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CALIFORNIA PATH PROGRAM
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# Los Angeles Smart Traveler Field Operational Test Evaluation

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# FINAL REPORT

# Los Angeles Smart Traveler Field Operational Test Evaluation

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## ABSTRACT

The purpose of this study is to evaluate the performance and effectiveness of the Smart Traveler Advanced Traveler Information System (ATIS). This project was implemented in Los Angeles by Caltrans District 7 as part of the new technology demonstrations being carried out by the California Advanced Public Transportation Systems Group (CAPTS) at Caltrans District 7. The Los Angeles ATIS project is among the most ambitious undertaken to date. It is designed as a field operational test of three different media approaches for providing traveler information: fully automated telephone systems; automated multi-media touch screen kiosks; and PC via modem. The information includes: transit routes, fares and services; traffic conditions on the freeways; and ridematching information for ridesharing on both frequent and one time occasions. The Smart Traveler Program is evaluated in terms of technical function, cost, user response and overall effectiveness. Extensive conclusions are presented with regard to all three media systems. In addition, the demonstration project itself is evaluated and conclusions drawn with regard to lessons learned for future evaluations.

Keywords: ATIS, Kiosks, Field Operational Tests, FOTs, Automated Ridematching, transit information, PC Modem.

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# EXECUTIVE SUMMARY

## INTRODUCTION

The Los Angeles Smart Traveler Field Operational Test (FOT) is one of the largest and most comprehensive ATIS experiments to date. The system is fully multi-modal and offers traffic, transit and ridematching information. The FOT tested the delivery of traveler information through three media interfaces: multi-media kiosks, touch tone phones and PC modem links. The major partners in the project were: State of California, Department of Transportation (Caltrans) Headquarters and District 7, the Los Angeles County Metropolitan Transportation Authority (LACMTA), the regional rideshare agency Commuter Transportation Services, Inc. (CTS), and the computer operations staff at the State of California, Health and Welfare Data Center (HWDC), Sacramento.

The original design of the project was confined to a single transportation corridor. However, in response to the Northridge Earthquake of January 1994, the project was reoriented and expanded. An original limited scale FOT based on the l-l 10 (Harbor Freeway) corridor was switched to target the earthquake affected areas of the San Fernando Valley, Santa Clarita Valley, Palmdale area and West Los Angeles. The refocussed study greatly broadened the scope of the evaluation, and required the evaluation to be conducted almost simultaneously with project implementation. It also introduced constraints of timing and budgets.

## SMART TRAVELER ELEMENTS TESTED

**Smart Traveler Kiosks.** These are multi-media touch screen operated information systems. They give access to full transit information and automated ridematching services. In addition, they have current Caltrans freeway information displayed on a map showing any delays that may be occurring. The system is menu driven and is available in English and Spanish. The kiosk is equipped with a printer that can be used to print transit and ridesharing information. The kiosks are also equipped with laser disks that offer short videos on a variety of topics associated with Caltrans, transit and ridesharing. The videos add an educational dimension to the kiosks which are already a rich source of information for the traveler. A total of 77 kiosks were placed in the field.

**Smart Traveler Automated Ridematching Service (ARMS).** This service is accessed through a I-800-COMMUTE information line. It is designed to provide individuals with lists of potential compatible rideshare partners for either regular carpooling or an occasional emergency ride home. The service is offered in English and Spanish. Users receive a computer generated list of people to contact who live and work near them with similar schedules. They have the option of calling these potential partners themselves or recording a message that Smart Traveler automatically delivers to potential carpool partners. This unique feature was intended to speed the carpool matching process. The earthquake impact area was the intended service area for ARMS.

**Smart Traveler PC Modem Software.** The PC Modem software was intended to provide access to the three data sources via modem. This element was planned to have a phased introduction. Version 1 of the PC software package gives access to the freeway conditions information. An added feature compared to the kiosk version is the ability to zoom in on certain sections of the freeway and thereby view conditions in greater detail.. Only Version 1 was completed for the FOT. Approximately 500 copies of the Version 1 software were distributed.

## THE EVALUATION PLAN

Traveler information systems are currently being promoted for their potential to support policy efforts aimed at influencing travel behavior. Seeking alternative routes of travel to avoid congestion, changing times of travel, changing travel modes to transit and ridesharing are all possible means of beneficially influencing both traffic congestion and air quality. The questions are: which further media and multi-media improvements should be pursued, how cost effective will they be and to what extent can they satisfy a broad range of traveler demands?

The evaluation considers the following:

Financial Impacts
Functional Characteristics
User Acceptance
Other Impacts

Financial impacts includes all fixed and variable costs associated with the development, operation and monitoring of the service. Functional characteristics include the reliability and maintenance of the ATIS hardware and software. User acceptance includes the extent to which the service is used and the user perceptions of the service. Other impacts includes the effectiveness of the service in terms of the basic program objectives of increasing the level of transit and ridesharing within the area. It also includes the institutional challenges related to interagency coordination and cooperation associated with the project.

## RESEARCHAPPROACH

Our evaluation involved the following:

1. To monitor and evaluate use made of the Smart Traveler elements using reports based on automated data to the extent possible.

2. To evaluate the reliability of the systems and their maintenance requirements through automated and manual reports and records.

3. To simulate and experiment with the systems, to test their designs and functioning against their intended purposes.

4. To investigate user acceptance and perception of the value of the systems through data collected from user surveys.

5. To perform a full financial analysis using data supplied by the project monitors.

## SUMMARY OF RESULTS

### Smart Traveler Kiosks

The kiosks provided a new medium for obtaining pre-trip traveler information. The kiosks provided information on all three of the major travel modes in a reasonably user-friendly way, and made this information accessible in a wide variety of locations. Our survey results indicated a high degree of user satisfaction, yet the overall usage rate was low (averaging 25 transactions per day), relative to the cost of providing the kiosk service. Low usage combined with high capital and operating costs yielded a (total) cost per use of about $2.00 (five-year lifetime), notably higher than for example a traditional telephone information system.

Functional performance was good. We estimate a mean-time-between-failures of 1.52 months. Failures were concentrated; the ten most failure-prone kiosks accounted for about 35 percent of all failures. Most of the failures were easy to fix. Overall kiosk availability was 95 percent, exceeding the contractual requirement of 91 per cent.

Daily use of the kiosks was quite variable. The kiosk with the highest daily use was located in Union Station in the downtown area of Los Angeles. The remaining four of the top five locations were all in shopping malls. Of the five least used, three were in office complexes, one in a grocery store and one in a City Hall. The kiosks did not receive extensive marketing and in some cases their siting was less than optimal. These factors are thought to have influenced the level of use.

Information on how and when the kiosks were used provides interesting insights. Kiosks were placed in many office buildings, on the assumption that they would provide another means for gathering information on work trip options. Since work trip information has historically been provided at the employment sites (through rideshare coordinators), it was logical to assume that the kiosks would perform a similar function. Instead, kiosks at office locations were used less than at any other type of location. We found that the most heavily used kiosks were located in shopping malls and discount stores. These findings suggest that the kiosks are used in the context of nonwork activities (shopping), when people have time to explore future trip options. Findings also suggest that kiosks may be used more for nonwork trip information. The work trip changes only when the traveler's options change, or when a job or residence change takes place. Nonwork trips are more variable, and therefore may be subject to more information gathering, particularly for the transit dependent traveler or the tourist.

Low usage at office locations is reasonable, for example, given the regularity of the commute trip. In addition, taking extra minutes to walk to the kiosk to check the freeway conditions map before leaving work is apparently not something most commuters are inclined to do. Conversely, tourists have a great need for travel information, hence the high usage of kiosks at Union Station and Burbank Airport. Our findings suggest that usage is a function of the level of demand for new trip information. The observed decline in use over the six month observation period may be the result of this demand (e.g. people used the kiosks to get the information they needed, and then had no further need to use them). More research is needed to examine this important issue.

The most frequently sought menu items were those offering transit information, followed by the freeway conditions map. Ridematching was the least frequently requested option. The information videos also had the same order with MTA bus and train information being requested more than any other item.

The researchers concluded from patterns of use that the current design appears to present difficulties for the less sophisticated user (e.g. problems with spelling street names). More attention should be paid to this aspect in future designs.

Analysis of the kiosks leads to the following conclusions:

1. Appropriate market. Kiosks are more effective in nonwork environments, and are used more for future trip planning than for immediate travel needs.

2. Marketing. The kiosks need to be introduced and marketed to the public.

3. "Ownership" of the kiosks. Maintenance costs and downtime can be reduced, if on-site coordinators regularly monitor kiosks and fix minor problems as they occur.

4. Information service compatibility. The freeway conditions map information is useful for a very short time, while rideshare and transit information allows for more extended pre-trip planning. A better combination might be transit information, location and hours of operation of public agencies, schools and hospitals, movie theater listings, etc.

5. Needs of the less sophisticated user. If the benefits of new technology are to be realized by all segments of society, software design will have to be oriented to novice users. This is a particular challenge in providing transit or rideshare information, because of the need for specific location and schedule information.

## ARMS

Arms provided a new way to obtain ridematching information. Average use was 34 persons per week. The system was judged to be relatively user friendly, but was afflicted with minor malfunctions throughout the test period. These malfunctions degraded system performance, and for some periods rendered the automated messaging feature inoperable. Low usage makes the unit cost for the service high: $27 per call assuming a five year lifetime for the project. Even if fixed start-up costs are disregarded, the cost per use would be $2.96 per call at the current level of usage.

From a small telephone survey of actual ARMS users it was concluded that the overwhelming majority of users were using the service to search the data base for regular ridesharing purposes and not for the featured one-time service. The research team also investigated the potential market for this service through two telephone surveys drawn from a random sample of the target market. The results showed that commuters have other preferred alternatives for those occasions when they cannot use their regular means of travel to or from work. Those who regularly carpool usually have a car available and use the alternative of driving alone. Those who drive alone get rides from household members or fellow workers. Survey results indicate that one-time rides are accommodated within the individual's personal, familiar family and social network. These findings are in accord with responses to questions about giving or taking rides from people that are unknown. The survey results showed that most people are not inclined to give or take rides from people they don't know. For such individuals ARMS would be a service of last resort. This helps to explain why there appears to be little demand for such a service. The researchers conclude that the market for one-time or occasional ridesharing is not sufficient to support a service like ARMS.

ARMS also serves as a valuable lesson in the importance of careful development and monitoring of technically complex systems. The problems that occurred were quite minor with respect to the technology, yet they compromised the system for those seeking to use the automated messaging system. An accurate reporting system for detecting problems and monitoring system usage was never established during the demonstration period.

The ARMS evaluation leads to the following conclusions:

1. Assessment of potential demand. The potential demand for complex and costly systems should be examined before making the decision to develop and test such systems. The Smart Traveler surveys and other -literature sources suggest that there is unlikely to be a significant market for one-time rideshare services. Some basic market analysis is a small investment, compared to building such a system.

2. Benefits of new svstem compared to existina services. Most of the ARMS users were seeking matches for regular carpools, not for one-time rides. However, the ARMS system requires going through an operator in order to change trip schedule records permanently. Without going through an operator, new individuals with compatible times added to the data base over time would never be matched with them. For those seeking regular carpool matches, ARMS was less efficient than directly calling CTS.

3. Marketing of ARMS was quite limited, and the marketing materials did not provide adequate information on ARMS' primary purpose of one-time ridematching.

4. Monitorina and rebortina procedures. The technical problems of ARMS could easily have been corrected had an effective monitoring system been in place. Monitoring ATIS systems for day to day malfunctions as well as to check that they perform as designed is essential if potential users are not to be disappointed by poor performance.

## **Smart Traveler PC** Modem

Unlike the two other elements there is no clearly definable population of users for the PC modem software, because the software was available on diskette and could be freely copied. About 500 diskettes were distributed. The only indication of use through automated data is a count of the number of times that the MTA ports are polled by outside users. In a period of 35 weeks a total of 83,155 uses were recorded. On an average weekday there are circa 400 uses per day, compared to about 150 uses per day on weekend days. Patterns of use by time of day are consistent with expected use by commuters for trip planning purposes i.e. before leaving to drive to work and before leaving to drive home. These levels of use indicate that there is indeed a demand for the service.

No significant cost analysis was performed for this element as only the first part was completed, and the multi-modal product was dropped before completion.

Surveys of a small sample of those who had received the software indicated some problems with the organization of the demonstration. Despite screening by project managers, many of those who had received the software were without the necessary hardware to use it or had failed to install it for other reasons. In future tests, it will be essential to have follow through with potential participants to check that they have installed and are using the system.

The preliminary indications from a small group of users was that they do indeed access the freeway information to help with route and scheduling choices. Those doing so find it useful, but not to the exclusion of other sources of information such as radio **traffic** reports.

## CONCLUSIONS ON THE SMART TRAVELER DEMONSTRATION

The Smart Traveler Demonstration was a very ambitious test of new technology. It was a considerable achievement to implement and field test three traveler information media interfaces. Much has been learned from the FOT that should provide valuable information for future **ATIS** developments and initiatives. Some general conclusions can also be drawn for future evaluations.

1. **Large scale demonstrations require significant investment in management and organization.** Demonstrations ought to be no larger than is necessary to adequately test a product or concept. Large scale demonstrations add a management and organizational burden that should be avoided if possible. In the case of Smart Traveler, the scale of the project implementation tended to overwhelm staff resources. This proved to be at the expense of establishing effective monitoring systems which would have allowed the modification and improvement of the demonstration over the life of the project.

2. **Data requirements and management should be established early in the project.** Automated systems generate awesome quantities of raw data. To be of any use for evaluation and monitoring it is essential that summary data requirements be identified in the project planning phase. These requirements must then be agreed upon with the technical experts responsible for the data retrieval and reduction. The evaluators of such projects should participate in developing these data requirements. It is extremely costly and in some cases impossible to

work with unprocessed data. The ability to track and understand use of systems in detail can be lost due to lack of adequate preliminary planning.

3. **Structure and timing of the evaluation should allow for the analysis of travel impacts.** The key issue in ATIS investment is whether these services have an impact on travel behavior, and therefore on the transportation system. This issue can only be examined over time as users and repeat users of new technology respond to the availability of more timely and extensive travel information. Evaluations of the impact of ATIS on travel behavior require sufficient time to monitor such impacts. Short term demonstrations allow no opportunity to study whether ATIS initiatives can have positive policy outcomes.

# CHAPTER 1 PROJECT OVERVIEW

## 1.1 Introduction

Traveler information systems can help inform travelers of available choices that influence travel decisions. Such information can help motorists save time by avoiding congested segments of the freeway system; can help those unfamiliar with rail and transit services to find out how, where and when to use them; and can offer rideshare support services to help find a carpool partner quicker and easier.

Traveler information systems are not new. Simple means of obtaining fare, route and schedule information for bus, rail and transit purposes as well as for airline departure and arrivals have been available for many years. Until recently such services were usually specific to one mode of travel. The media used have varied from maps and printed information to simple automated machines, closed circuit T.V., to telephone systems and computer terminals. Most recent developments have involved graphic displays of status boards showing freeway conditions which are available on cable T.V. and on-line on the "Internet". Other media interfaces involve cellular phones and fax services as well as on-board computers to aid in-vehicle navigation.

A number of comparable experiments have recently been undertaken with Advanced Traveler Information Systems (ATIS). Examples are:

- SmarTraveler in Massachusetts offers traffic and public transportation information via telephones. (Multisystems, 1994)

- Trans Action Network an experiment with four multi-media kiosks which supplied transit planning and ridematching information in the Coachella Valley area of Southern California. (Commuter Transportation Services, Inc and SunLine Transit Agency, 1995)

However, the Los Angeles Smart Traveler Field Operational Test(FOT) is one of the largest and most comprehensive ATIS experiments to date. The system is fully multi-modal, offering traffic, transit and ridematching information. Three media interfaces are used: multi-media kiosks, touch tone telephones and PC modem links. This FOT was envisaged as an opportunity to test the delivery of multi-modal traveler information through a variety of interfaces. In order to do this a high level of multi-agency coordination was required to link and manipulate data sources. The major partners in this project are: State of California, Department of Transportation (Caltrans), the Los Angeles County Metropolitan Transportation Authority (LACMTA), the regional rideshare agency Commuter Transportation Services, Inc. (CTS), and the computer operations staff at the State of California, Health and Welfare Data Center (HWDC), Sacramento. The agencies were supported by Pacific Bell and Pacific Bell Information Services, the IBM Corporation and North Communications in the development and implementation of the project.

