ Will there be a place to keep bikes at the CarLink lot?
- ❑ What are the technologies involved in the CarLink system?
- ❑ Will mapping devices be available?
- ❑ Will cell phones be available?

ENVIRONMENTAL ISSUES

- ❑ Can you rent electric vehicles?
- ❑ How does this system help the environment?

ADDITIONAL QUESTIONS AND COMMENTS

Exit Interview Questionnaire

Interviewer: _______________
Date: _______________
Time: _______________

1. What is your name? ________________________________

2. Do you think that you would use the CarLink: Smart Car Sharing System? (Please provide **one** response **only**.)
   - ❏ No. (Please go to question 3.)
   - ❏ Yes. (Please go to question 4.)

3. I do not think that I would use the CarLink system because… (Please check **all** that apply.)
   - ❏ I like my current set of transportation modes.
   - ❏ Personal vehicles are a preferable transportation tool.
   - ❏ The system is too complicated.
   - ❏ I would be concerned about maintaining my privacy when using such a system.
   - ❏ CarLink is too risky (e.g., I'd worry about vehicle availability, breakdowns, and a backup taxi or shuttle service.)
   - ❏ Other, please specify: ____

4. I think I would use the CarLink system because with CarLink… (Please check **all** that apply.)
   - ❏ I wouldn't have to worry about parking in my neighborhood.
   - ❏ I wouldn't have to worry about insurance, maintenance, fueling, and parking.
   - ❏ I wouldn't have to pay for parking at work.
   - ❏ I could walk and bike more often.
   - ❏ I could save money using CarLink.
   - ❏ I could help improve air quality.
   - ❏ I could save time by using a combination of transit and CarLink.
   - ❏ I could take transit more often.
   - ❏ I could reduce commute stress.
   - ❏ I could get to work on time.
   - ❏ I could have a transportation alternative that is more compatible with telecommuting because I telecommute.
   - ❏ It looks like a fun way to get around.
   - ❏ I could change my current way of getting around, which I don't like.
   - ❏ Other, please specify: _______________________________________

5. For what time increments would you like to pay (e.g., 10min, 15min, etc.) for CarLink? ____

6. What would you like to pay for each of these increments?

____

7. Do you prefer a time rate alone (e.g., price per hour or minute.), a per mile rate alone (e.g., price per mile) for a CarLink vehicle or would you prefer a slightly lower time rate and a per mile rate?

____

8. Would you be willing to pay more for accessories (e.g., cell phone, mapping device, Internet)?
   - ❑ No.
   - ❑ Yes. How much more per hour for each accessory you listed would you like to pay?

____

____

____

____

9. How would you like to pay for CarLink vehicle usage, e.g., debit card draws on amount in account, credit card, or monthly statement?

____

____

____

10. Do you have any other questions?

____

____

____

____

APPENDIX III

CARLINK FOCUS GROUP SUMMARIES

FOCUS GROUP ONE: CONTROL GROUP

SECTION A3.1 INTRODUCTION

This is the first summary in a set of four that documents the findings of four focus groups held in October 1998. These focus groups brought people together who participated in the CarLink carsharing study to discuss carsharing. Nine people from the control group of the CarLink project met on October 15, 1999, at the offices of Margaret Yarbrough and Associates to participate in this session. As control group participants, they received very little information on carsharing throughout the longitudinal survey. In fact, they were only mailed a brochure on the CarLink concept. Unlike the experimental group, they did not review the CarLink video, which explains carsharing, nor did they participate in the CarLink drive clinic. Due to limited exposure and learning on this subject, I expected the control group participants would be skeptical toward this transportation alternative. To gauge how learning might affect their feelings toward such a system, I showed participants the CarLink video mid-way through the focus group session, and then documented their responses. During and after the video, I monitored the group's reactions and attitudinal changes toward the system in response to the video. Furthermore, I was able to explore user needs, desired carsharing service features, and how CarLink might best meet participants' transportation needs.

