10. CarLink - A smart carsharing system

Susan Shaheen, CarLink Project Manager

Editor's Note: The author of this piece is today intensely involved in the second stage of her professional interest in carsharing. Starting several years ago, she began to look into as part of her doctoral research in transportation studies at an American university. Several years later, here she is as entrepreneur and managerbehind an ambitious carsharing project. This is a report on the first months of their experience and goals for the future.

Introduction

Carsharing organizations, which are becoming popular throughout Europe, Asia, Canada, and the U.S., can reduce traffic congestion, air pollution, and government spending.

1. Sharing vehicles means less traffic and fewer cars overall: By cutting down on the number of vehicles needed by households and society as a whole, and by facilitating and encouraging biking, walking, and increased transit usage, carsharing can reduce congestion.
2. For commuters especially, shared-use vehicles and offer a low-cost, low-hassle alternative to getting to and from their destinations.
3. Carsharing fleets can also employ ultra-low-emission, energy-efficient cars.
4. Because a carsharing organization would handle maintenance and repairs, these would be completed properly and on schedule, further reducing pollution and energy waste.
5. 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.
6. Sharing vehicles would even free up parking spaces; by serving multiple users each day, vehicles would spend less time parked.
7. Moreover, sharing could reduce the need for additional household vehicles to support a family's travel needs.
8. Travelers would benefit by gaining the mobility of a car without carrying the full costs of ownership;
9. Transit operators would benefit by tapping a much larger potential market; and

10. Society would benefit by diverting travelers from singleoccupant vehicles to transit for part of their trips.

The Institute of Transportation Studies at UC Davis, and its partners the Bay Area Rapid Transit (BART) District; American Honda Motor Company, Caltrans, Lawrence Livermore National Laboratory (LLNL), INVERS, and Teletrac are studying the use of intelligent communication and reservation technologies to reduce the inconvenience of carsharing, and to identify market segments where smart carsharing (what the project team calls “CarLink”) would be attractive.

CarLink is the use of short-term rental vehicles and intelligent communication and reservation technologies to facilitate sharedvehicle access at transit stations or other activity centers for making local trips. CarLink vehicles, owned and operated by a transit district or third-party service provider, can be used by different drivers at many locations throughout a day. Using advanced communication and reservation system technologies, they can be reserved in advance or rented automatically upon arrival at a CarLink lot. The union of “smart” or intelligent communication and reservation technologies with shared-use vehicles can provide convenient and flexible accessibility, offering both short-term, automatic services and a diverse fleet of lowemission vehicles to meet the mobility needs of system users.

CarLink Lot, August 1999

Existing carsharing organizations typically provide a choice of vehicle type, rate, and convenience suited to the needs of participants. Many programs have found that participants are apt to more carefully consider the necessity of their trips, duration and distance of travel, and modal alternatives. Carsharing efforts have proven viable where environmental consciousness is high; where there are disincentives to driving, such as parking costs and

congestion; where alternative modes of transportation are easily accessible; and where service attributes favor the substitution of a shared-use vehicle for trips that otherwise might have been driven alone.

The following scenario exemplifies CarLink usage. A traveler picks up a shared-use vehicle upon arriving at a transit station close to home on their return from work. They drive the CarLink vehicle home, and perhaps to other places during the evening; then they drop it off at the station in the morning. After riding the train for the morning commute, they pick up another CarLink vehicle at their destination station, drive a short distance to work, and leave the car there for colleagues to use for other trips throughtout the work day .

CarLink System Components

A fully implemented CarLink system could radically change the way households use transportation. A basic system, modifiable to support the specific transportation needs of each community, would be composed of private-sector firms providing shared-use vehicles and services, linkages to mass transit, neighborhoods, and employment centers; and intelligent communication and reservation systems. Users would have access to affordable, convenient, and user-friendly services.

A CarLink system could be supported by a bundle of intelligent transportation system technologies, including:

- Cellular- and satellite-based global positioning systems (GPS) for use in automatic vehicle location and as navigational aids,
- Advanced communication technologies linking vehicles to a central system controller,
- Automated reservation systems via kiosks, telephone, or other user interface (such as an Internet-based travel planner linked to a range of intermodal travel modes), and
- Smart cards for billing and to control vehicle access.

The CarLink Behavioral Study

The CarLink study has three components. First, it includes a review of relevant technical and institutional literature. Second, the study employed a longitudinal market survey of 335 individuals in the Bay Area, including focus groups with survey participants (approximately 40 individuals). Third, it includes a nine-month field test of the CarLink system with interviews and focus groups with field test participants. Many field test participants were drawn from the longitudinal market survey. The survey and focus groups

evaluated participants' willingness to participate and pay for the CarLink innovation. Study data will be used to create a usercentered model for smart carsharing in the San Francisco Bay Area.

Participating households, for both the longitudinal survey and field test, include four groups: current 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. In the field test, participants access CarLink vehicles at the Dublin-Pleasanton BART station, Lawrence Livermore National Laboratory (LLNL), about fifteen miles east of the transit station. They drive the cars to and from the lab, the BART station, and their homes in the residential suburbs nearby.