### 1.2 The Los Angeles Smart Traveler Field Operational Test

This project seeks to evaluate the performance and effectiveness of the Smart Traveler Advanced Traveler Information System. The Los Angeles Smart Traveler Project is a part of the new technology demonstrations being carried out by the California Advanced Public Transportation Systems (CAPTS) Group, within California's Department of Transportation. The original design of the project was confined to a single corridor. However, in response to the Northridge Earthquake, the project was reoriented and expanded. An original limited scale field operational test based on the I-I 10 corridor was switched to target the earthquake affected areas of: the San Fernando Valley, Santa Clarita Valley, Palmdale area and West Los Angeles. The refocussed study has greatly broadened the scope of the evaluation.

Smart Traveler focusses on out-of-vehicle information systems and provides information concerning: transit routes, fares and schedules; traffic conditions on the freeways; and ridematching information for ridesharing. Three different media systems are utilized: automated multi-media touch screen kiosks; PC-modem software; and an automated telephone system. The characteristics of the systems and information available are summarized below.

#### 1.2.1 Smart Traveler Kiosks

The kiosks are multi-media touch screen operated information systems. They give access to full transit information and automated rideshare matching services. Menus are bi-lingual (English and Spanish). In addition, they have current Caltrans freeway information (generated by the MODCOMP system) displayed on a map showing any delays that may be occurring. The freeway'information is continuously updated. The kiosk is equipped with a printer that can be used to print transit and ridesharing information. ( The freeway map of current conditions cannot be printed.) The kiosks are also equipped with laser disks that offer short videos on a variety of topics associated with Caltrans, transit and ridesharing. The videos add an educational dimension to the kiosks which are already a rich source of information for the traveler.

The kiosks are linked by dedicated digital phone lines to the HWDC central computer in Sacramento which allows them to access the LACMTA rail and transit data base, the CTS ridesharing data base and the Caltrans freeway graphics system. For the first time they make a wealth of information available, at a single location, at no cost to the traveler. A special feature of the kiosks is the ability to print information. For example a printout of a requested bus route will show the departure location, bus number and direction, time of departure, time of arrival, the fare to be paid and the approximate trip time. Similarly, those searching for carpool partners can print out the names and telephone numbers of potential partners.

### 1.2.2 Smart Traveler Automated Ridematching Service (ARMS)

I-800 COMMUTE is a free service to the public which was adopted by transportation providers as a post earthquake travel advisory service. Information is provided on transit and rail routes, fares and schedules, freeway routes and alternatives and information on telecommuting. Direct access by menu selection is also given to the regional rideshare agency Commuter Transportation Services (CTS). CTS responds to requests for carpool and vanpool matching and registration. Prior to the introduction of Smart Traveler, a caller would be connected to a CTS operator to request ridematch information.

On June 30, 1994, Smart Traveler was incorporated into the I-800-COMMUTE service. This feature allows individuals to use their touch tone phone to find rideshare partners quickly and effectively. It is designed to provide individuals with lists of potential compatible rideshare partners for either regular carpooling or an occasional emergency ride home. As with the kiosks, the service is available in both English and Spanish. For the purposes of finding either regular rideshare partners or a once only ride, those using the system use the touch tone phone to enter changes in preferred travel times. They receive a computer generated list of people to contact who live and work near them with similar schedules. The individual can then choose to call some or all of the people on the list, or record a message that Smart Traveler automatically delivers to potential carpool partners, allowing them to call the individual back if they are interested in sharing a ride. This automated call-up feature is a unique aspect of the service. The ability to record messages which the computer then dials and leaves with the potential rideshare match is intended to help speed responses.

### 1.2.3 Smart Traveler PC Modem Software

The PC Modem software was intended to provide access to the three data sources via modem. This element was planned to have a phased introduction. Version 1 of the PC software gives access to the freeway conditions information. The package began distribution and service May 30, 1994. Later versions were intended to integrate the rail and transit routes, fares and schedules information and the ridematching service. Effectively this software can bring the kiosk to an individual's own desk, thereby greatly increasing the convenience of using Smart Traveler. An added feature over the kiosk version is the ability to zoom in on certain sections of the freeway and thereby view conditions in greater detail. The software was distributed at no charge for the demonstration project, but the individual or company pays the telephone charges associated with modem use.

### 1.3 The Objectives of the Field Operational Test and Evaluation

The Federal Transit Administration has developed the Advanced Public Transportation Systems(APTS) Program as an integral part of the overall U.S. DOT Intelligent Vehicle Highway Systems (IVHS) effort. Aims of the program are to promote research and development of technological applications which can be expected to enhance the-ability of public transportation systems to satisfy customer needs and if possible contribute to the achievement of broader community goals and objectives.

The pursuit of effective traveler information systems is but one part of an ongoing effort to reduce the impact of traffic congestion and improve air quality. These twin goals have their origins in the Clean Air Act of 1970 and the amended Clean Air Act of 1990 together with the ISTEA of 1991 (Intermodal Surface Transportation Efficiency Act) which strengthens this commitment by firmly linking transportation and air quality policy. Traveler information systems have the potential to support policy efforts aimed at influencing travel behavior. Seeking alternative routes of travel to avoid congestion, changing times of travel, changing travel modes to transit and ridesharing are all possible means of beneficially influencing both traffic congestion and air quality.

At the local level the significance of mobility for maintaining the health of the California economy is also recognized. It is vital to keep California moving even in the event of naturally caused traffic disturbances such as weather, fire, and earthquakes or major planned events such as the Olympics. For all these reasons, improved traveler information systems are seen as an important policy tool. The questions are: which further media and multi-media improvements should be pursued, how cost effective will they be and to what extent can they satisfy a broad range of traveler demands?

Smart Traveler FOT objectives were further defined by the study team as follows:

To demonstrate the feasibility of using multimedia kiosks, automated telephone (Audiotext), and PC via modem to provide transportation system information to travelers.

To demonstrate the feasibility of providing transportation system information in different settings.

To demonstrate the feasibility of providing flexible and temporary rideshare services.

To demonstrate the effectiveness of using information to influence travel behavior.

To demonstrate the effectiveness of using flexible and temporary rideshare services to increase transit and carpool travel.

To demonstrate the effectiveness of a centralized clearing house of travel and transportation information in reducing or eliminating interagency barriers.

These objectives form the basis around which the evaluation plan was constructed:

The Advanced Public Transportation Systems: Evaluation Guidelines (1994), prepared by the Volpe National Transportation Systems Center suggest six possible categories of evaluation. Four of these apply to the Smart Traveler Project. They are:

Financial Impacts
Functional Characteristics
User Acceptance
Other Impacts

Financial impacts includes all fixed and variable costs associated with the development, operation and monitoring of the service. Functional characteristics include the reliability and maintenance of the ATIS hardware and software. User acceptance includes the extent to which the service is used and the user perceptions of the service. Other impacts includes the effectiveness of the service in terms of the basic program objectives of increasing the level of transit and ridesharing within the area. It also includes the institutional challenges related to interagency coordination and cooperation associated with the project.

Based on the above requirements, an evaluation plan was developed which entailed the following:

1. To monitor and evaluate use made of the Smart Traveler elements using reports based on automated data to the extent possible.

2. To evaluate the reliability of the systems and their maintenance requirements through automated and manual reports and records.

3. To simulate and experiment with the systems, to test their designs and functioning against their intended purposes.

4. To investigate user acceptance and perception of the value of the systems through data to be collected from user surveys.

5. To perform a full financial analysis using data to be supplied by the project monitors.

## 1.4 The Implementation of the Smart Traveler Project

### 1.4.1 Northridge Earthquake Induced Changes and Consequences for the Project

#### The Original Smart Traveler Field Operational Test

The Los Angeles Smart Traveler Project was designed as part of the l-l 10 Corridor Traffic Management Plan(TMP). The purpose of this plan is to mitigate traffic congestion problems during construction of the l-l 10 Harbor Transitway. Smart Traveler was one of several programs aimed at increasing ridesharing and transit use. The project was to have been a small scale test of three media interfaces designed to convey transportation information to travelers. The media interfaces were: multimedia kiosks, automated telephone and PC via modem. Three kiosks were to be installed in activity centers within the corridor and would give access to freeway, transit and ridesharing databases. The automated telephone service was to have provided transit and ridesharing data to the general public, and 100 copies of the PC modem software were to be distributed to employment sites, hotels libraries, schools and selected homes. The TMP effort was to have been supported by a six to ten month marketing campaign focussed on the corridor beginning in January 1994. The marketing campaign was to have been a home-base project using direct mail, bus benches, employer posters, local radio, door hangers and newspaper ads.

Development of the project began in November 1992 with early work being directed toward the design of the kiosk concept. By March of 1993 the project had evolved to include the automated ridematching service and the PC-modem software. The evaluation team was selected and designed an evaluation plan which would commence with the implementation of the project in January 1994.

#### Effects of the Northridge Earthquake on the FOT

The Northridge Earthquake which occurred on January 17, 1994 presented a series of challenges and constraints. Earthquake relief funds (through the Federal Highway Administration) were used to expand the project. The earthquake relief program stipulated that all expenditures were to be made by July 17, 1994 i.e. six months after the earthquake occurred. The funds could only be used to supplement state funds that were otherwise available and the use of the funds had to be targeted to the earthquake affected region. The expansion had profound effects for both the scale and location of the FOT.

- The number of kiosks to be field tested rose from 3 to 77. The map at the back of this report shows all kiosk locations.
- Distribution of the PC modem software was increased from 100 to about 500.
- The service area for the trial of the automated telephone service increased. It became part of a I-800 traveler information service established shortly after the earthquake.

The project expansion took place at a time when Caltrans staff were under great pressure to repair the freeway system damage caused by the earthquake. This was a period in which the management and design of the project deployment also changed dramatically. The new scale of the project necessitated a shift incentral computing activity from the local agency MTA computer to the Health and Welfare Data Center computer in Sacramento. This led to changes in contracting at both the hardware and software level. Timetables for testing and deployment were greatly compressed. This led to difficulties with marketing the new services (especially the kiosks) since site locations could not be mapped and promoted in time for their deployment. Also, marketing for ARMS could not be developed and mailed quickly enough to meet the implementation deadlines, and funds for long term marketing were not available. The PC-modem element was divided into two phases. Version 1 contained only the freeway information. Version 2 included the addition of transit and ridematching information but became delayed by staffing difficulties. The delays eventually led to the dropping of this Smart Traveler element in late January of 1995.

**Effects of the Changes on the Smart Traveler Evaluation**

Changes in timing and scope also affected the evaluation. (See School of Urban and Regional Planning, 1994). A key element for the evaluation was the extraction and handling of the automated data generated by both the kiosks and ARMS. These data track use of Smart Traveler systems. The scale and complexity of the project and the numbers of contractors involved created resource problems for the reporting of these data. Ultimately the evaluation team committed their own resources to the analysis of the raw data from the 77 kiosks instead of using the expected summary reports. In the case of ARMS data the team relied on data supplied by contractors. Due to limited staff resources at LACMTA PC-modem use data became available only at the very end of the project. This eliminated any opportunity to monitor or make adjustments over time to its evaluation.

A major difficulty for the evaluation was the manner in which the expansion of the project skewed the majority of the data collection effort so that most user survey work had to be performed and reported prior to the July 17th deadline. In the case of the kiosks this meant that surveys were conducted immediately following installation when all users were effectively first time users. This means that no evaluation of one-time versus repeat users is possible.

In the case of ARMS, implementation of this element was so delayed that a majority of the survey work focussed on the evaluation of the potential user market, rather than users of the actual service. The potential user market was defined as those registered with CTS. Functional difficulties with the service operation and malfunctioning in the reporting mechanism delayed any survey of actual users until the end of the project. At this point budget constraints and low levels of use influenced the sample size and survey method. A qualitative survey of users was substituted for a quantitative survey. Nevertheless, the combined survey approaches provide useful insights into the potential effectiveness of this service.

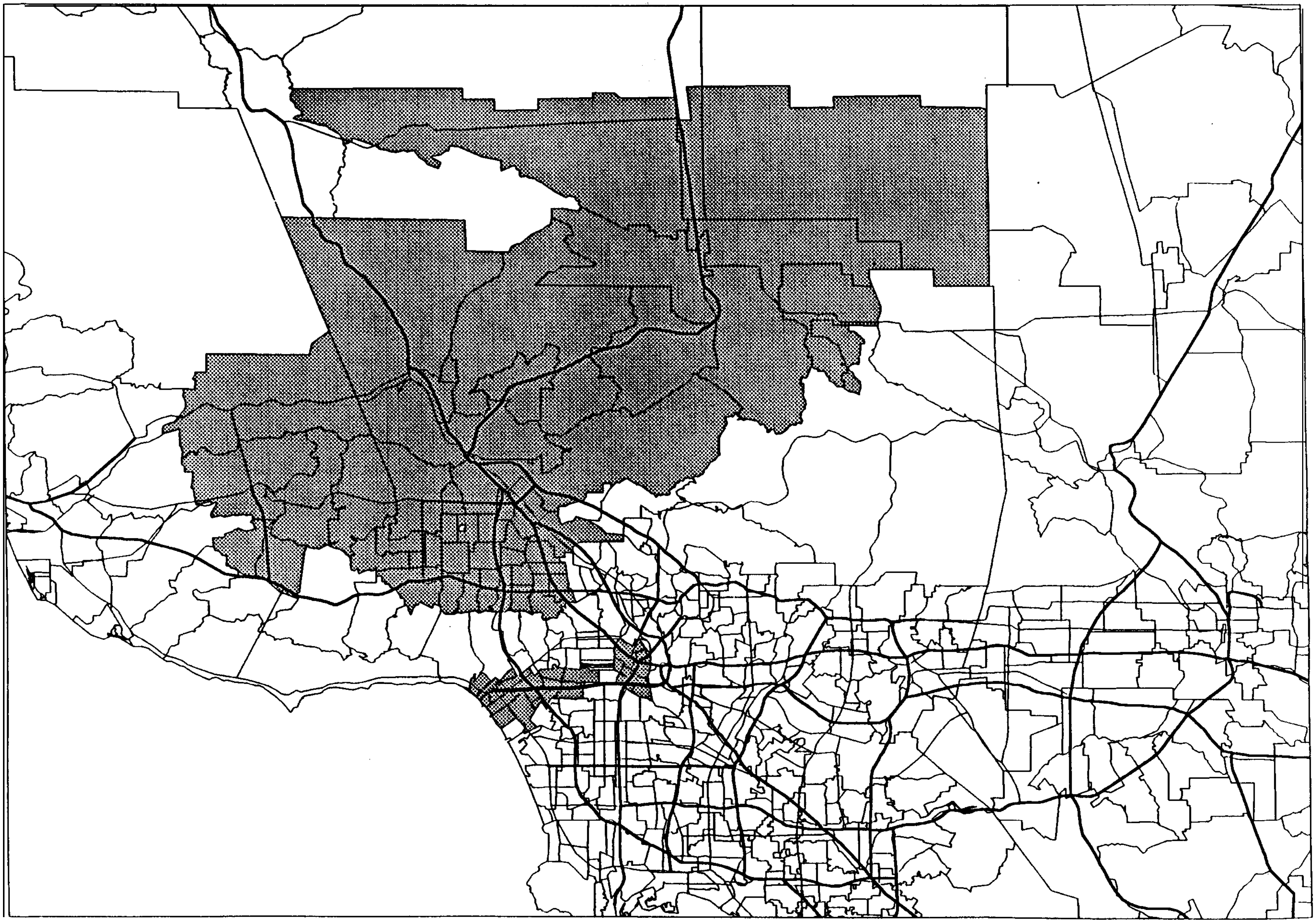
### 1.5 Location of the Test Site

The Smart Traveler program was targeted to the area within the Los Angeles region that was most seriously impacted by the Northridge earthquake, as shown in Figure I-I. Kiosks were located at employment sites, retail sites and public venues within the target area. (See the fold out map included in the back of this report).

The ARMS service was also targeted to this area. Promotional information was mailed to circa 68,000 commuters registered with CTS and listed as living and or working in the target area.

The Smart Traveler PC modem software was initially distributed to a limited set of employers within the target area. Subsequent distribution was on request. The PC modem software was intended to be available to dispatchers, truckers, sales representatives, messengers and other commercial travelers as well as to commuters.

Figure l-l Smart Traveler Emergency Response Target Area



# CHAPTER 2 SMART TRAVELER INFORMATION SYSTEMS

This chapter describes key components of the Smart Traveler system, and provides an assessment of their capabilities.