The focus group began with a brief discussion of participants' feelings toward private vehicles. Next, participants explored the issue of commuting by transit. Participants identified several areas for improving transit services during this discussion. After warming up, participants shifted their attention to the topic of carsharing, particularly their concerns and suggestions for improving this service. During the second half of the focus group, participants watched the CarLink video and provided their reactions. Subsequently, they discussed how they would design a CarLink system, focusing mainly on lot location and service features. Finally, the group explored CarLink billing options and their willingness to pay for this service.

SECTION A3.2 USING PRIVATE VEHICLES

Following is a list of reasons why the focus group participants like driving personal vehicles. The reasons are listed in the order they were mentioned, not necessarily the order of importance. One might argue, however, that the order in which they are listed reflects their relative importance.

1. Convenience:
    - Do not have to wait to make a trip,
    - Privacy,
    - Always carry something,
    - Can keep seats and mirrors in same position and do not have to readjust,
    - Spontaneity and flexibility,
    - Getting in and out easier with own car, and
    - Easier to stick with routine.
2. Part of job:
    - Need the car throughout the entire day.

3. Carrying items:
    - Baby seat and diaper bag,
    - Store a hand truck in the vehicle,
    - Cell phone, and
    - Work materials.
4. Health issues:
    - Could get a cold on BART and using CarLink.
5. Time issues:
    - Instant: “Where I want and when I want.”
    - “Takes 20 minutes to drive to work, and it would take 15 minutes alone to walk to BART to pick-up a CarLink car.”
6. Safety.
7. Prestige.

SECTION A3.3 COMMUTING BY TRANSIT

After the participants discussed their feelings about driving private vehicles, they shifted their focus toward commuting by transit. Reasons are again listed in the order they were voiced.

Commuting by transit was characterized as:

- Dirty,
- Scary/dangerous,
- Unreliable,
- Expensive,
- Crowded,
- A good alternative to get to San Francisco,
- Platforms are unpleasant: windy and noisy,
- Inconvenient, and
- If a strike occurs, there are no other transportation alternatives.

SECTION A3.4 CARLINK—A CARSHARING SYSTEM

After participants expressed their opinions about transit, I shifted the discussion to address CarLink as a transportation alternative. Also discussed were CarLink concerns and recommendations for improving such services. Again, responses are listed in the order they were recorded.

- It would be nice to take a CarLink vehicle home from a BART station.

  Many liked the idea that a car would be waiting for them at the end of a BART trip. The group was very interested in either driving a CarLink car home or leaving it at a nearby CarLink station.

- An apartment complex would be a good location for a CarLink lot.

  In the CarLink model, BART riders would be able to take a car from the BART station to their apartment complex. The group also felt a complex would provide an optimal location for carsharing because a high-density living environment could offer a larger user base.

- Concerns about vehicle sharing, include:
  - Cleanliness,
  - Smoking,
  - Messes, and
  - Discounts for good drivers.

  The group was particularly concerned about the care of carsharing vehicles, specifically how others might treat the vehicles and the condition of vehicles when returned. Most in the group felt that users who abused the system by returning dirty or damaged vehicles must be assessed a fee. They felt that this would deter users who were less cooperative in maintaining clean vehicles. One participant suggested providing a checklist that specifies what items must be clean before returning a CarLink vehicle.

- Do not like sharing:

  One participant admitted that she does not like sharing. However, this feeling was not generally expressed by other focus group participants.

- Vehicle maintenance concerns

- Total number of cars available:

  The group was concerned about the total number of vehicles that would be in the system.

- Availability in general:

  Many participants were generally concerned about the availability of the vehicles when they are needed and requested. Most participants stated that they would not want to rely on a carsharing system in an emergency.

- Questions about program administration:

  Most participants asked the following questions: Who makes sure that vehicles are available where and when they are needed? Who verifies that participants have a good driving record?

- Fueling concerns:

  Many participants felt that it would be favorable to have someone else fuel the CarLink vehicles. Some suggested that this feature might be part of the maintenance costs for system usage.