CarLink Teletrac control unit, August 1999

The field test employs a fleet of twelve 1998 Honda compressed natural gas (CNG) vehicles, a smart key manager (i.e., INVERS' key dispenser and reservation system, called Car-sharing Organization and Communication System (COCOS)); a fleet management system (i.e., INVERS' software system, called COCOS Universal Communication Manager (CUCUM)); and contactless smart cards. Reservations are made via COCOS and an Internet web page operated at the LLNL, and vehicles have been monitored using the Teletrac vehicle tracking technology. COCOS provides a two-way flow of information between a central control computer and the key manager. Teletrac is used to record the travel-use characteristics of the CarLink vehicles.

Longitudinal Survey

In evaluating a new technology, it is critical to document the processes of response and preference formation. Since research into consumer responsiveness to innovations (especially those embodying new values and performance attributes) must be attentive to the evolution of these processes, researchers are using a longitudinal approach to evaluation throughout the study. Focus groups were held after the completion of the longitudinal survey, and additional focus groups and household interviews will be conducted after the field test.

From June to October 1998, a quasi-longitudinal survey was administered by researchers to collect user evaluations of the CarLink system from 335 individuals (210 households) in the Bay Area to measure user acceptance of this new form of transportation and to learn how CarLink could affect the overall travel of households. An experimental and control group were recruited for this study to evaluate the impacts of these exposures. Several ways to explain CarLink were used: an informational brochure; a video; and an interactive drive clinic with the Honda Civics, the COCOS smart key manager kiosk, and smart cards. The survey consisted of four questionnaires: a baseline (or initial survey) and three identical questionnaires that followed each of the informational exposures.

At the drive clinic, held in September 1998, participants used a smart card to access a CarLink vehicle, release the immobilizer, which blocks unauthorized users from starting the car, and took a test drive, accompanied by a researcher who documented their observations, questions, and concerns. The drive clinic offered participants a chance to see and try new technologies, as well as interact with study researchers. Each participant completed a 20-minute exit interview with a researcher on his or her response to the CarLink system and willingness to participate in such a service.

At the end of the clinic, participants received a final questionnaire and travel diary to take home and complete over the next several days, giving them time to reflect on their observations from the clinic and to answer questions about CarLink within the context of their own travel. After the survey was completed, four focus groups were held with study participants in October 1998, to further gauge participant perceptions and overall response to the CarLink concept.

Field Test

Launched on January 20, 1999, the CarLink demonstration project involves approximately 60 participants sharing 12 vehicles based at a BART station and at LLNL. Three types of participants use the cars at different times, paying

different prices:

Homeside Users drive a CarLink vehicle between home and the BART station daily, keeping the car overnight and on weekends for personal use. A $200 monthly fee includes a tank of CNG fuel, insurance, and maintenance costs. Participants can also pay for additional fuel with a refueling card at approximately $.80 per gallon.

Workside Commuters take BART to the Dublin-Pleasanton station and drive a CarLink vehicle to and from LLNL. A $60 monthly fee, which can be shared with a coworker by carpooling, again includes fuel, insurance, and maintenance costs.

Day Users pick up a CarLink vehicle at either BART or LLNL and use it for business trips or personal errands during the day at a fee of $1.50 per hour and $.10 per mile. Users are not charged for business trips because LLNL has donated the fuel to this demonstration. Approximately 30 Day Use members are signed up to participate at LLNL.

Program Manager shows CarLink smart card

Focus Groups and Household Interviews

In this study, the focus groups have been designed to provide a setting in which several individuals who participated in the study come together at a later date to explore larger visions of a shareduse vehicle service in the San Francisco Bay Area. This larger image is intended to be the construction of a carsharing service, as users might imagine it in this region. These images are built by the

group through a discussion of their experiences in the study and subsequent reflection on the CarLink concept.

Through the process of building such images, participants reveal what they consider to be the essential features of these systems. These include important system 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 reveal how much they value the new transportation service, how that value is constructed, and whether this new transportation 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.

Focus groups with longitudinal survey participants were conducted in October 1998, and groups with field test participants will be conducted in the fall of 1999. At that time, researchers will also conduct ten 2-hour household interviews with field test participants to deepen their assessment of CarLink and willingness to pay for this system. The interview technique to be employed is grounded in the actual behavior of participants to ensure that households explore and consider the impacts that this new travel options has had on their lifestyle, activity, and travel choices.

The fundamental goal of the interviews is to ensure that researchers perceive smart carsharing through the eyes of users and how participants value these services. Households completed travel diaries prior to their field test participation and will do so prior to their CarLink interview. The interviews will employ the baseline and field test usage data to explore differences in a household's travel and activity choices due to CarLink.

Conclusion

A wide variety of users, including public agencies and privatesector companies, should find this study of smart technologies valuable. The study will provide valuable user response data, vehicle trip data for energy and emissions analysis, and experience applicable for a larger-scale demonstration and deployment of other personalized public-transportation services.

> Results from the longitudinal survey and focus groups will be available in the early fall of 1999 at the Institute of Transportation Studies-Davis. The field test evaluation will be available in the late fall of 1999. Please contact the ITS-Davis website for publications at www.engr.ucdavis.edu/~its or e-mail itspublications@ucdavis.edu for a copy of these publications and other carsharing papers.

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Author

Susan Shaheen, CarLink Project Manager & Research Scientist at Institute of Transportation Studies-Davis, sashaheen@ucdavis.edu.

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