## 2.1 TECHNICAL DESCRIPTION OF SMART TRAVELER SYSTEM

On a technical level, elements of the Smart Traveler system include interfaces, communication media, host computers,, and databases. The system as a whole is depicted in Figure 2-l. PC Software and the telephone based automated ridematching service interfaces reside in individuals' homes and places of business, whereas kiosks reside at a select group of commercial and office locations characterized by high foot traffic. The kiosk accesses information on bus-routes, car pools and highway congestion via the IBM 3090 computer at California Health and Welfare Data Center, located in Sacramento. This computer in turn accesses databases at Caltrans, CTS and MTA. The PC software operates through the MTA computer (this was not originally intended to be a permanent solution). The automated ridematching provides direct access to CTS via Pacific Bell.

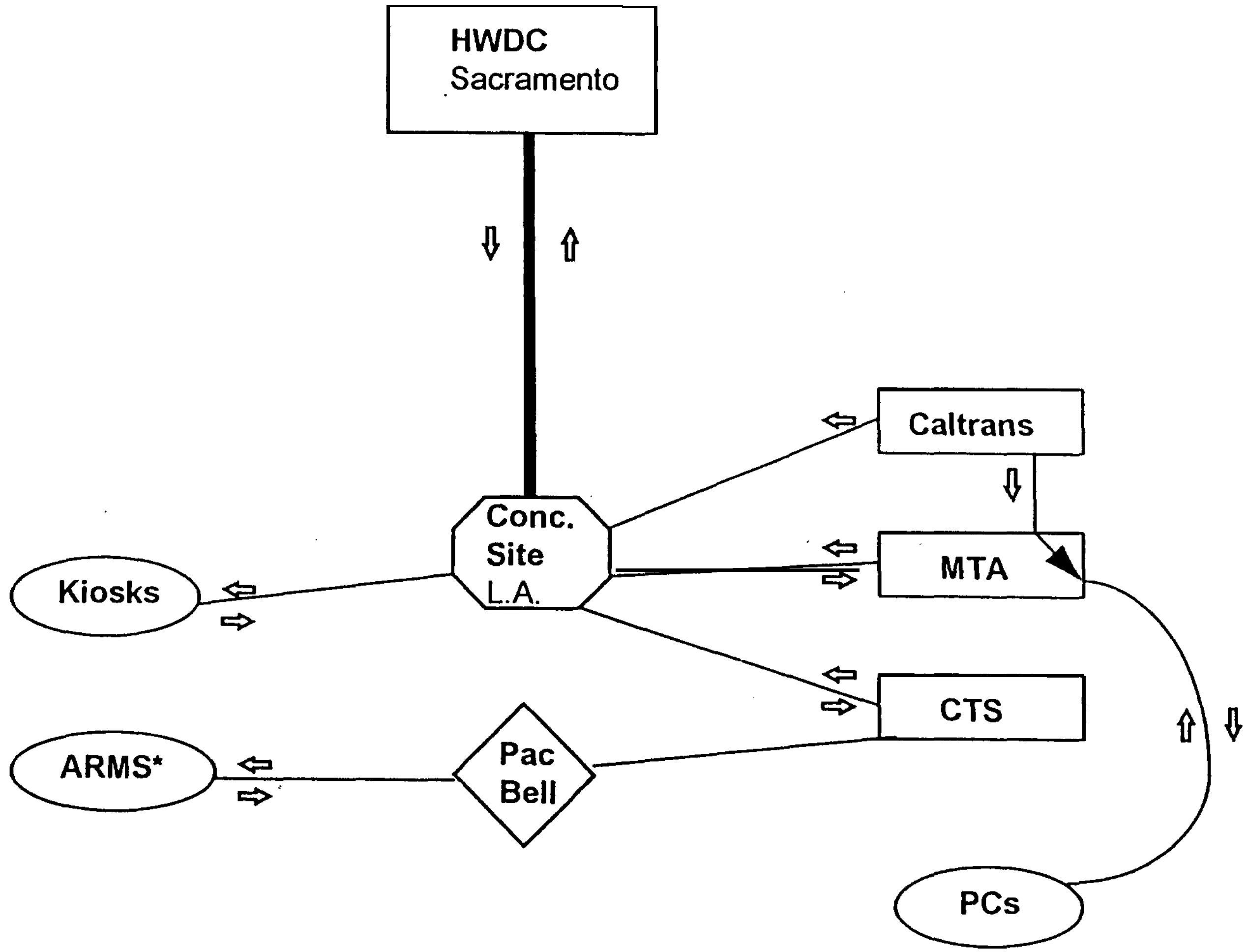
### 2.1 .1 System Interfaces

**Kiosks:** The kiosks are a multi-media personal computer based system for accessing information on bus routes, carpools, and freeway congestion, and for viewing videos on various transportation topics. System components include:

- an IBM PS/2 personal computer (based on the 486 Intel chip)
- a Pioneer LDV-8000 laser disk player
- Computer interface IBM 8516 touch-screen monitor
- MagnaTek commercial grade 40 column printer

The kiosks are totally self-contained; only the touch-screen is visible to the user. Videos are stored on laser disk. Bus route, carpool and freeway congestion databases are accessed via modem. The kiosk displays are in textual form, with the exception of freeway congestion, which is displayed on a map. The printer allows users to print and take home transit route directions and carpool match lists.

Figure 2-1 Smart Traveler System Diagram (Present)




* Automated Ride Matching Service

**PC Software:** The PC software accesses only the freeway congestion map, though it was originally intended to include carpool and bus schedule information, Freeway data is accessed via one's own computer. Smart Traveler Version 1 .O PC software requires the following equipment:

- IBM-compatible computer of at least 286 capability
- Color monitor (CGA, or EGA, or VGA)
- Hayes-compatible modem capable of 2400 bps, connected to port COM1 or port COM2,
- Two megabytes of random access memory (RAM) for the VGA version, 640 KB for the CGA version,
- A hard disk drive with 750 KB available for the VGA version, 400 KB for the CGA version, or two diskette drives, one of which must be HD for the VGA version.
- DOS operating system, version 3.3 or later,
- Single-party, tone controlled telephone line connected to the modem. "Call Waiting " feature is not recommended for this line, because the codes generated by a second call may interrupt *or* garble communications during the Smart Traveler cycle.

A technical support line for the service was available until July 17, 1994. After this time questions were directed to the project manager.

**Automated Ridematching Service (ARMS):** This is a feature within Caltrans' toll-free I-800-COMMUTE line, as described earlier. The service is available to residents of the earthquake affected region and to employees of a select group of companies. *Users must be pre-registered with CTS.*

ARMS Design:

- Menu driven, touch tone telephone interface
- User enters pre-assigned identification number to gain access to the system

Two Options:

- Manual option: User listens to names and phone numbers of potential match through synthesized voice. User is then responsible for phone calls.

- Automated messaging feature: Records a message by speaking into the phone, which is then automatically relayed to persons on the ridematch list through automated dialing. The user must wait for call backs.

- Users can also change departure and arrival times to generate new match lists. These changes are only temporary and do not alter the users record with CTS.

### 2.1.2 Communication Links

Communication links are required to connect kiosks to the HWDC computer, and to connect the HWDC computer to participating agencies, and to connect personal computers to MTA. Communication links are also required for the automated ridematching service access.

**Kiosks:** As illustrated in Figure 2-1, kiosks access the HWDC computer via a concentrator, which is operated by HWDC at a Downtown Los Angeles location. PacBell and, to a lesser degree GTE, provide leased ADN (advanced digital network) service to the Kiosks, which communicate with the concentrator via modem. PacBell provides a T1 phone line connection from the concentrator to HWDC. This high capacity (24 channel) line is capable of transporting all types of signals, data and voice. All communication takes place via modems operating at a speed of 19.2 KBaud.

Communication between HWDC and computers at participating agencies (Caltrans, CTS and MTA) is also via the concentrator. PacBell provides leased ADN (advanced digital network) lines for agency connections. Communication from HWDC to the concentrator occurs over the same T1 line that is used for kiosks.

**PC Modem:** Communication for the PC modem goes to the MTA computer, which then polls the Caltrans computer.

**Automated Ridematching Service:** The automated ridematching service is accessed via ordinary touch-tone telephones, through the number "1-800-commute". Automated ridematching is one of several options available through this toll-free number. The connection is of the "Centrex" type. It behaves like a PBX type system, except that all connections are routed through the central PacBell office. The PBX acts as a switchboard. At the user site, up to 80 lines per connection may be used as a “hunt group” (i.e., an algorithm hunts for a free line, jumping busy lines in doing so). Within the automated ridematching service system, there are some voice mail lines too. These carry user suggestions and comments to voice mail boxes. In addition, voice mail messages can be automatically relayed from the caller to persons on the match list, for the purpose of forming car pools. This system is designed to only relay the message if the phone is answered by a person, and not an answering machine, but will dial up to five times (at 30 minute intervals), or until a connection is made. (The message does not begin playing until the recipient of the call enters a key on the phone.)

### 2.1.3 Computers

**Caltrans:** A ModComp computer, coupled with the Traffic Vision application program, is used to generate the speed condition map for the Los Angeles region. (Traffic Vision was developed by JHK & Associates and is used throughout the U.S.) In addition to Smart Traveler, the map data are received by various private companies and broadcast media.

This map is based on data provided by Caltrans’ 170 controllers in the field, which provide updates on traffic volume and occupancy (proportion of time that a detector is covered by a vehicle) at 30 second intervals. These data are processed to derive estimated speeds, and to categorize these estimates. Subsequently, portions of the freeway are color coded to represent the speed categories. The data for HWDC are updated automatically every 30 seconds through a one way data line, independent of the number of requests for the information. A freeway condition request from a PC or kiosk, therefore, does not reach the Caltrans system. It is satisfied at the HWDC stage of the network.

**CTS:** A DEC VAX microcomputer is used, running under the VMS operating system. The core database is called Ridestar, which supports different application software programs. This database was designed for access via trained operators. The database information is limited to the counties of Los Angeles, Orange, Ventura and San Bernardino.

**HWDC:** HWDC is responsible for bringing the whole system together. HWDC was selected because of its experience in developing “InfoCal”, a computerized kiosk system with intended statewide application. HWDC's mainframe IBM 3090 computer acts as the central processing unit of the whole system. Its major role is to obtain information for Caltrans, CTS and MTA databases, in response to requests from kiosk users, and put the information in a format that is compatible with kiosk software. The system has been made compatible by making dialogue between disparate operating systems possible.

**MTA:** An IBM mainframe 3090 is being used, similar to the HWDC system. The TransLink database stores information on bus routes and schedules. Ordinarily, this information is accessed via MTA's trained operators, but HWDC provides an automated link to the bus schedule database.

## 2.2 EVALUATION OF SYSTEM COMPONENTS

This section discusses the capacity and reliability of system elements. Due to relatively low usage, capacity did not prove to be an issue for any of the three elements, so relatively little detail is provided. Detailed data was available on kiosk maintenance, which is analyzed in detail. Little was available on ARMS reliability because it did not become fully operable until January of 1995, when data collection was scheduled to end. No data was available on PC software reliability, because there was no way to collect information on it.

### 2.2.1 System Capacity

System capacity can be viewed in terms of the capacity as implemented, and in terms of the ultimate capacity possible through system expansion. In either case, critical defining elements include the following:

**Kiosks**

- In the case of kiosks, capacity depends on the number of kiosks deployed, their service capacity, and the percentage of time that they are accessible and working. Based on our time analysis (Chapter 3), kiosks can serve 5-l 0 customers per hour. With an installed base of 77 kiosks, total capacity is on the order of 500 customers per hour. The total kiosk capacity is readily expandable through additional purchases.

- Communication capacity is limited by the number of phone lines provided, the capacity of the HWDC concentrator, and the capacity of the leased line connection between the concentrator and HWDC. Current capacities appear to well exceed projected demand. Should more kiosks be installed in the future, communication capacity is readily expandable through leasing more lines.

- HWDC computer. The ultimate capacity could not be ascertained. However, because it only acts as a switching device, capacity is unlikely to be critical.

- Caltrans computer. Speed maps are already routinely generated, so Smart Traveler poses no substantial computational demand. The Caltrans computer poses no practical limit to system capacity.

- CTS computer. Because the CTS computer must respond to customer queries, Smart Traveler imposes a new computational burden, which increases linearly with the number of requests served. Given the current size of Smart Traveler, and the small number of ridematch requests, this burden is small relative to the current number of customers served. If Smart Traveler is expanded substantially, it remains to be determined whether CTS poses a constraint, but this is unlikely.

- MTA computer. The MTA computer already must respond to thousands of requests for schedule information per day. While Smart Traveler imposes a new computational burden, this burden is relatively small. Ultimately, if Smart Traveler is expanded substantially, it remains to be determined whether MTA poses a constraint, but this is unlikely.

**Automated Ridematching Service:**

The automated ridematching system has fewer elements than kiosks:

- Communication capacity is limited by the number of phone lines provided at I-800-COMMUTE, but this is readily expandable. Furthermore, ARMS constitutes just 15 percent of the incoming calls to I-800-COMMUTE. Capacity is also limited by the number of ARMS ports on the 1-800-COMMUTE line. There are ten ports, which far exceeds current requirements (should be sufficient to accommodate a 1 O-20 fold increase in demand). Capacity is also limited by the number of phone lines between PacBell and CTS. The single existing line is sufficient to serve demand. Capacity is readily expandable.

- CTS computer. Because the CTS computer must respond to customer requests, ARMS imposes a new computational burden, which increases linearly with the number of requests served. Given the current user base, this burden is small relative to the current number of customers served. Ultimately, if the automated ridematching service is expanded greatly, it remains to be determined whether CTS poses a constraint. Based on usage to date, this seems implausible.

**PC Software**

- There appears to be no practical limit to software distribution, with the exception that Smart Traveler may find it difficult to support customer inquiries and software reproduction without budgeting accordingly.

- The current system for accessing data (through MTA) was never intended to be permanent. With the relatively small number of users, capacity does not appear to be an issue. If the software receives larger scale distribution, then alternate means for accessing data may be needed, either through HWDC or directly to Caltrans.

### 2.2.2 Reliability

System reliability for the kiosks was analyzed in detail through tracking maintenance records provided by HWDC. A brief discussion is provided on ARMS. No discussion is provided on the PC software due to the impossibility of collecting data from user sites.

**KIOSKS**

We define as a failure any event that results in all or part of a kiosk becoming inoperable, from the kiosk power source being turned off, to a hardware malfunction. The main source of data was HWDC, Sacramento. The procedure for data collection was as follows: The kiosks were monitored at two separate locations using similar software called "Netview". The software has the capability to run on both mainframe computers and on IBM-PCS. This allows it to provide interaction between the kiosk -- running on a PC -- and the monitoring facility, which utilizes the mainframe. The two locations that monitor the kiosks are:

- Health and Welfare Agency Data Center (HWDC), Sacramento
- IBM Network Competency Center (NCC), San Ramon

The HWDC unit and NCC are operated independently and have demarcated areas of maintenance responsibilities. "Network" failures (i.e., line, communication, or connection fault) fall within the domain of HWDC. "Hardware" failures (i.e., Kiosk malfunctioning) fall within the domain of NCC.

HWDC largely relies on software methods to fix their problems. Some HWDC problems require assistance from two companies: PacBell and Cordoba. PacBell takes care of the line failures. Cordoba's primary responsibility is to carry out periodic preventive maintenance on the kiosks. This takes place approximately on a 20 day cycle. It allows them to assess the kiosks overall condition. Thus, they also serve as HWDC's "eyes" in the field. In addition, they carry out minor repairs on behalf of HWDC.

The on-line monitoring of kiosks at HWDC takes place between 6:00 a.m. and 6:00 p.m. on weekdays. Sometimes there is overtime and weekend monitoring. When either one of the monitoring centers detects a failure that appears to be in the other's domain, they exchange information.

Kiosk failure documentation takes place in the form of "Tickets". A ticket is "opened" to handle a failure at a kiosk location. When the problem is rectified, the ticket is "closed". One ticket may have more than one failure stated on it. The duration of time that a ticket remains "open" varies from minutes to days. Appendix A provides a sample record to illustrate the complexity of these tasks. In some cases, a ticket may have remained open after the problem was rectified. However, these tickets provide the best available data.

## DATA ANALYSIS

Three forms of data analysis were conducted:

(1) Classification of failures
(2) Calculation of time to repair
(3) Counts of failures

The respective methodologies are described below.

**CLASSIFICATION OF FAILURES** Because the ticket does not precisely classify failures, some judgment was required to assess cause. Failures were classified according to 8 broad categories.