- Bicycles and racks available at CarLink lots:

  Most participants were interested in connecting CarLink vehicles and lots to other transportation modes. One individual suggested providing bike racks at CarLink stations for transporting bicycles on CarLink vehicles. Another also suggested providing bike rentals at CarLink lots.

- Vehicle damage concerns

- Reservation options:

The group was overwhelmingly in support of an Internet-based reservation system, whereby a user can check vehicle availability at various lots and make reservations via the web.

- Emergency taxi vouchers:

  The group thought that it would be advisable to offer taxi vouchers to customers in the event that a reserved vehicle is unavailable.

- Preferred lot location suggestions:

  The group felt that a significant attraction of the CarLink system would be reserved and preferred parking spots at transit stations. This feature would be particularly appealing for those driving to BART daily, since parking is limited at many stations.

SECTION A3.5 CARLINK VIDEO IMPRESSIONS

After a one-hour discussion on the above topics, the group watched the CarLink video for the first time. (As mentioned earlier, the control group only received the brochure during the longitudinal survey.) After viewing the video, initial comments focused on user lifestyle issues. Many thought the CarLink system would only work for certain types of people. The remaining impressions are organized into three categories: concerns, questions, and suggestions.

A3.5.1 Concerns

CarLink concerns included the following:

- The service assumes a car is always available.
- There were some privacy concerns associated with the vehicle tracking system.

  One participant was particularly concerned that a CarLink vehicle could be tracked at all times. He felt that his privacy would be greatly compromised with such a system. It is interesting to note, however, that many other participants liked the idea of vehicle tracking for safety and in an emergency.
- Administration costs.
- Insurance costs and coverage.
- User fees.
- Vehicle security:

  If a user parks a CarLink vehicle and goes into a grocery store, could the same CarLink vehicle be taken by another program member?

A.3.5.2 Questions

CarLink questions include the following:

- How do you know which key to take from the CarLink key box?
- Does BART have the capacity to accommodate such a system?

- With the CarLink system in place, what would be the impact on Wheels (i.e., a local shuttle bus service that is currently linked with BART in the Dublin/Pleasanton region)? Would CarLink competition eliminate this service?
- Could another driver use the vehicle?
- Where could a stroller be stored at a CarLink lot?
- Will lockers be provided for storing personal items?
- Will child seats be available?

A3.5.3 Suggestions

- There could be a place to rent vehicle accessories (e.g., bike racks, child seats, cell phones, etc.) at the CarLink lots.
- There should be a few cars available for teenagers. It would be a good training car.
- Employers could promote the use of the CarLink system for commute trips.
- The CarLink system would be a good transportation alternative for neighborhoods and other types of group sharing.
- The system would work best for the commuter market and individuals needing specialized vehicles (e.g., a user who needs a truck to haul something).
- CarLink could provide a good linkage to the Silicon Valley. CarLink might offer a feeder service to the Altamont Commuter Express, which runs between Stockton and San Jose.

SECTION A3.6 CARLINK LOTS AND FEATURES

The following is a list of locations the group identified as convenient for CarLink services:

- Transit,
- Airports,
- College campuses,
- Shopping centers,
- Neighborhoods,
- Business parks,
- Hospitals, and
- Large parking lots.

Overall, the group agreed that CarLink lots should be located in high-density regions to attract the most usage.

A3.6.1 Vehicle Features

Participants provided the following list of key vehicle features and concerns.

- Safety:

  Participants did not like the idea of small cars and were worried about safety in the event of an accident.

- Sporty vehicles would be desirable and fun.

- Comfort is an important feature for CarLink vehicles.
- Traditional amenities, including air conditioning, radio, heat, etc., would be critical to the system.
- Advertising space within vehicles (e.g., Coke®, Nike®, etc.) could help subsidize the costs of the CarLink system.
- Employer recognition of CarLink could help promote vehicle use.
- Alternative fuel vehicles would be nice to include in the CarLink fleet. Compressed natural gas (CNG) vehicles would provide independence from petroleum fuel. Electric vehicles (EVs) would provide an interesting alternative because they could be charged at home.

A3.6.2 Alternative Fuel Vehicles

Most participants would like to have access to some alternative fuel vehicles through the CarLink system.

- Economics:

  Some participants were willing to pay more for the system if it helped the environment (e.g., alternative fuel vehicles). The group was impressed that natural gas is less expensive than gasoline.
- Registration:

  Some group members were concerned about the costs of registering alternative fuel vehicles.

- Range limitation:

    Many participants had concerns about the maximum driving time or range of EVs that might be used in a CarLink fleet.

- Efficiency of vehicles:

    One participant inquired whether or not it would take more energy to charge an EV than using compressed natural gas or petroleum. Most in the group were interested in knowing whether charging an EV would cost more than fueling a normal car.

SECTION A3.7 BILLING

Finally, the group discussed how much they would be willing to pay for the CarLink service. Surprisingly, the group set considerably higher prices than I expected based upon their previous remarks and skepticism. Most participants stated that the CarLink system would have to be economically competitive with other transportation modes for the system to be appealing. Although most of the group seemed to be concerned with the environment, system costs were more of a driving force than environmental concerns. When I asked participants if they thought they would be occasional or frequent users (e.g., daily commuters) of CarLink, five responded that they would be occasional users, and four thought that they would use CarLink to commute. Below are the CarLink payment levels and options suggested by the focus group.

A3.7.1 Hourly Basis

$10 to $12 per hour would be a reasonable rate for weekend and evening use.

A3.7.2 Commuter Package

$100 per month for unlimited commute usage (e.g., to and from BART station and office).

A3.7.3 Mileage

- CarLink must have a competitive rate for mileage, depending on whether the user is or is not charged for time of use as well ($.10 to $.32 per mile).
- Commuters could pay a flat rate that would include their hourly and mileage charges.
- Occasional users could pay on an hourly and mileage basis.

SECTION A3.8 SUGGESTIONS

- One participant expressed interest in a constant reservation package in which they would have access to a reserved vehicle the same time or times everyday for a defined length of time (i.e., weekly, monthly, etc.).
- Another participant requested a flexible credit system whereby a user could purchase a certain number of hours for usage at a reduced rate.
- Several participants suggested that a CarLink tax credit could provide an incentive to system use.

- The ability to keep the vehicle overnight (e.g., on evenings and weekends) would provide an attractive user package.
- Participants suggested that usage time be billed in 5- to 15-minute increments.
- Different prices should be charged for prime time usage compared to off-peak hours.

SECTION A3.9 CONCLUSION

As expected, I found the control group participants were much more skeptical about the CarLink system throughout the focus group session in contrast to members of the experimental group. Having received very little information about the CarLink system nor an opportunity to interact with researchers (i.e., the drive clinic), these participants were expected to be much more wary of this new concept during the focus group. After discussing their current transportation modes and their CarLink system concerns, they began to identify potential benefits of the carsharing service. Overall, their attitudes toward CarLink generally improved, and the group began making constructive suggestions for a CarLink service.

Initially, the CarLink video did little to change their attitudes and concerns about the system. Many of the participants began listing reasons why it might work for others but not for them. Many felt that CarLink usage would be highly dependent on lifestyle. This response was likely prompted by the illustration of two households using the CarLink system to help meet their transportation needs. Furthermore, the video seemed to spark many more logistical questions from the group. They began questioning costs, insurance, maintenance, system reliability, and management (issues they had not discussed earlier in much detail). Through the process of identifying and discussing their concerns, many participants seemed to become more positive about the system. With time, the group's position, suggestions, and attitudes became more positive and reflective of the other three focus groups held with members of the experimental group. Interestingly, this group's willingness-to-pay estimates were higher than those of the other three focus groups. Based upon the response of the control group, it would appear that CarLink learning, coupled with discussion, helped the focus group participants think more seriously about the innovation and feel more comfortable with the concept.