"Other failures" refer to unclassifiable failures. "Unidentified failures" refer to failures that were fixed before a satisfactory diagnosis could be performed. Failures that dealt specifically with the kiosk screen were classified in the Audio/Video category, as were the sound failures. These may include failures due to any number of reasons, e.g., software, communication. However, in many cases, an exact cause was not known and a combination of methods resulted in correcting the failure. All other hardware and software failures were then grouped together as Hardware/Software failures.

**TIME TO REPAIR** Some records show multiple start and end times, depending on whether multiple service calls were required to repair the failure. In some cases, an initial repair failed to correct the problem, resulting in continued downtime. Sometimes, subsequent service calls were made after the problem was resolved, because a properly functioning kiosk appeared to be malfunctioning. Furthermore, some tickets contain discrepancies between values for "time entered" and the time that the service call took place. All-in-all, some judgment was required to determine time to repair, which was calculated as the time between when a failure was first detected and the time when the failure was corrected. The "Average time to fix failures" was computed by averaging the correction times from the tickets. This average was also multiplied by the average number of failures per kiosk, to give average down time per kiosk. The average down time per kiosk was then used to derive the percentage of time that kiosks were available for use (which is the average up time per kiosk, divided by total time of test, multiplied by 100%).

**COUNTS OF FAILURES** The number of reported failures was counted for each month and plotted for the September 1994 to January 1995 period. In addition, the total number of failures was counted and plotted for the entire set of kiosks. In addition, an ordinary least-square multivariate regression was performed to determine whether the number of failures was correlated with measures of system usage.

## RESULTS

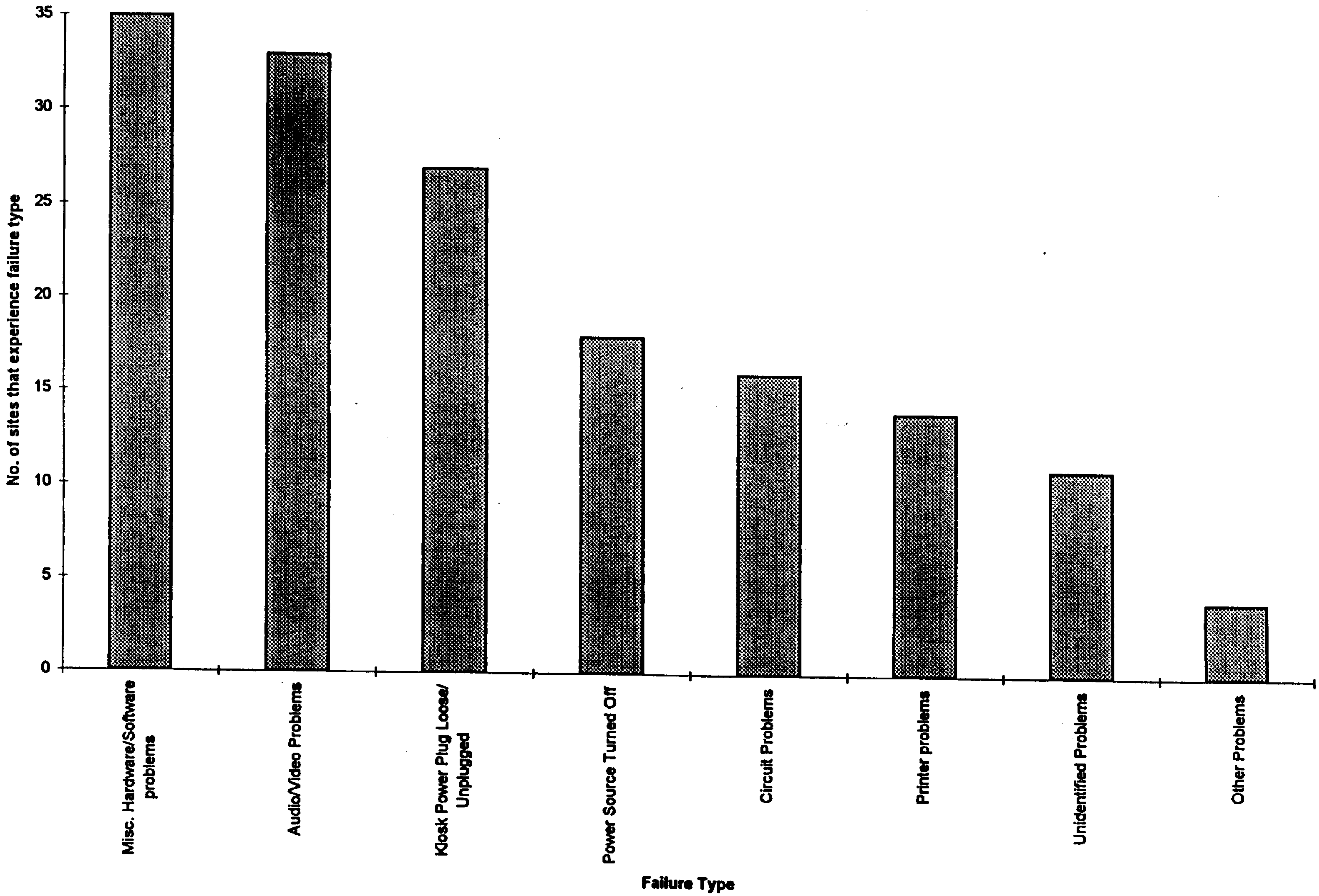
**CLASSIFICATION OF FAILURES** As shown in Table 2.1 the biggest category of failures is "miscellaneous hardware/software problems", amounting to 59 failures and a quarter of the total. More than half of these failures were rectified by rebooting the kiosk computer. The second biggest category (at 21 percent) was audio/video failures, the majority of which were video failures. The most common sign of video failure was in the form of a screen getting stuck or "frozen". The most common remedy was rebooting of the kiosk. There were 42 occurrences of a loose or unplugged power plug, accounting for 18 percent of total failures; 13 percent of the failures were due to the power source being turned off. There were 18 printer failures, with the printer running out paper being the most common (some of these may have been warnings that paper is about to run out).

After looking at the data in more detail, we discovered that certain failure types were concentrated at a limited number of sites (Figure 2-2). 'For instance, only 14 sites produced 20 circuit failures, and only 18 sites experienced 31 "power off" failures. No individual failure category was experienced at more than half of the sites.

**Table 2.1 Kiosk Failures by Problem Type**

| PROBLEM CLASSIFICATION | PERCENT OF ALL PROBLEMS |
|---|---|
| Printer Problems | 8% |
| Power Source Turned Off | 13% |
| Power Plug Loose or Unplugged | 18% |
| Audio/Video Problems | 21% |
| Misc. Hardware/Software Problems | 25% |
| Circuit Problems | 9% |
| Other Problems | 2% |
| Unidentified Problems | 5% |

Fig e 2-2 Failures by pe



**TIME TO REPAIR** Figure 2-3 provides a distribution of the time to repair, measured in days. As shown, the majority of failures (about 2/3) were fixed within one day. However, in several cases, the recorded repair time was unusually long (about 5 percent took more than 20 days to fix); this may be due to delays in recording data rather than actual downtime. The average time to repair was 68 hours, resulting in an average downtime of 8.9 days per kiosk over the test period (meaning about 5 percent were out of service at any given time). Overall kiosk availability was 95 percent, exceeding the contractual requirement of 91 percent availability.

**COUNTS OF FAILURES** Figure 2-4 plots failures by month. After an initial start-up phase, the failures leveled off at about 50 failures per month, yielding a mean-time-between-failures of 1.52 months. Considering that the majority of the failures are minor and easily correctable, and considering that the kiosks come into contact with the general public, a failure rate on this order is quite reasonable.

Figure 2-3 Time taken to fix failure

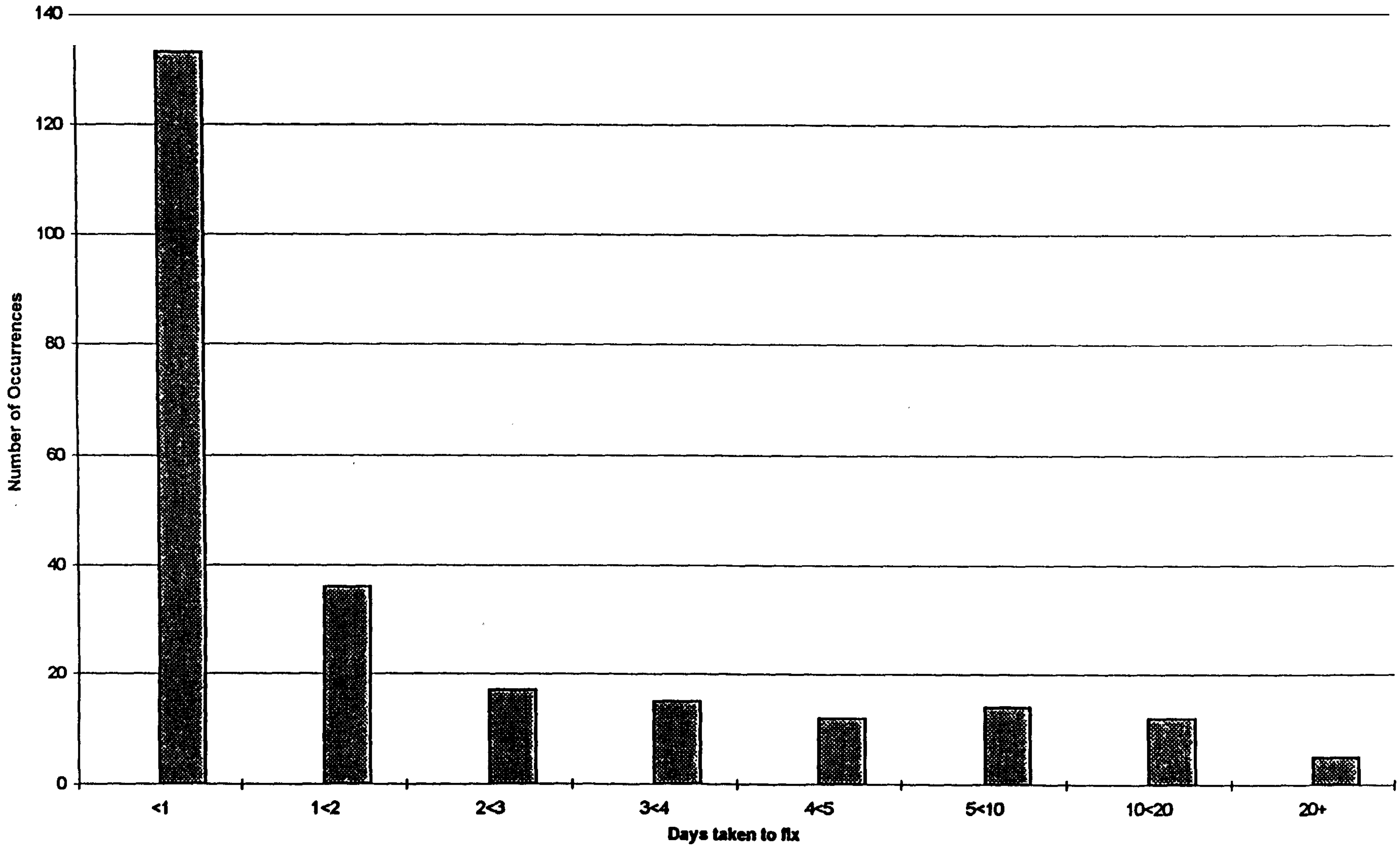
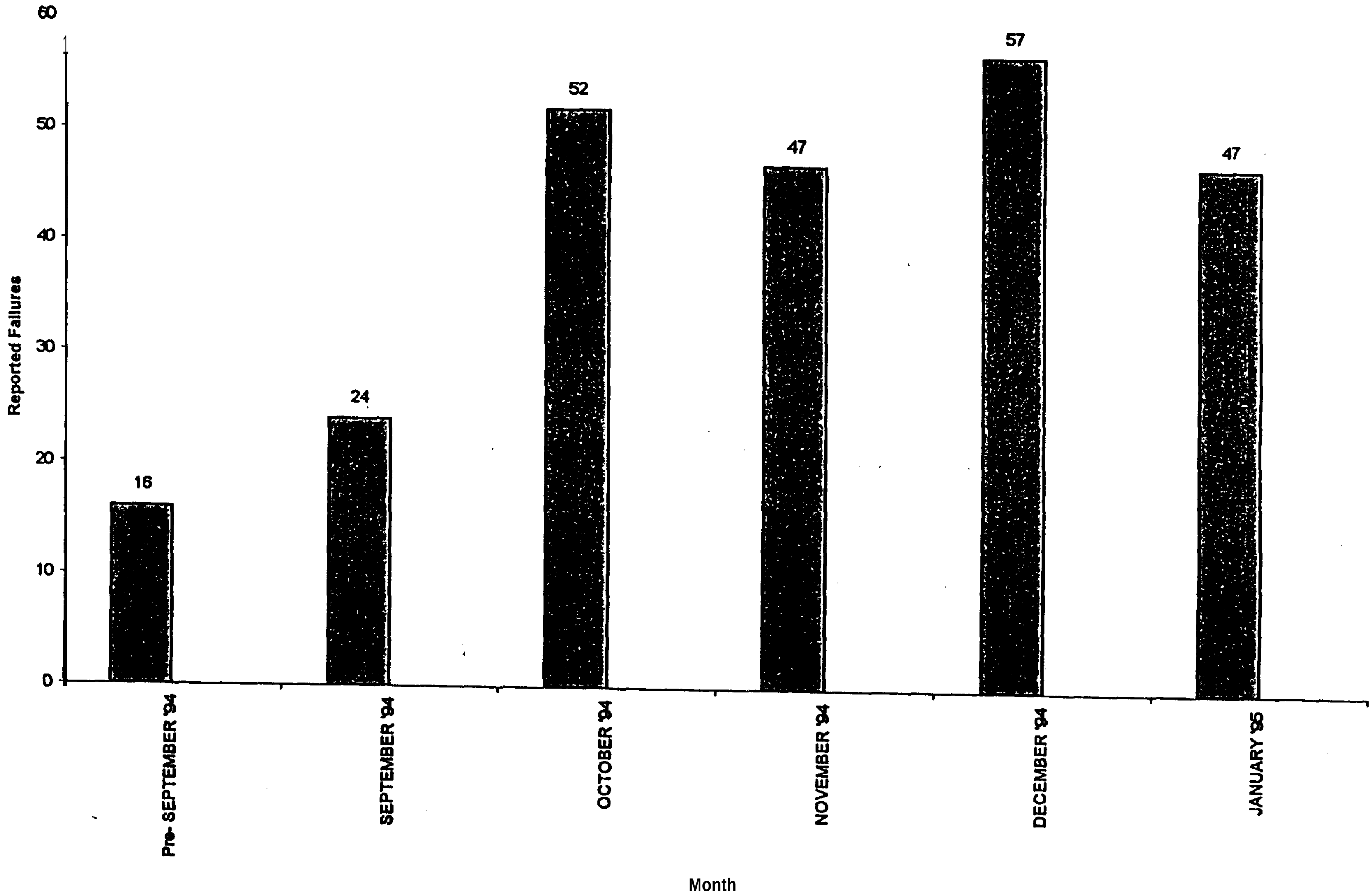


Figure 2-4 Failures by Month



In addition, we examined how failures are distributed among kiosks. Figure 2-5 provides a cumulative distribution of failures across kiosk sites, showing that 17 kiosks are responsible for half of the failures, and approximately half of the kiosks account for 80 percent of failures. The 10 most failure-prone kiosks (accounting for 35.5 percent of failures) are shown in Table 2.2 below.

**Table 2.2 Top Ten Failure Locations**

| SITE CODE | # FAILURES | % TOTAL | MOST COMMON FAILURE |
|---|---|---|---|
| KLA10 | 11 | 4.7% | Power source turned off |
| KLA61 | 11 | 4.7% | Power source turned off |
| KLA18 | 9 | 3.8% | Power source turned off |
| KLA03 | 8 | 3.4% | Audio/video failures |
| KLA15 | 8 | 3.4% | Power source turned off & misc. Hardware/software failures |
| KLA64 | 8 | 3.4% | Audio/video failures & Misc. hardware/software failures |
| KLA38 | 7 | 3.0% | Audio/video failures & Misc. Hardware/software failures |
| KLA54 | 7 | 3.0% | Misc. Hardware/software failures |
| KLA58 | 7 | 3.0% | Audio/video failures |
| KLA69 | 7 | 3.0% | Audio/video failures |
| TOTAL - TOP TEN | 83 | 35.5% | |

Interestingly, the most common problem at the top three locations is a simple one: “power source turned off,,. Figure 2-6 further rank orders failures by kiosk.