FOCUS GROUP TWO: PARTICIPANTS EITHER LIVING OR WORKING IN DUBLIN/PLEASANTON REGION

SECTION A3.10 INTRODUCTION

This is the second summary in a set of four that documents the findings of four focus groups held in October 1998. These groups brought together individuals who had participated in the CarLink longitudinal survey to further explore the CarLink concept. Eleven experimental group participants who live in, and/or work in the Dublin/Pleasanton region met on October 21, 1998, at Margaret Yarbrough and Associates, a Bay Area market research firm. All participants have different commuting patterns; they either live in the Bay Area and commute to Dublin/Pleasanton or live in Dublin/Pleasanton and commute to the Bay Area. Not surprisingly, participants from the experimental group were better informed about carsharing than the control group. Experimental group participants received a brochure on the CarLink system, a video further explaining the concept, and participated in the CarLink drive clinic. Because of the additional learning and discussions, researchers expected the experimental group to be well informed and less skeptical of the concept than the control group. Through the focus group discussions, researchers monitored how participant concerns and attitudes about carsharing might have changed since the drive clinic. Furthermore, researchers explored the topics of carsharing services and billing to determine how to best meet user needs.

The focus group session began with a discussion of carsharing, focusing on lot locations, service, and vehicle features. Next, the group explored CarLink billing options and their willingness to pay for this service.

SECTION A3.11 CARSHARING

As mentioned, during this portion of the focus group, participants explored where they would like to have CarLink lots and vehicles located in the community, as well as what features they would like to see integrated into the overall service, lots, and vehicles. A considerable portion of time was dedicated to exploring these issues in greater detail. It is notable that this group did not focus on operational or logistical management issues as did the control group. At this later stage in the learning process, it appears that the experimental participants are much less skeptical about carsharing and not as interested in exploring potential system problems. The process of watching the CarLink video, participating in the drive clinic, and the opportunity to discuss questions, concerns, and attitudes with researchers may have allayed many participant concerns. Consequently, this may have allowed participants to think and explore the concept more openly, particularly with respect to identifying what they would like to have included in this service.

A3.11.1 CarLink Lot Locations

Using a map of the Alameda/Oakland area, participants were asked to choose where they would like to locate the first five lots in an initial phase implementation of the CarLink system. Second, they explored where they would deploy additional lots as the program increased in size. The first five lots (listed in the order they were mentioned) include:

- BART/ferry stations,
- Neighborhoods,
- Shopping centers,
- College campuses, and
- Employment centers.

Rather than placing lots in new locations in a secondary phase, participants recommended that the CarLink system expand the network of lots in the same locations, creating a more dense and convenient system for users. They also thought that placing a lot at the airport should be postponed until a later phase because commuting to and from airports is not part of most individuals' everyday lives.

To become part of a community lifestyle, participants thought the lots should be where the community would use them. With lots at BART/ferry stations and employment centers, CarLink would allow commuters to use public transportation to go to work and gain access to a vehicle during the day. Employment centers might sponsor the CarLink program—placing their corporate logos on the sides of CarLink vehicles—and provide incentives to employees who use the program to help reduce parking cost and congestion at work sites.

Many participants would like to have CarLink vehicles in neighborhoods and at shopping centers. Participants also said this would be a perfect system for college campuses.

Introducing this idea to college-age citizens, who cannot afford their own vehicles and insurance, would also be beneficial.

A3.11.2 CarLink Lot Features

Key lot features, listed and described in order of importance, include security, billing receipts, car seats for children, and other accessories.

1. Safety at lots and convenient access:
    - Locate close to BART exits,
    - Employ security guard,
    - Provide plenty of lighting,
    - Install video cameras at key box (similar to ATM machines),
    - Display large logo/signs to attract potential customers and divert potentially dangerous people,
    - Provide shelter from rain and wind, and
    - Facilitate simple key/car access.
2. Receipt at time of use (if needed).
3. Car seats for kids.
4. Hand truck/dolly.
5. Maps.
6. Phones for safety at key box.
7. Bike storage/racks for vehicles.