## Figure 2-5 Cumulative % of Failures

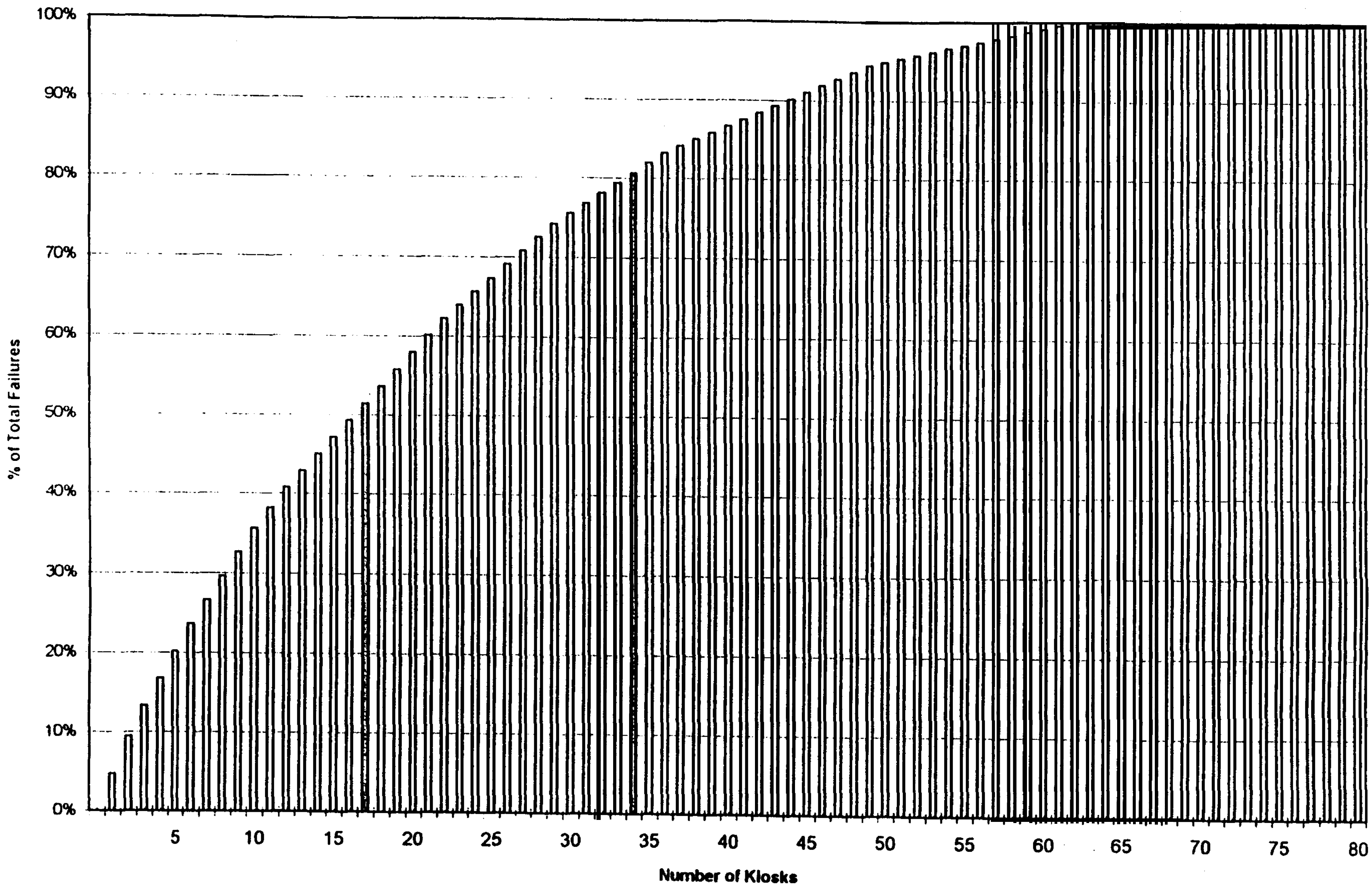
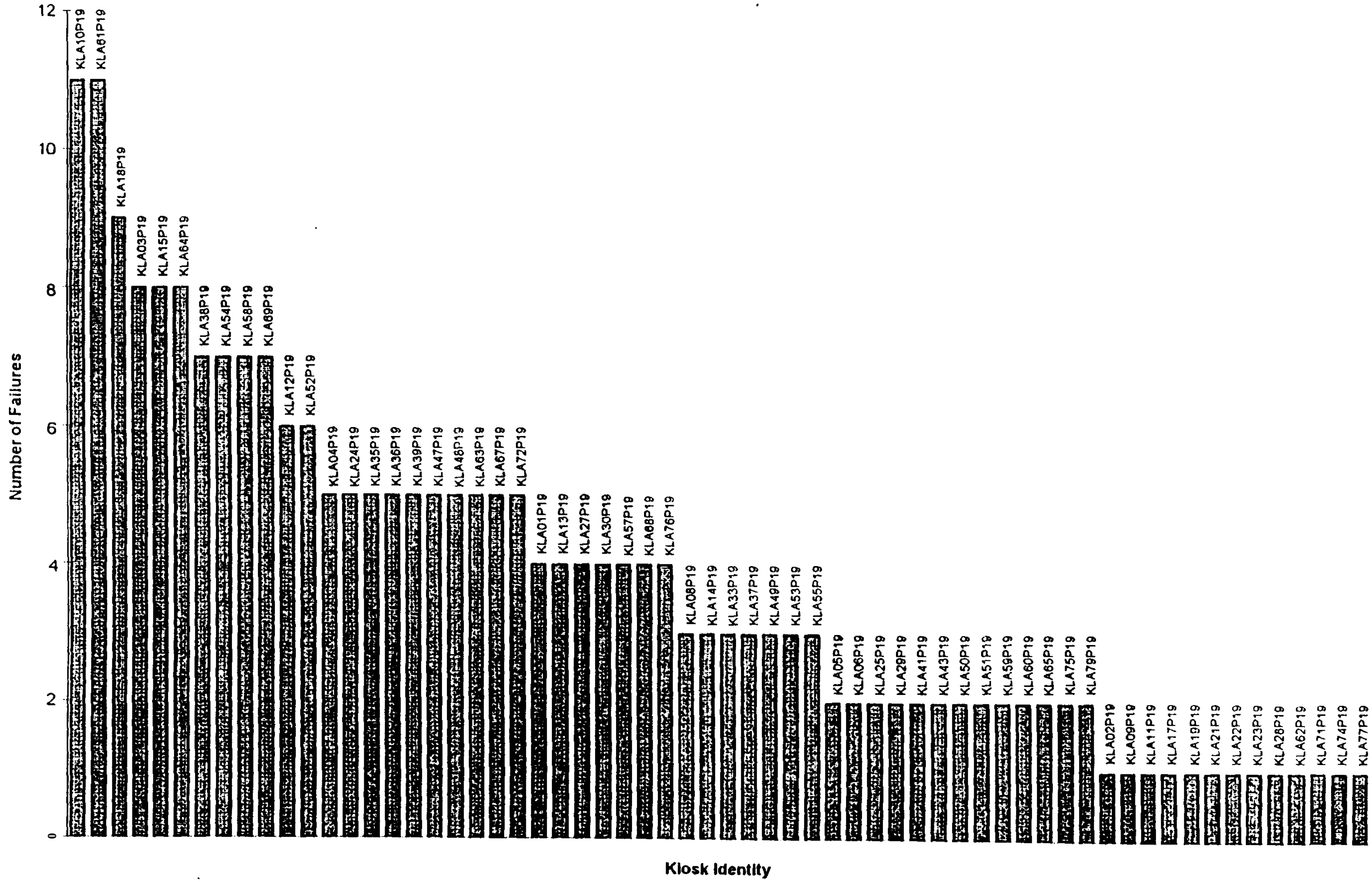


Figure 2-6 Failures by Kiosk



Lastly, we performed a regression analysis to determine whether the number of failures over the test period is correlated with measures of system usage (days in operation, average usage per day, and time in use). We found that failures was not correlated with days in operation and time in use, but it was positively correlated with average usage per day. The specific relationship was:

Failures/Kiosk = 1.75 + (.0493)(average usage/day)

The usage parameter has a standard error of .0188, which makes the parameter significant at the 1% level. To illustrate the equation, a kiosk with average usage of about 25 users per day would expect to have about 3 failures over the test period, whereas a kiosk with high usage of 50 per day would expect to have about 4.25 failures over the test period. This indicates that if usage were to increase, the number of failures would increase as well.

## DISCUSSION

A first observation is that many of the failures are not technical at all, and should be easily corrected. For instance, power failures account for nearly one-third of the total. In some instances, the failure may be due to something as simple as a shopping mall that turns off electricity at night. A more persistent problem occurs in busy locations where the kiosk plug is in an exposed area. The result is frequent unplugging and power failure in the kiosk. The monitoring system receives a signal that the system is down, but cannot "see" whether it is just a plug problem. Each site has a site coordinator for the kiosks. He or she is a regular employee of that local organization with this added responsibility. But the coordinator is not available at all times to check the kiosk when such a problem occurs.

Hardware/software failures, although large in number, are the easiest to correct. The most common remedy is to power the kiosk computer off and on. However, in a small number of cases, some software or hardware repairs/replacements have to be made before powering the kiosk off and on.

The site coordinator is usually issued a key to the kiosk so that he or she may replace the paper in the printer. Running out of paper is considered a failure. In fact, it is a minor problem that can easily be fixed and does not stop the kiosk from operating. However, unless the site coordinator can attend to the problem, someone from Cordoba has to come out and fix this minor problem.

The kiosk does not appear to be robust to power outages. When the power comes back on, the kiosk should automatically reboot, perform systems check and connect back with the HWDC link. This feature is necessary in order to maximize the utility of the whole system. Finally, it appears that site coordinators lack the incentives to attend to minor problems. Ideally, someone should not have to be dispatched to the site to correct minor failures.

Despite these concerns, the system, during the period up to January 31, 1995, had relatively few major problems and showed reasonable reliability for the start-up period (exceeding the contractual requirement for availability).

**Automated Ride Matching Service**

Detailed maintenance records were unavailable for this Smart Traveler component. However, during the course of the project, we became aware of several software problems that degraded system performance and, for some periods, rendered the "automated messaging" feature inoperable.

- Until mid-January, the automated messaging feature was not properly programmed to ensure that out-dial calls would be placed at intended times. This error took two forms: (1) when the system encountered a busy signal or no answer, call-backs occurred immediately, rather than spaced at desired intervals; (2) calling times did not account for whether the phone number was residential or business (i.e., residential calls would be placed during the daytime).

- Even following the software correction, the automated messaging feature did not operate properly. Examination of records for the March period revealed that out-going messages were sometimes relayed one or two days after recording, too late to be of value for a same day service. Furthermore, down periods appeared during which no out-going messages would be relayed.

- In July of 1994, CTS registrants were issued two code numbers, referred to as "RIN" and "PIN". Both were initially required to access the system. However, CTS did not provide PIN numbers in their Rideguides issued to new registrants. The system later ceased to work as described. It is not known with certainty whether the cause was a glitch in the system or whether it had been re-programmed. For whatever reason, an inconsistency in the system allowed some but not all users without PIN number to access the automated messaging system.

- Pacific Bell was unable to provide proper reports summarizing system usage due to programming errors in reading raw data files.

All of these errors appear to be correctable. Furthermore, once corrected, the problems are unlikely to recur. However, the problems are indicative of the difficulties in assuring quality for a complex phone system such as ARMS, especially with respect to the automated messaging feature. Furthermore, these problems reflect the need to perform adequate quality assurance testing *prior* to deployment. Problems should have been detected during the summer of 1994. As of this writing, the system is still not problem-free.

# CHAPTER 3 FUNCTIONAL CHARACTERISTICS EVALUATION

The Smart Traveler system consists of three elements: (1) Computerized kiosks, (2) Personal Computer Software, (3) Automated ridematching service, via telephone. The kiosks include four main features: (1) access to real-time maps displaying highway speeds, (2) access to bus and train schedules, (3) access to ridematch databases, (4) videos on Caltrans, CTS and MTA, on such topics as “driving tips” and “effect on the environment”. The PC software includes only the first kiosk feature.

The kiosks and PC software are primarily interfaces, with modem access to a host computer, operated by California Health and Welfare Data Center, which subsequently accesses three separate databases. The freeway congestion database is maintained by Caltrans District 7, in Los Angeles, the transit schedule database is maintained by MTA, and the ridematch database is maintained by CTS. Videos, however, are stored at individual kiosks on laser disk.

The purpose of this section is to evaluate the functional characteristics of the Smart Traveler interfaces, including kiosk, PC and the automated ridematching service. The section is divided into two parts. First, principles are presented for the design of computer and telephone interfaces. These principles are presented generically, so that they may be applied to all three system components. Second, these principles are applied to the three components of Smart Traveler (kiosk, PC and automated ridematching service), to form the evaluation.

## 3.1 Principles of Interface Design

Design principles are organized according to objectives, interface features and user profile. The objectives provide the basis for evaluating features of the interface, judged against the specific user needs. The framework borrows from the text by Mayhew (1992).

### 3.1.1 Design Objectives

Eleven objectives for interface design are presented below.

1. **User Compatibility**

The design should be compatible with the specific needs of the user, based on a user profile (to be presented later). This requires that the designers envisage themselves as users, and anticipate the diversity of user needs. Example considerations include psychological characteristics, physical characteristics and environment.

## 2. Product Compatibility

The system should be compatible with similarly used products already on the market. This saves the user learning time. A tradeoff exists, however, in that compatibility may require sacrifices in system performance. Typically users prefer familiar systems to marginally quicker ones.

## 3. Task Compatibility

The system should present the user with task choices instead of data types. That is, a good system allows the user to think about the task at hand without worrying about the manner in which it will be carried out. The user's focus should be uninterrupted toward the task, and not be distracted by unnecessary system details.

## 4. Consistency

Compatibility within the system, in terms of formatting, menu types, and wording, is a requirement.

## 5. Familiarity

Symbols, signs, metaphors etc. that are part of everyday life may be incorporated in the system. This facilitates cognition, as the indicator is already familiar to the user.

## 6. Simplicity

Even if the system is capable of numerous functions, many users get to use only some of them. Unnecessary choices should be eliminated, to avoid overwhelming the user. Effort should be made to keep the system's optimal capabilities in the background -- readily available to those who need to access them -- but out of the view of the average user.

## 7. Control and Flexibility

The degree of control the user has on the machine decides his attitude toward using it. A machine that provides friendly everyday phrases to describe a computer response may be contrasted to one that is loaded with technical jargon. The user feels more at ease with everyday language. The system should also support different types of inquiries and user styles.

8. **Task Time**

Task time is a critical system feature. Users usually have time constraints. Therefore, the response time should be small, and the time required to read instructions and enter data should also be small. In addition, it is important to keep the interface "alive." When the system is accessing information, the interface should indicate that work is going on and the system is working. If the time is excessive, the system should present the user with an alternate activity. A slow system should also be designed to allow multi-tasking. This keeps the user busy on another application while one is running.

9. **Robustness**

A system that crashes frequently, or does not know how to respond under certain situations, discourages use. In contrast, a robust system covers almost all the scenarios of incorrect input, and provides proper responses.

IO. **Protection**

There should be protection designed in the system against frequently carried out mistakes by the users. This could be done by verification options for such tasks.

11. **Ease of Learning and Ease of Use**

A difficult tradeoff exits between systems that are easy to use and ones that are easy to learn. The former requires some time before the user learns to fully utilize the capabilities, but once learned there is payoff in terms of speed and ease of use. The latter may be ready to use right away, but are more structured in form, and therefore cumbersome for frequent use. The decision to go with one option or the other lies with the user profile.

### 3.1.2 Interface Features

The interface features depict the actual design, and are categorized as follows:

- Menu Structure
- Menu Ordering, Selection & Invocation
- Menu Navigation
- Icon Design

**Menu Structure:**

1. **Depth Versus Breadth**

This refers to the number of levels of menu screens (depth), in relationship to the contents of each (breadth). One option calls for presenting the user with many levels of screens, with few choices per screen. At the other extreme, there might be few screens, with each containing many choices. The first is the depth option; the latter is the breadth option.

The issue at stake is the user response time. The quicker the user is able to decide which screen and choice he is seeking, the better is the option. Two factors are relevant: decision time for the user, and execution time for the system. When system response times are long, breadth becomes more desirable. With inexperienced users with complex and disparate menu choices, depth is preferred. Also, wherever feasible, like items in a menu should be grouped together, allowing greater breadth.

2. **Grayed Out Versus Deleted**

Choices not possible on a menu may either be taken out for that particular case, or grayed out (i.e. shaded to cue the user that it is no longer usable.) Keeping the choice in place, while graying it out, maintains consistency across menus. This is a desirable trait for reluctant or novice users. Expert users might want to cut screen clutter and therefore prefer deletion to graying out.

3. **Orientation**

Choices on a screen may be presented in a vertical format; horizontal format; pie format etc. In most cases, user perception times are fastest when using the vertical format. Exceptions include: choices ordered in some set shape all across the application, to keep consistency; commands lines that share the screen (bottom, top etc.); non-hierarchical menus.

4. **Semantics (Clear, Logical, Mutually Exclusive and Exhaustive)**

Choices should be worded toward user objectives, as opposed to system conventions. This means that the menus' leveling be logical. Choices should be mutually exclusive, and exhaust all possible user choices. Vague labeling of choices should be avoided. Specific and distinctive wording keeps the focus of the user toward the task. Instructions should be clearly and succinctly provided.

**Menu Ordering, Selection & Invocation:**

1. **Item Ordering**

   Menu ordering should ordinarily place the most frequently used choices high on the list. Exceptions include: conventional groupings (e.g., months in a calendar), consistent menus across the system, alphabetical order (e.g. city names).

2. **Cursor Versus Pointer**

   Cursors are appropriate for shorter menus and casual users. For high frequency users and longer menus, the best option is mnemonically lettered selection codes. The performance increases when mnemonic codes are complemented by letter codes.

3. **Default Choices**

   Default choices decrease the user input time in many cases. These may be selected according to some criterion (e.g., the first/last choice in each screen, the most used selection in each screen etc.)

4. **Permanent Versus Pop-Up Menus**

   Permanent menus take up screen space. They are preferred to pop-up menus for low frequency users. Expert users tend to favor pop-up menus.

5. **Help Assistance**

   Help options should be available on all menus in a consistent manner, and should anticipate typical user questions with clear directions.

6. **Legibility and Clarity**

   From a human factors perspective, all menu items should be clearly legible to the user, whether presented visually (kiosk or PC), or audibly (kiosk, ARMS).

**Menu Navigation:**

1. **Consistent Location**

   Consistency of choices, screen format and other system features facilitate learning and make the system easier to use.

2. **Type Ahead**

   This allows a user to enter all choices from menus down the desired path without having to view each screen. It results in saved time for the expert user.

3. **Maps and Markers**

   Markers, maps, etc. act as navigational guides to the user. These put the user more in control of the situation by making them aware of where they are going, where they are and available paths.

4. **Backward Navigation**

   Backward navigation is one of the most important ways to make the system "user friendly." Easy backward navigation should be available at all levels. This saves time and effort on the part of the user, and is an important factor in deciding whether the casual user will become a repeat user.

**Icon Design:**

1. **Concrete and Familiar**

   The strength of an icon lies in it being readily recognizable. This can be achieved in two ways: relying on concrete representations instead of abstract (e.g., a phone book in the shape of a book with a receiver drawn on it is more concrete than a phone alone); and making use of familiar symbols, even when they may be abstract (e.g., the slash within a circle indicating not allowed).

2. **Visually and Conceptually Distinct**

   Icons should be designed such that their meaning is clear to the user. Not only should they be familiar and tangible, but easily distinguishable from similar objects. This is called conceptual distinctiveness. Visual distinctiveness focuses the user on the icon as much as possible, without spending time on the frills (e.g., borders, reverse shades).

3. **Simplicity**

Care should be taken that conceptual distinctiveness does not result in too much detail. This makes icons complicated, and therefore liable to longer cognition times for the user. Elegant icon design is a combination of distinctiveness and simplicity.

4. **Accompaniment With Text/Names**

No matter how good the intentions, some concepts are not easily transferrable into symbolic form. Therefore, well designed icons may possess distinctiveness, but may still lack recognition. This is more so in the case of new users. Thus, accompanying them with text/names is a good idea. It also helps in hastening the learning of symbols.

### 3.1.3 User Profile

The user profile represents the user requirements, which naturally form the basis for interface design. Interface objectives must be evaluated on the basis of the user profile.

1. **Psychological Characteristics**

These include **Motivation and Attitude. Motivation** may refer to motivation to use the technology as well as motivation to perform the functions enabled by the technology. **Attitude** reflects an individual's innate desire toward using the system. Motivation is classified as low, moderate or high, and attitude is classified as positive, negative or neutral.

2. **Knowledge and Experience**

This may include **Typing skill, Education level, Native language and fluency, Computer literacy,** and **Experience (task, system,** or **application).**

**Typing skills** may be considered as: expert(>90wpm); average(>40wpm); low. **Education level** may be scaled as: College, High School, etc.. From this information, the users' reading skill may be inferred. The user's **Native language** may be non-English, and may have varying levels of fluency or literacy in English or other languages. **Computer literacy** may be categorized as: high (e.g., programmers); moderate (e.g., general office users); low. This corresponds to general computer knowledge and hands on daily experience with computers.

**Task-experience,** also called semantic knowledge, refers to familiarity with the job (e.g., in the case of a commuter, names of streets). This contrasts with **System-experience,** called Syntactic knowledge, which is a measure of familiarity with the interface (e.g., the method to input the names of the streets, or anticipation of the windows environment). **Application-experience** refers to exposure (or lack of it) to the particular package (e.g., word-processing, database, etc.). All three types of experience can be classified as low, moderate or high.

**3. Job and Tasks**

These consist of factors such as **User frequency, Task structure, Training, System use,** and **Task importance.** These categories affect the level of effort needed to learn to use the system.

**User frequency** is the frequency in which the particular application is used, which may be taken as: high (once per day), moderate (1-4 per month), low (less than once per month). **Task structure** refers to the commonality of tasks among users, which may be classified as: high, moderate, low. Generally, system-controlled interactions lend themselves well. to highly structured tasks, and user-controlled interactions to unstructured tasks.

**Training** may be classified as: formal (with instructor), manual only, or none. **System use** indicates if the user must use the system or not to perform the task. Therefore it may be: Mandatory; discretionary. **Task importance** may be categorized as high, moderate or low, reflecting whether the task itself is mandatory or discretionary (i.e., whether information is required to perform a trip). This is classified as low, moderate or high.

**4. Physical Characteristics**

These may include such physical factors as **Color blindness** (y/n), **Handedness** (left/ right/both), and **Disability (sight, hearing, mobility, etc.).**

**5. Environmental Compatibility**

This is descriptive of where the interface is placed, and may include factors such as **Noise level, Privacy, Lighting** and **Workspace layout.** These human factor considerations depend on physical characteristics of the user, along with task difficulty, task repetition and the need for confidentiality.

## 6. Relationship of User Profile to Menu Structure

Menu structure can be either menu, dialog or direct manipulation based. The choice among these three is dictated by the user profile. Table 3.1 suggests that menu-based structures are most appropriate for novice users, dialog structures are most appropriate for low skilled users and direct manipulation is most appropriate for moderate to high level users.

**Table 3.1 User Profiles of Alternative Menu Structures**

| DETERMINANTS | MENU | Q & A DIALOG STYLE | DIRECT MANIPULATION |
|---|---|---|---|
| Motivation | Low | Low | Low |
| Attitude | Negative | Negative | Negative |
| Typing skill | Low | Moderate/High | Low |
| Education | | | |
| Language | | | |
| Computer literacy | Low | Low | Low |
| Task experience | Novice | Low | Moderate/High |
| System experience | Expert | Moderate/Expert | Moderate |
| Application Exp. | None | None | Some |
| Frequency of Use | Low | Low | High |
| Task structure | Highly structured | Highly structured | Low structure |
| Training | None | None | Formal |
| System Use | Discretionary | Discretionary | Discretionary |
| Task importance | Low | Low | Low |
| Physical character | | | |
| Environment | | | |

## 3.2 Interface Evaluation Results

Each of the three system components was evaluated with respect to the principles outlined in the prior section, covering user profile, interface features and design objectives. A summary of the findings can be found in the tables which follow. User profiles are somewhat speculative, and based on best judgment. These will be refined after detailed survey results are available.

### 3.2.1 Computer Kiosk

Most kiosks are placed in high-traffic indoor locations, such as shopping malls, grocery stores and office buildings. The kiosks may attract people who are curious about computers, or people who might otherwise have some free time. In general, however, kiosk users are likely to be as diverse as the general population.

From this general description, a user profile was created (Table 3.2). Because kiosks are intended to draw from passers-by, rather than people who have a deliberate need for travel information, the motivation is likely low. The attitude of the user is unlikely to be negative, because kiosk use is discretionary. However, it is unlikely to be highly positive, because users are mostly unfamiliar with their exact functions in advance. A possible exception to this is the freeway map, which should invoke a positive response. Overall, attitude is rated as neutral. As we are dealing with the general population, the typing skill and computer literacy are likely low, and education and language are highly variable (especially considering the diversity of the Los Angeles population).

Most people are experienced in the task of wayfinding, as well as somewhat familiar with city and street names, but may not be familiar with forming carpools or using buses, so task experience is moderate. System experience is low because kiosks draw from the general population, and application experience is also low because the kiosk serves a large number of one-time users. The task itself is highly structured and sequential, but there is no training (other than built in instructions). Kiosk use is entirely discretionary. The task importance is moderate: while the trip itself may have high importance, it may not be essential to acquire further/additional information in order to complete the trip. Placement and design of the kiosk screen make it possible to be used by the physically impaired; however, the system cannot be used at all by the blind. The environment is characterized by high foot-traffic public locations (described in detail elsewhere).

**Table 3.2 Kiosk User Profile**

| | |
|---|---|
| Motivation | Low |
| Attitude | Neutral |
| Typing skill | Low |
| Education | Variable |
| Language | English, Spanish, etc. (wide variability) |
| Computer literacy | Low |
| Task experience | Moderate |
| System experience | Low |
| Application Exp. | Low |
| Frequency of use | Low |
| Task structure | Highly structured |
| Training | None |
| System use | Discretionary |
| Task importance | Moderate |
| Physical Characteristics | Sighted, otherwise variable |
| Environment | Public spaces, no seating, moderate noise |

**Interface Features:**

Interface features are detailed in Table 3.3. Some of the more significant observations are discussed below. Overall, the interface appears to be well designed for its intended application, perhaps with the exception of response time. The following comments are largely refinements.

**Depth vs. Breadth** As is appropriate for inexperienced users, the menu structure contains considerable depth (up to 20 menus to reach conclusion). Nevertheless, given that user motivation is relatively low and the task is discretionary, the depth may be excessive, resulting in users dropping out before reaching conclusion. To save on screen change time, the depth of menus could have been improved by grouping items when screen space is available (for instance, bus fare information and days of the week).

**Table 3.3 Evaluation of Kiosk Interface Features**

| INTERFACE FEATURES | PERFORMANCE |
|---|---|
| Depth vs. breadth | Bus route depth = 20 menus; Carpool depth = 18 menus. Maximum breadth = 7 options. |
| Grayed out vs. deleted | Grayed out feature is not currently used; could be useful with re-designed menu structure. |
| Orientation | Horizontal and vertical, with boxed choices |
| Semantics | Semantics are mostly clear and unambiguous. public holidays not included in schedule information, and there are minor inconsistencies in wording. |
| Item ordering | Congestion map is provided first, which is likely most frequently used option. Otherwise ordering seems somewhat random. |
| Cursor vs. pointer | Direct manipulation is used in form of touch screen. |
| Default choices | When planning a second trip, origin/destination information from the prior trip becomes a default. |
| Permanent vs. pop-up | Both choices are used: pop-up options menu leads to choices as "main menu", "backup", "refresh" etc. |
| Help | Basic help is provided through instructions at each screen. Further help may be invoked through a two step process from the options menu. Help is not automatically provided when the user makes a mistake, such as entering an incorrect street name. |
| Legibility and clarity | Visual and audio instructions are legible and clear. Lettering exceeds 3/16 in height and screen resolution is adequate. |
| Consistent location | Permanent menus (options, continue)have consistent location. Cross street menus from bus schedule and carpools are consistent. |
| Type ahead feature | Type ahead feature is not available |
| Maps and markers | Initial menu choices indicate direction, but markers and maps are not provided to estimate usage length. |
| Backward navigation | Can be invoked in two steps: select"option" from permanent menu, then "backup" from option menu. |
| Icons | Icons are provided on the permanent menu and options menu. These are generally supplemented by text. Designs are appropriate. |

**Item ordering** The format appears to be somewhat random, though the frequently used congestion map option is presented first. At this stage, menu usage is still being determined, so some re-ordering may be considered in the future. Also, direct manipulation somewhat mitigates the effect of first choice items.

**Semantics** Semantics of the system are generally good. The wording is clear, logical and mutually exclusive under most circumstances. There may be some confusion when terms are used interchangeably (e.g. “done” and “continue”, “Carpool” and “RideShare”, and “Route” and “Bus and Train”). Choices are not always exhaustive (for instance, excluding holidays on route information). Furthermore, explanation is not provided on how to use landmark information in place of cross streets when accessing bus routes and carpools. Finally, there is a minor inconsistency between instructions and actual menus. For instance, audio instructions in one instance refer to a “Done” key when none exists.

**Default Choices** Defaults are provided in two instances. First, if the user wishes to plan two trips, the origin and destination for the first trip becomes the default for the second. This could speed up entry time if either the origin or destination is held common. Second, for the bus route option, the user can plan a return trip without re-entering origin and destination. The default data is erased when a user finishes using the system (i.e., when the kiosk returns to the first screen, demo and audio). Unfortunately, it is not easy to deliberately quit the system, which presents a confidentiality problem, allowing the next user to retrieve data on the prior user’s trip.

**Permanent vs. Pop-up** Screen space is not cluttered by permanent menus. However, the “backup (to last screen)” and “help” choices should be present on the screen as a permanent one-touch feature. Going through two steps is cumbersome. The user may even forget that help is available if not presented on a permanent menu.

**Maps and Markers** General system choices are presented at the initial menus. However, no guideline map or overview of the steps is provided. The user is unaware both of the format that awaits him and the time it will take to finish the task. This is especially critical for first-time users.

**Interface Objectives**

The following evaluates the interface from the standpoint of meeting interface objectives, as outlined earlier.

**User Compatibility** On the whole, the kiosk design is appropriate for likely users. The kiosk user profile most closely matches the requirements for a menu structure (Table 3.2), on which the kiosk is based. Semantics are clear, and system experience, application experience and training are not required for use. The biggest question mark is whether an automated interface is appropriate, or whether it would be preferable to work through a human operator. This issue is also discussed in Chapter 6.

**Product compatibility** Automated kiosks are still relatively novel, so product compatibility is not a major issue. Touch-screen displays are becoming standard for kiosks, so compatibility is provided here. The use of a non-standard-keyboard for entering cross-streets makes the kiosk more difficult to use for experienced typists, but is appropriate considering that the kiosk is intended to serve the general population and uses a touch-screen instead of a standard keyboard.

**Task compatibility** is good, as the user is not distracted by data types. Similarly, the system is largely technologically invisible. The biggest limitation is the manner in which origin/destination data are entered. Travelers are not always familiar with cross-streets, and may prefer to enter actual addresses, or perhaps zip codes.

**Response Time** Table 3.4 provides estimates for the time to execute three different tasks: (1) view congestion map, (2) obtain carpool list, and (3) obtain bus schedule. For each task, low, medium and high estimates are provided, based on the assumptions in Table 3.5. The low estimate applies to experienced users, who do not need to read through instructions, while the high estimate is for an inexperienced user who must deliberate over each choice.

**Table 3.4 Task Time Estimates for Kiosk**

| MENU ITEM | MINIMUM TIME | AVERAGE TIME | MAXIMUM TIME |
|---|---|---|---|
| Freeway condition | 1:00 | 1:15 | 5:15 |
| Carpool service | 3:30 | 5:15 | 12:30 |
| Route service | 3:45 | 5:15 | 14:30 |

The time to complete a task is probably the biggest limitation of the system, and could be a major source of frustration for inexperienced users. This is not so much due to system response time (though this is not immediate), as the time required by the user to read instructions and enter data. In particular, the process of entering origin/destination information for the carpool and bus schedule elements can be quite slow. In this regard, it would be highly desirable to explore quicker means for entering this data, perhaps based on zip codes, addresses, graphical interface, or menus. Fortunately, the congestion map can be viewed quickly by an experienced user.