A3.11.3 CarLink Vehicle Features

During this discussion, participants identified several basic features they would like included in CarLink vehicles. These features included:

- AM/FM radio,
- Cup holders,
- Air conditioning and heating, and
- Two panic buttons (i.e., a blue one for mechanical and a red one for danger to personal safety).

SECTION A3.12 BILLING

When the participants were asked about CarLink billing, one participant mentioned that CarLink user fees could be handled similarly to those charged for airplane rental. In this case, a user pays for actual flight time and operation costs rather than the entire time that it is rented. A different pricing structure for usage time and parked time would be necessary. Most participants thought a reasonable billing system would consist of a combination of mileage and time. Mileage charges would help capture costs for those driving long distances, and time charges would act as a disincentive for long rental periods, making vehicles available to more individuals throughout a given day. Some participants also thought that different packages based on user needs should be available. Many expressed that daily commuters should have a less expensive package and receive an incentive for regular use of the vehicles. Participants also suggested creating corporate packages to entice employers to support the CarLink system. Most thought that debit and credit cards would be the best payment method, while other individuals felt more comfortable with a monthly statement.

SECTION A3.13 CONCLUSION

As expected, I found this focus group to be very enthusiastic about the CarLink system throughout the session. Having participated in a more in-depth learning process, I expected these participants to be less skeptical of the new concept. This group focused more on their transportation needs and suggestions for improving the service rather than on operational concerns. This group's response was quite different to that of the control group, who focused mainly on logistical issues such as costs, insurance, maintenance, system reliability, and management. More than any other issue, this group was most concerned with system safety and provided several suggestions for improving lot and vehicle safety. It seems clear that several of the participants had put more thought into CarLink prior to the focus group than did the control.

FOCUS GROUP THREE: LAWRENCE LIVERMORE NATIONAL LABORATORY PARTICIPANTS

SECTION A3.14 INTRODUCTION

This is the third report in a set of four that documents the findings of four focus groups held in October 1998. These focus groups brought together people who had participated in the CarLink longitudinal survey to discuss this concept in greater detail. Nine individuals from the experimental group, who also work at the Lawrence Livermore National Laboratories (LLNL), met on October 29, 1999, for this session. Again, experimental group participants were more informed about carsharing than the control group. Based on the previous focus groups, I expected the discussions to be less focused on operational considerations and concerns than those of the control group. Indeed, the group provided many valuable suggestions and was reluctant to conclude the two-hour meeting.

I followed the same protocol that I developed for the first experimental focus group. However, the discussions varied a bit more from the agenda than did the first and third experimental focus group discussions. This group focused a significant amount of attention on vehicle size and CarLink's transit connection.

SECTION A3.15 CARSHARING

The discussion began with an emphasis on vehicle type. The group described what types of vehicles they would like included in a carsharing system. They also explored how a carsharing organization might be coordinated with an existing transit system, and how a carsharing service could be best designed for the Dublin/Pleasanton region.

A3.15.1 Vehicle Types

The first concept the group focused upon was vehicle type. During this discussion, participants explored the issue of vehicle size, how size relates to regional deployment, and the need for a wide variety of vehicles. The items listed appear in the order in which they were mentioned during this discussion.

- Small vehicles:

  Most participants thought small vehicles would be sufficient for carsharing usage most of the time.
- Midsize vehicles:

  One participant felt that midsize cars would best accommodate family needs.
- Vehicle size depends on locale.
- Another participant stated that vehicle size greatly depends on the location of the carsharing program, pointing out that San Francisco users might prefer more compact and economical vehicles, whereas participants in the Dublin/Pleasanton region might like to drive larger vehicles.

- Vehicle variety:

  Many in the group thought that while smaller commute vehicles might be preferable for a majority of users, it would be optimal to provide a variety of vehicles to satisfy a wide range of specialty needs (e.g., a pickup truck for hauling).

A3.15.2 Vehicle Features

Listed below and in order of importance are features that the group most wanted in CarLink vehicles:

- Radio, heating, air conditioning, and cup holders,
- Two models of vehicles available: a two-seater and a four-seater,
- Electronic mapping devices,
- Emergency panic button with two-way communication capability, and
- Child car seats.

A3.15.3 CarLink and Transit

The next discussion began when one participant mentioned the potential impacts of the CarLink system on public transportation. This individual was concerned that carsharing be designed to complement existing transit systems rather than to compete with them. The entire group agreed that transit cost is a problem for the region, particularly when users must take more than one transit service to get to a destination. With cost in mind, participants thought CarLink should be priced so it is less expensive than driving. This would encourage users to adopt it as their primary commute mode.

When asked if they thought it was a good idea to connect the CarLink service to BART stations, participants stated that CarLink could enhance the BART service; nevertheless transit services should still be improved. Many felt that BART could not meet their current transportation needs. Their greatest BART concern is the high ticket price. I asked participants if they would be more likely to use the system, if the cost of BART was lower and the transit service was supported by CarLink. Their response was overwhelmingly positive. Some even mentioned that this system might help them reduce the size of their household vehicle fleet.

A3.15.4 CarLink Lot Locations

During the next segment of the focus group, participants were asked to design a carsharing system for their community, namely the Dublin/Pleasanton region. I first asked participants to place initial lots in locations that they thought would draw the greatest number of users. Listed below are the lot locations selected by the group, which are also ranked by their relative importance:

- BART,
- Employment centers,
- College campuses,
- Shopping centers,

- Hotels, and
- High-density residential areas.

A3.15.5 CarLink Lot Features

After exploring CarLink locations, the group discussed lot features and subsequently ranked them in order of importance:

- CarLink-preferred parking that is clearly designated and located close to a station entrance/exit,
- Safety: phones at the lots and good lighting, and
- Bike storage at lots and bike racks for transporting bicycles on vehicles.

A3.15.6 Other Service Features

Finally, the group explored a range of other service features they thought were important to a regional CarLink design.

- Panic button:

  Most participants felt a panic button should be linked with a two-way communication device, so users would know if someone was going to respond to their call and how long it would take before someone arrived.
- Many in the group already carry their own phones, so they were not interested in this accessory.

- Smoking in vehicles:

  One participant was particularly concerned about smoking in the vehicles. Many in the group were relieved when told that smoking would not be permitted in CarLink vehicles.

- Overall appearance:

  Most of the participants demanded a clean system. The group thought that the public's perception of the CarLink system would determine the success or failure of this service (i.e., the CarLink lots and vehicles should be maintained in very good condition for the public to be attracted to this service). Some suggested that landscaping and a nice atmosphere at the lots would add to system success.

SECTION A3.16 BILLING

Next, I introduced the Homeside, Workside Commuter, and Day Use rates that were selected for the upcoming CarLink field test in the Dublin/Pleasanton region. The participants were quite comfortable with the LLNL participation rates for the field test (i.e., Workside Commuter and Day Use). Most reiterated that the CarLink cost of $60 per month for Workside Commuting (i.e., $30 per month, if there are two participants sharing a car) was reasonable. However, several were concerned about total commute costs when BART fares are combined with CarLink commuter fees. Most thought the Day Use rate of $1.50 per hour and $.10 per mile was very reasonable. The $200 a month Homeside User rate was also well received.

SECTION A3.17 CONCLUSION

As expected, I found that the LLNL group focused on system design improvements rather than logistical concerns. They also discussed transit costs as a barrier to overall transit and CarLink usage. They thought that if transit costs are lowered, CarLink would be a great complement. Although participants focused on vehicle and lot styles and features, they placed a greater emphasis on the need for a positive public perception of the service. Lot and vehicle appearance would positively enhance this perception and the demand for this transportation alternative.

FOCUS GROUP FOUR: DUBLIN/PLEASANTON RESIDENTS

SECTION A3.18 INTRODUCTION

This is the fourth report in a set of four that documents the findings of several focus groups held in October 1998. This group brought together individuals who had participated in the CarLink longitudinal survey to discuss issues involved in a carsharing system. Eight experimental participants who live in the Dublin/Pleasanton region, met on October 29, 1999, at the Livermore Tennis Club (a local facility that donated the meeting room at no cost to the project) to participate in this session. Again, these participants were better informed about carsharing than control group participants.