**Table 3.5 Task Time Assumptions**

| TASK | MINIMUM TIME | AVERAGE TIME | MAXIMUM TIME |
|---|---|---|---|
| Audio instructions | None | None | Full |
| Visual instructions | None | Some | Full |
| Mistakes | None | None | None |
| Alternate choices (for bus routing) | No | No | Yes |
| Deliberation on keyboard | None | Some | Full |
| Time inputs (work/start/leave) | Given screen only | Once other screen; second time "Pgdn" | Both times, Other screen |
| Time spent on reading Freeway legend | None | Some | Full |
| Time spent on reading Freeway information | Some | Some | Full |
| Going through the 2nd screen, i.e. Initial help | No | No | Yes |

The system allows multi-tasking at the technical level, as it uses the IBM OS/2 operating system. However, at the user interface level, only one task is possible at one time. The only consolation is that it does not leave the user with a blank screen: proper messages flash to indicate system usage.

**Consistency** The system is internally consistent, with exceptions noted under interface features.

**Simplicity** is followed to an extreme, with no "look ahead" options for advanced users. This is appropriate for a system designed for infrequent users.

**Degree of Control** While technical jargon is not heavily used in the menu choices, the user feels at a loss of control by some of the redundant routing built into the system (e.g., going through all the steps when changing an MTA bus route *after* completing information for one.) The system is highly structured and inflexible.

**Robustness** The system would benefit from greater flexibility in entering origin/destination data. Although the system has a spell-checker, along with a user verification procedure, insufficient guidance is provided if the user enters an incorrect street name.

**Data Protection** seems to be good based on experience to date. The system design appears to preclude corruption of source data (residing at Caltrans, CTS and MTA).

**Ease of Learning and Use** The system has appropriately been designed to facilitate ease of learning, to serve inexperienced users. As mentioned earlier, few short-cuts are provided for experienced users.

**Overall Assessment**

Given that the Smart Traveler kiosk is a new product, it performs quite well. It is well suited for the novice user, being simple to use and clear to understand. Most problems are minor and fixable.

The most significant concern with the kiosk is the manner in which origin/destination information is entered for carpools and transit schedules. Owing partially to the constraints of the CTS and MTA databases (which were designed for a trained operator), the process is slow and cumbersome. Most users may find it easier to phone CTS and MTA and speak with a human operator. On the other hand the kiosk has the advantage of immediately printing out a route and match list.

### 3.2.2 PC Software

PC software is used out of one's own home or workplace, in a private or semi-private environment. It cannot be used without some familiarity with computers, and it is more likely to be used on a frequent basis than the kiosks.

**Table 3.6 PC Software User Profile**

| | |
|---|---|
| Motivation | High |
| Attitude | Positive |
| Typing skill | Moderate |
| Education | Some college |
| Language | primarily fluent/literate in English |
| Computer literacy | Moderate |
| Task experience | Moderate |
| System experience | Moderate |
| Application Exp. | Moderate |
| Frequency of use | Moderate |
| Task structure | Highly structured |
| Training | Manual |
| System use | Discretionary |
| Task importance | Moderate |
| Physical Characteristics | Sighted, otherwise variable |
| Environment | Private: work or home |

From this general description, a user profile was created (Table 3.6) above. Except for the first-time, PC use is likely to be quite deliberate and aimed at specific information, so motivation should be high. Attitude is also likely to be positive, because users should be well accustomed to PCs (though some may be unfamiliar with modems). Again because users are familiar with PCs, typing skills should typically be moderate, with English literacy and education level ranging from high school graduate to college graduate. Computer literacy and system experience should be moderate and, as with kiosks, task experience should be moderate. Frequency of use should also be moderate, and perhaps high in the case of the congestion map, because the software facilitates repeated use. This should also lead to moderate application experience. As with the kiosk, the task itself is highly structured.

PC use is entirely discretionary. The task importance is moderate, for the same reasons as the kiosk. Physical characteristics vary among users, though the system is likely unusable by the blind. The environment is characterized by private or semi-private space.

**PC Software:**

The PC software was intended to perform the bus route, carpool and freeway congestion functions on one's own computer. In its current Phase 1 version, only freeway congestion information is available. The software can operate on any IBM 286 (or higher) compatible computer equipped with a 2400 Baud Modem, with memory of 2MB or more (with VGA card; 640 KB with CGA card). Input is via standard keyboard, and output is via standard color computer monitors. Printing is not currently possible.

**Interface Features**

Because only Phase 1 of the PC software was available, the evaluation is abbreviated. Both the depth and breadth are small, as a result of the software's limited features. The main menu lists both the current option (freeway information) and future options (bus schedules, carpool). Items are oriented vertically, with freeway information (likely the most used option), placed first. The semantics are clear and jargon free, except that error messages are technically worded. A permanent menu appears in the shape of a freeway speed legend on the map. It appears both on the basic map and zoom level. The only help available is in the form of a couple of instructions regarding navigation at the basic freeway map level. A simple manual is also provided with the software. Type ahead, maps and markers are not available, though this is not a problem, given the software's limited scope. Backward navigation can be a problem e.g., once zoomed in, the user cannot go directly to the main menu, but must backtrack through the basic (full) map.

**Interface Objectives**

The software design seems appropriate and user compatible. Some system and application experience, together with some level of familiarity with computer semantics, is required. However, this matches our user profile. The software format is standard, so there is sufficient product compatibility. The initial installation process requires entering some data, an activity not directly adding to the main task at hand. But after that, the system is generally task compatible. The task time is not excessive, but does entail a modem dial-up and associated delays. This may be troublesome to some users, who want to obtain the information on demand. The task format is consistent with the similar application -- kiosks. Hence familiarity is promoted.

Though using the software is simple, installing the system requires some effort and is not altogether easy. Degree of control is mixed, while the Robustness is low. Some examples:

- Zoom is limited to one level of detail

- Pressing "enter" at zoom level -- for refreshing screens -- returns an error message after you exit the screen. It also takes you out of the system and ends the program. This means that the program is vulnerable to incorrect input at the zoom level.

- At the full map level too, the system is not robust. According to instructions, only "enter" has the capability to refresh the screen, meaning to request fresh freeway status. Actually, many other keys also do so.

- Control-C (^C) breaks the sequence and takes you to the Main Menu.

- Some minor portions of the freeways are not covered by the Caltrans sensors, e.g., l-710 south of l-5; SR 91 etc.

**Overall Assessment**

The PC software was never completed as intended, so its function is limited to accessing the Caltrans congestion map. In this context, it works adequately. One drawback is that the software does **not** allow continuous updates of highway speeds. Each update requires a somewhat time-consuming inconvenient re-connect. (However, this has the benefit of minimizing communication demands at the host computer). A second drawback is that installation is not as easy as it should be, and associated documentation could be made clearer.

### 3.2.3 Automated Ridematching Service

This service is used out of one's own home or workplace, in a private or semi-private environment. It requires a touch-tone phone. While it may be possible to use it on a more frequent basis than kiosks, the nature of forming carpools makes frequent usage unlikely.

From this general description, a user profile was created (Table 3.7). People only use the system after receiving mailed instructions stating the system's functions, so motivation should not be low. It also may not be high, because of general reluctance to form carpools. Attitude may be negative, because of the general unpopularity of non-human phone interfaces. Research indicates that although the system response time benefits from automated voice systems, the user perception of service provided is low (Le Colletter et al. 1993). Typing skill and computer literacy are not relevant. Education and language is variable, likely similar to the general population. Task experience is moderate and highly structured, for the same reasons as the kiosk. System experience should be moderate, because touch-tone interfaces are widely available, but experience with the particular application should be low. Training is limited to simple mailed instructions. Use of the automated ridematching service is entirely discretionary. The task importance is moderate, for the same reasons as the kiosk. Physical characteristics vary among users, though the system is likely unusable by the deaf. The environment is characterized by private or semi-private space.

**Table 3.7 Automated Ridematching User Profile**

| | |
|---|---|
| Motivation | Moderate |
| Attitude | Non-human interface - may be negative |
| Typing skill | Not relevant |
| Education | Variable |
| Language | English, Spanish (literacy not required) |
| Computer literacy | Not relevant |
| Task experience | Moderate |
| System experience | Moderate |
| Application Exp. | Low |
| Frequency of use | Low |
| Task structure | Highly structured |
| Training | Simple instructions |
| System use | Discretionary |
| Task importance | Moderate |
| Physical Characteristics | Must have hearing; otherwise variable |
| Environment | Private: work or home |

**Interface Features:**

**Depth vs. Breadth** The depth of the system seems appropriate, given the task and that users are largely inexperienced. Breadth is nicely used to differentiate actions. This works out well for the user, who then has little to remember. This is the general practice for audiotext systems.

**Item ordering** Items appear to be ordered randomly.

**Permanent vs. Pop-up** There are no permanent choices present at all levels (e.g., “0” for the operator, or **“*”** for backup). Similarly there are no pop-up choices (e.g. “0” for options that may contain “operator” “backup” etc.)

**Help** This is provided in the form of instructions before the start of a level. It may be complemented by going to an operator. However, getting to an operator once in the middle of a system is not always possible.

**Type ahead** The feature is available in two forms: one, frequent users do not need to wait before each level appears. Initial menus may be saved by punching in one’s PIN/RIN in the beginning. This saves time for the frequent user. Two, the audio instructions can be interrupted by pressing the desired choice’s number.

**Maps and Markers** Some audio mapping is performed at each level, but there is no overall system mapping or marking that tells the user how many levels to go before getting the information. This is a concern because of the depth of the ridematching service menu.

**Backward navigation** This can be a problem because it is not available at all levels. However, there is always verification of input.

**Table 3.8 Evaluation of Automated Ridematching Interface Features**

| INTERFACE FEATURES | PERFORMANCE |
|---|---|
| Depth vs. Breadth | Depth = 18; Maximum breadth = 5 |
| Grayed out vs. deleted | <not applicable> |
| Orientation | <not applicable> |
| Semantics | Instructions are clear, precise and jargon free |
| Item Ordering | Items are randomly ordered |
| Cursor vs. pointer | Touch tone phone is used; operator assistance necessary for rotary |
| Default choices | No default choices. The default for no response is to disconnect, after instructions are repeated. |
| Permanent vs. pop-up | No permanent choice appears system wide "*" may be used as permanent backup choice. |
| Help | Basic instructions re provided at each level. Further instructions are available at subsequent levels, e.g. after entering RIN/PIN. Help my be sought by contacting the operator. |
| Legibility and clarity | Audio instructions are clear. |
| Consistent location | <not applicable> |
| Type ahead | Frequent users can skip initial menus; instructions can be interrupted. |
| Maps and Markers | Initial menu choices indicate direction, but no markers or maps are provided to get an estimate of usage length or depth. |
| Backward navigation | Can be invoked on some menus with "*" key. |
| Icons | <not applicable> |

**Interface Objectives**

**User Compatibility** The system design is consistent with the type of user profiled for this system. Touch-tone interfaces are growing increasingly common, so users have familiarity and training is not necessary. Instructions for regular users are provided through the mail, which include their entry codes: RIN and PIN numbers. Even with good compatibility, the question remains to what degree the users will use a system format that is not generally viewed as user friendly.

**Product Compatibility** There is a high degree of product compatibility. Voice activated information systems are commonplace in the market. This one follows the basic format used by others and is therefore not novel to the user. The new feature is its automatic ride matching ability: the system automatically dials up the potential rides and leaves a recorded message.

**Task Compatibility** is not good, due to the inherent limitations of telephone interfaces. The infrequent user is distracted by irrelevant choices, and may have difficulty remembering options or prior entries. In essence, the system distracts the user from the task at hand by presenting numerous menus and choices.

**Response Time** Table 3.9 provides estimates for execution of two basic tasks: Request an emergency ride home.from work; and arrange a regular commute trip. High, medium and low estimates are provided. High estimates apply to first time users; medium estimates indicate some previous experience with the system; Low estimates indicate frequent users. In all cases, a task is considered completed when the user reaches the point where either a ridematch list can be obtained or a message can be recorded. This means that the time listening to names is not included. Table 3.10 gives the task time assumptions used.

Time to use the system is not restrictive, considering the service being provided. If users were not pre-registered, an automated system may not have worked as well. ARMS saves time because information on the trip origin, destination and departure time are already entered. Furthermore, the system provides automated dial-up and matching -- repeated tasks that are well handled by an automated system. This saves considerable time and effort on the part of the user. Therefore the levels encountered and the time spent on using the system seem justifiable.

In addition to time accessing the Smart Traveler system, ARMS users who elect the manual feature must spend time phoning potential ridematches. Through experimentation with the system (reported on in detail in Chapter **6),** we estimated that it takes 45 minutes on average to find a ridematch after listening to names, with a range of 1 minute to 6 hours, before a ride is offered. The majority of the average is time waiting for people to return calls. The amount of time on the phone is typically of the order.of 5-10 minutes per call.

The actual response time between user input and computer response is minimal. There is no waiting on line, so there is no need for hold messages, jingles, etc.

**Consistency** The system is not entirely internally consistent. Verification occurs at each entry level. However, the backup option appears sporadically. Similarly, no response on some levels gets a repetition of the instructions, but ejection from the system at others.

**Table: 3.9 Task Time Estimates for Automated Ridematching Service (minutes:seconds)**

| ITEM | MINIMUM TIME | AVERAGE TIME | MAXIMUM TIME |
|---|---|---|---|
| Emergency Ride home | 1:15 | 6:45 | 15:15 |
| Regular Carpool service | 1:15 | 7:30 | 17:15 |

**Table 3.10 Task Time Assumptions Automated Ridematching Service**

| | MINIMUM TIME | AVERAGE TIME | MAXIMUM TIME |
|---|---|---|---|
| Listen to instructions | No | Only until required choice is mentioned | Full instructions at each level |
| Listen to verifications | No | Yes | Yes |
| Change times (arrival and departure) | No | Change times wherever possible | Change times wherever possible |
| Operator assistance | None | None | None |
| Mistakes | None | None | None |
| Deliberation on phone keypad | None | None | None |
| Listen to rider names and numbers listed | 0 | 3 | 10 |
| No. of rider names repeated | 0 | 1 | 4 |
| Record message /listen to message yes/no (in seconds) | 25 | 40 | 40 |
| Review message | No | No | No |
| Re-record message (once) | No | No | Yes |
| Leave Comments | No | No | No |

**Familiarity** is present and used to advantage at places within the system. First, there is the familiarity with the system as a whole. Second, a voice mail box/answering machine type format is used when the new concept of automated ride matching is utilized.

**Simplicity** is dominant in the system. There are no "look ahead" options for the specific uses, and little need for such exists. Also, as the frequency of use is profiled as low, this is appropriate.

**Degree of Control** The user has sufficient degree of control over how the system can be manipulated. Verification levels provide the necessary control choices. The recorded message may be played back and changed; start and leave times may be changed too. Technical jargon is low and is explained in the documentation sent to users.

**Robustness** The system is robust in the sense that it covers most choices the user may require. However, at places, the user may unexpectedly exit the system if slow in responding.

**Data Protection** is high. No one can enter the system without an assigned RIN. These are sent after registration only. Furthermore the system does not allow permanent changes in records. However, data security is not high in that many people can access carpool data on other registrants.

**Ease of Learning and Use** Simple instructions are sent to registered users. For non-registered users, operator assistance is available. The system is designed with ease of learning in mind. Since a primary objective is to attract as many new users as possible, the emphasis is correctly placed. Even for frequent users, the time to get to their function is not high, and can be shortcut by not listening to all of the instructions.

**Overall Assessment**

The system successfully builds from familiar technologies, while at the same time providing a number of innovative features. The option of automatically relaying messages to potential ridematches is in theory a great time saver. Unfortunately, our experimentation with the system (reported on in Chapter 6) found this feature to be ineffective in finding ridematches. The feature was completely inoperable in a large percentage of trials. When it did operate, the feature generated few responses from potential ridematches.

The manual option proved to be workable in all trials. The system was easy to use, though slow. The synthesized voice clearly articulated the phone number of ride matches, and did an adequate job articulating the spelling of names (however, some letters, such as S and F, were difficult to distinguish). The deficiencies that exist in the manual option are due to the limitation of a touch-tone telephone interface. Ideally, the user would have the flexibility of a computer terminal to search data-bases and print records on a screen or paper. Another minor deficiency is that the system cannot provide more than 10 names, which is fewer names than can be obtained from contacting CTS directly.

# CHAPTER 4 SYSTEM COSTS

## 4.1 Cost Data

This section assesses the cost of establishing and operating Smart Traveler and projects the cost for a fully deployed system. This assessment is based on the- best available information provided by Caltrans as of September 25, 1995, which includes summarized invoices, as well as cost data contained in its Kiosk contract with IBM and supplemental data provided from HWDC. It was not feasible to independently audit the invoices. Furthermore, costs incurred internally at Caltrans, CTS and MTA (for project management and project support) were unavailable. Finally, the cost of performing the Smart Traveler evaluation was considered to be independent of the project itself, and therefore not included.