I followed the same protocol as I did with the previous two focus groups. First, the group explored the topic of carsharing lot locations. Next, they considered desirable lot and vehicle features. I concluded the session with a discussion of CarLink billing and willingness to pay.

SECTION A3.19 CARSHARING

Similar to the earlier focus groups, the final set of participants explored where initial CarLink lots should be located in the community, lot design, and vehicle features.

A3.19.1 CarLink Lot Location

All participants agreed that a dense network of lots is needed to make CarLink an efficient transportation system. The group identified and ranked, in order of importance, the following locations:

- BART station /Altamont Commuter Express (ACE),
- Business parks,
- High-density residential areas, and
- College campuses.

A3.19.2 CarLink Lot Features

During this discussion, participants focused on four main issues, ranked in order of importance.

- Convenience and accessibility:

  Many participants thought that easy access is a critical lot feature. Several suggested that dedicated CarLink shuttles be employed to help individuals get to and from the CarLink lots, at least initially, until a more dense network of lots became available.

- Security:

  Participants suggested that security devices, such as lighting systems, automated gates, and security guards be employed.

- Bike access and storage:

  Participants suggested encouraging bicycle use to facilitate CarLink access from homes and businesses. Others suggested supplying bike lockers and racks for bike transport at CarLink lots. However, when I inquired about providing a shared-bike service (i.e., shared-use bikes that could be rented and returned to different CarLink lots) in conjunction with CarLink vehicles, participants did not appear very interested.
- Child seats would be a key feature for many family participants.

A3.19.3 Vehicle Features

Providing a range of CarLink vehicles was one of the group's main concerns. Many thought this feature would attract many occasional users to the service. Mini-vans and pickup trucks seemed to be the most desired, beyond the basic commuter vehicle. Other features requested include:

- Air conditioning, heating, and a stereo, and
- An emergency cell phone.

Mapping devices were not desired. The group thought that most participants would use the vehicles to drive from one local location to another and be familiar with the area.

SECTION A3.20 BILLING

During the final segment of the focus group, I presented three pricing strategies. The participants provided little feedback on the possible payment structures. At this time, participants seemed tired and anxious to conclude the meeting.

A3.20.1 Hourly and Mileage Charges

From the drive clinic, I found that most participants were willing to pay approximately $1.50 per hour and $.10 per mile for CarLink use. This pricing strategy targets day and occasional users. Participants thought that this was a reasonable pricing strategy.

A3.20.2 Homeside Users

In this model, Homeside Users pay to use vehicles on evenings and weekends. The proposed pricing strategy for these users is a flat, monthly charge of $200. Participants preferred to pay for this service using an automatic debit card. Overall, participants thought this customer package and rate structure were reasonable. In fact, one participant became one of the first Homeside Users in the CarLink field test.

A3.20.3 Workside Commuters

The proposed price for this user package is a monthly charge of $60. Focus group participants liked the flat rate package and thought the rate was quite reasonable.

SECTION A3.21 CONCLUSION

In contrast to participants from the other experimental focus groups, I found this group less enthusiastic about the CarLink concept throughout the session. I expected this group to offer more suggestions for designing and improving the CarLink service for the region. This group was difficult to motivate and lead through the discussion. Although they provided suggestions for improving the CarLink service, they were not as interested in discussing the system as the previous experimental groups.

APPENDIX IV

PARTICIPANT EVENT PHOTOGRAPHS

DRIVE CLINIC PHOTOGRAPHS

The CarLink tent at the Dublin/Pleasanton BART station where participants were greeted by a drive clinic researcher.

A drive clinic researcher demonstrates how to check out a key from the CarLink key manager.

CarLink cars parked in their designated spots at the Dublin/Pleasanton BART station waiting to be driven.

A girl checks a vehicle key into the CarLink key manager using a smart card.

Shaheen conducts a CarLink drive clinic exit interview with two participants and answers any last minute questions.