Smart Traveler is funded by a combination of State of California and federal funds, through the CAPTS (California Advanced Public Transit System) program. As indicated in Chapter 1 earthquake relief funds (through the Federal Highway Administration) have been used to expand Smart Traveler. The earthquake relief program stipulated that all expenditures be made by July 17, 1994 (6 months after the Northridge earthquake), and that funds only be used to supplement state funds that are otherwise unavailable. Earthquake relief funds must also be targeted toward the earthquake affected region as shown in Figure l-l. In Smart Traveler, earthquake funds have been used to expand deployment of kiosks and distribution of PC software, and to expand the service area for the ARMS service.

Table 4.1 lists generic types of costs incurred by the three Smart Traveler elements: Kiosk, ARMS and PC Software. Costs are categorized by direct (i.e., directly attributable to the Smart Traveler element) versus indirect, and categorized by installation (i.e., one-time) versus operating (i.e., annually recurrent).

**Kiosk**
Direct installation costs are divided according to: kiosk purchase costs, site preparation/site negotiation, phone line installation, software development and IBM technical assistance (including a variety of services associated with software development, videos and site selection). Direct operational costs are divided according to: kiosk maintenance, software maintenance, supplies, phone expenses, HWDC computer charges, and annual software license fees. In addition to project management, some level of indirect expenditure is incurred at CTS, Caltrans and MTA with respect to maintaining and developing access to their databases and Smart Traveler. Indirect expense is also incurred for promotion.

The contract with IBM to develop, install and maintain the Smart Traveler kiosk accounts for the majority of project expenses and deserves some elaboration. Due to the customized nature of the kiosks, the agreement is quite complex, amounting to over 250 pages with all of its riders. Because of the number of prices contained in the contract, the financial analysis was based on the summarized invoices provided by Caltrans, rather than the contract itself. The following information is provided for background.

## TABLE 4.1 CATEGORIZATION OF EXPENDITURES

| | | |
|---|---|---|
| **KIOSK** | | |
| Direct | **Installation (one-time)**<br>Kiosk purchase<br>Site preparation/negotiation<br>Communication/phone lines<br>Software development<br>IBM technical assistance | **Operational (recurrent)**<br>Kiosk maintenance<br>Software Maintenance<br>Supplies<br>Phone line expenses<br>HWDC computer charges<br>Software license fees |
| Indirect | Project management<br>Development support MTA<br>Caltrans and CTS<br>Smart Traveler Promotion | Project Management<br>Operation of Caltrans, MTA, CTS databases<br>Space occupied by kiosks (currently no charge)<br>Utilities (currently no charge)<br>Smart Traveler Promotion |
| **ARMS** | | |
| Direct | **Installation (one-time)**<br>Development of ARMS<br>Initial Marketing of ARMS | **Operational (recurrent)**<br>Phone bills and port charges |
| Indirect | Project management | Project Management<br>Operation of CTS database<br>System upgrades<br>1-800-COMMUTE incoming calls<br>Promotion |
| **PC Software** | | |
| Direct | **Installation (one-time)**<br>Software development<br>Software Documentation<br>Software Distribution (reproduction/mailing) | **Operational ( recurrent)**<br>Phone lines for incoming calls |
| Indirect | Project Management<br>Promotion<br>Development Support MTA | Project Management<br>Operation of Caltrans, MTA, CTS databases<br>Promotion<br>User support<br>Ongoing distribution |

### Direct Kiosk Expenses

The contract specifies four kiosk types: "primary," "library", "security", "base" and "primary without shell." Prices range from $18,433 for the base model after factoring in overhead charges at HWDC to $26,328 for the library kiosk. The "mandatory primary kiosk" is priced at $22,660 (see Appendix B for hardware list). For each of the kiosk types, the agreement also specifies monthly maintenance fees, which vary according to the age of the equipment ($336.1 O/month to $398.78/month for primary), costs of consumable supplies, and cost for optional components. Other direct kiosk expenses include site preparation ($592/kiosk), site negotiation ($623/kiosk) and freight and installation ($524/primary kiosk).

### Software

A second major expense category is software development and licensing. Prices are specified in the contract for six categories of multi-media software. Prices vary widely according to the category, number of applications created and the number of sequences within each application. Prices are also conditioned to the year that the software is developed. Additional prices are specified for "integrating, testing and deploying" applications created by other entities, and for providing additional languages (Mandarin, Cantonese, Korean, Tagalog, Vietnamese, Armenian, Russian, Japanese). The contract also specifies various software license fees. However, software was developed outside the contract.

### Technical Services

The contract provides for a range of technical services, some of which are covered within software and direct kiosk expenses. Rider H specifies course fees and Rider I specifies fees for a list of 10 tasks, including "Applications Design/Implementation", "System Interface", "Project Management/Change Control," "Installation", and "System/ Application Acceptance Testing".

### ARMS

Direct installation costs include development costs at Pacific Bell and a separate development and marketing contract, which includes distribution of informational brochures on the service (specifics on how this money was spent were unavailable). Direct operational costs are primarily phone expenses, including the cost of providing ports on the I-800-Commute system, and the cost of providing a phone line between Pac Bell and CTS for data transfer. Although not included in our analysis, periodic mailings to users may also be an operational expense (however, these might be combined with CTS' regular mailings at minimal cost). An additional expense is the cost of receiving calls on the I-800-Commute line, which was classified as indirect because the line is not exclusively for ARMS. In addition to project management, some level of indirect expenditure is incurred at CTS for maintaining access to their databases.

**PC Software**

Direct installation cost includes the development of the PC software and user documentation and the distribution of the software. Direct operational cost is limited to the cost of providing phone lines to receive incoming calls. In addition to project management, some level of indirect expenditure is incurred at Caltrans and MTA with respect to maintaining access to their databases and promoting the software. MTA provided development support at no charge, which constitutes an indirect expense. It is also likely that ongoing expenses would be incurred for software distribution. It may also be necessary to upgrade and replace software in the future.

The data below summarizes cost data from which the analysis was based.

### Table: 4.2 Basis for Cost Calculations

| | |
|---|---|
| **Basis for Kiosk Cost Calculations** | |
| **Installation** | |
| Software Purchases | $57,200 |
| IBM Technical Assistance | $436,000 |
| Kiosk Purchase Costs | $1,421,547 |
| Kiosk Site Preparation/Negotiation Costs | $141,428 |
| Phone Line Installation | $121,500 |
| Total Installation | $2,177,674 |
| **Operations** | |
| Kiosk Maintenance | $217,792 |
| Software Maintenance | $97,047 |
| Supplies | $821 |
| Dedicated Lines | $381,235 |
| HWDC | $27,412 |
| Annual Software License Fees | $90,800 |
| Total Operations | $815,109 |
| **Basis for ARMS Cost Calculations*** | |
| **Installation** | |
| Develop and Market Contract | $107,338 |
| Pac Bell Development Costs | $38,000 |
| Total Installation | $145,338 |
| **Operations** | |
| Line Between Pac Bell and CTS | $1,440/year |
| 10 Ports on I-800-COMMUTE | $26,400/year |
| Total Operations | $27,840/year |

**Source*: Caltrans Division of New Technology, Materials and Research, Based on Existing Systems

## 4.2 **Cost Analyses**

The focus of the cost analysis was on projecting how much it would cost to operate Smart Traveler if the system is fully deployed. Costs are life cycle based, including start up costs and recurrent costs. Kiosk and ARMS costs were estimated on an annual and a per use basis, as a function of the system lifetime. An analysis was also performed for future costs under the assumption that all development costs are sunk (i.e., they do not enter into calculations). Details are provided below.

**Kiosks** Analysis was performed for two kiosk lifetimes: one year and five years. Five years is the standard depreciation period for computer equipment, as allowed by the Internal Revenue Service. We believe that it is a reasonable maximum lifetime for the Smart Traveler kiosks. The one year lifetime is based on the possibility that kiosks will be removed one year after installation. Installation costs were annualized in uniform amounts over the kiosk lifetime on the basis of a discount rate of 7 percent per year.

Cost estimates were produced under the favorable assumption that all installation costs are incurred one-time only over the kiosk lifetime. This assumption ignores the possibility that kiosks might have to be moved to new locations, incurring additional site related expenses. Technical assistance provided by IBM was also assumed to be 100 percent attributable to installation, though. it is possible that some portion of this expense is recurrent. Internal costs at Caltrans and other participating agencies were conservatively estimated at 5 percent of total project cost, accounting for project management, accounting, contracting, and costs incurred internally in accessing databases.

All costs were assumed to be proportional to the number of kiosks installed, with the exception of IBM technical assistance. Technical assistance was assumed to be a fixed cost, independent of the number of kiosks installed.

Inflation was not considered in the analysis because some of the cost elements are subject to deflation (e.g., computer hardware purchases) while others are subject to inflation (e.g., maintenance). Costs were evaluated as a function of the installation base, ranging from 10 kiosks to 200 kiosks, with the purpose of assessing the effects of scale economies, should the Smart Traveler concept be expanded (or contracted). Annual costs were converted to **a** cost per use by assuming that the current average of 25 users per day per kiosk will not change.

Tables 4.3 and 4.4 show cost results broken down by cost element, based on a 1 year and 5 year lifetime. The installation base of 77 kiosks is highlighted, because this is the actual number of kiosks installed. With this installation base, the cost per use is estimated at $4.64 for a l-year lifetime and $1.99 for a **5-year** lifetime, and the cost per kiosk was estimated at $42,890 and $18,360 per year, respectively. As mentioned, earlier, both estimates are conservative. Cost per use declines only slightly (to $4.16 and $1.88) as the installation base increases to 200, indicating that Smart Traveler is of sufficient size to nearly exhaust scale economies. Cost per use increases significantly as the installation base decreases to 10 (to $9.86 and $3.18) indicating that a smaller kiosk network would have considerably higher cost per use. This cost trend is further illustrated in Figure 4-l.

Figures 4-2 and 4-3 show how costs are distributed by category, on an annual basis. For a l-year lifetime installation costs clearly dominate, accounting for 71 percent of total expenses. Clearly, the high installation costs cannot be justified for a project with a one-year duration. For a five year lifetime, installation is still the number one expense, but now it accounts for less than half (38 percent) of the costs. Other major expenses, in decreasing order, are phone charges (27 percent), kiosk maintenance (15 percent), and software maintenance (7 percent).

As a final calculation, cost per use was estimated under the assumption that installation costs are sunk. Hence, only the recurrent operating costs are considered. Under this scenario, the annual cost drops to $1.20, independent of lifetime.

**ARMS** Analysis was performed for five ARMS lifetimes: 1, 2, 3, 4, and 5 years. Cost estimates were produced under the favorable assumption that all installation costs are incurred one-time only over the lifetime. This assumption ignores the possibility that software will have to be upgraded to remain compatible with the CTS database. More importantly, it ignores the likely need to continue promoting the service throughout the lifetime. Internal costs at Caltrans and other participating agencies were estimated at 5 percent of total project cost, accounting for project management, accounting, contracting, and costs incurred internally in accessing databases. Inflation was not considered in the analysis.

Costs were analyzed as a function of level of usage (see Figure 44). It was assumed that each port to the ARMS line can serve approximately 150 calls per week, and that each port costs $220/month ($2,200/month for 10 ports). This is based on an assumed call time of 10 minutes with 50 hours of operation per week and a utilization factor of 50 percent. At this level of usage, busy signals should be rare. It was further assumed that the cost of the phone line between Pacific Bell and CTS is $1 .OO per use, based on a current cost of $120/month with 27.4 users per week, and assuming that phone costs are proportional to level of usage (it is unclear whether this assumption is correct, based on data provided). Usage of 27.4 calls per week is based on automated data for a 21 week period, with repeated, sequential calls from the same individual screened out. (See Chapter Six, Section 6.2). The global cost of providing the I-800-commute line for incoming calls was not included.

Table 4.5 provides cost results. As shown, the cost per use, at the current level of usage (27.4 calls per week) is approximately $110, assuming a 1 year lifetime and $27, assuming a 5 year lifetime.

## Table 4.3 Kiosk Cost Analysis (by number of kiosks)
## 1 Year Lifetime

| | INSTALLATION COSTS ($'000s) | | | | | | ANNUAL OPERATING COSTS ($'000s/yr) | | | | | | | SUMMARY COSTS ($'000s/year) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ksks | Fixed | Purch | Site | Phone | CT | TOT | KMnt | SMnt | Supp | Lines | HWDC | Lic. | CT | Operat. | Instal. | Total | Total/ Kiosk | Cost/ Use ($) |
| 10 | 493 | 185 | 18 | 16 | 36 | 748 | 28 | 13 | 0 | 50 | 4 | 12 | 5 | 111 | 800 | 911 | 91.10 | 9.86 |
| 20 | 493 | 369 | 37 | 32 | 47 | 977 | 57 | 25 | 0 | 99 | 7 | 24 | 11 | 222 | 1046 | 1268 | 63.40 | 6.86 |
| 30 | 493 | 554 | 55 | 47 | 57 | 1207 | 85 | 38 | 0 | 149 | 11 | 35 | 16 | 333 | 1291 | 1625 | 54.16 | 5.86 |
| 40 | 493 | 738 | 73 | 63 | 68 | '1437 | 113 | 50 | 0 | 198 | 14 | 47 | 21 | 445 | 1537 | 1982 | 49.55 | 5.36 |
| 50 | 493 | 923 | 92 | 79 | 79 | 1666 | 141 | 63 | 1 | 248 | 18 | 59 | 26 | 556 | 1783 | 2339 | 46.78 | 5.06 |
| 60 | 493 | 1108 | 110 | 95 | 90 | 1896 | 170 | 76 | 1 | 297 | 21 | 71 | 32 | 667 | 2029 | 2696 | 44.93 | 4.86 |
| 70 | 493 | 1292 | 129 | 110 | 101 | 2126 | 198 | 88 | 1 | 347 | 25 | 83 | 37 | 778 | 2275 | 3053 | 43.61 | 4.72 |
| **77** | **493** | **1422** | **141** | **122** | **109** | **2287** | **218** | **97** | **1** | **381** | **27** | **91** | **41** | **856** | **2447** | **3302** | **42.89** | 4.64 |
| 80 | 493 | 1477 | 147 | 126 | 112 | 2355 | 226 | 101 | 1 | 396 | 28 | 94 | 42 | 889 | 2520 | 3410 | 42.62 | 4.61 |
| 90 | 493 | 1662 | 165 | 142 | 123 | 2585 | 255 | 113 | 1 | 446 | 32 | 106 | 48 | 1000 | 2766 | 3766 | 41.85 | 4.53 |
| 100 | 493 | 1846 | 184 | 158 | 134 | 2815 | 283 | 126 | 1 | 495 | 36 | 118 | 53 | 1112 | 3012 | 4123 | 41.23 | 4.46 |
| 110 | 493 | 2031 | 202 | 174 | 145 | 3045 | 311 | 139 | 1 | 545 | 39 | 130 | 58 | 1223 | 3258 | 4480 | 40.73 | 4.41 |
| 120 | 493 | 2215 | 220 | 189 | 156 | 3274 | 339 | 151 | 1 | 594 | 43 | 142 | 64 | 1334 | 3503 | 4837 | 40.31 | 4.36 |
| 130 | 493 | 2400 | 239 | 205 | 167 | 3504 | 368 | 164 | 1 | 644 | 46 | 153 | 69 | 1445 | 3749 | 5194 | 39.96 | 4.33 |
| 140 | 493 | 2585 | 257 | 221 | 178 | 3734 | 396 | 176 | 1 | 693 | 50 | 165 | 74 | 1556 | 3995 | 5551 | 39.65 | 4.29 |
| 150 | 493 | 2769 | 276 | 237 | 189 | 3963 | 424 | 189 | 2 | 743 | 53 | 177 | 79 | 1667 | 4241 | 5908 | 39.39 | 4.26 |
| 160 | 493 | 2954 | 294 | 252 | 200 | 4193 | 453 | 202 | 2 | 792 | 57 | 189 | 85 | 1778 | 4487 | 6265 | 39.16 | 4.24 |
| 170 | 493 | 3138 | 312 | 268 | 211 | 4423 | 481 | 214 | 2 | 842 | 61 | 200 | 90 | 1890 | 4732 | 6622 | 38.95 | 4.22 |
| 180 | 493 | 3323 | 331 | 284 | 222 | 4652 | 509 | 227 | 2 | 891 | 64 | 212 | 95 | 2001 | 4978 | 6979 | 38.77 | 4.20 |
| 190 | 493 | 3508 | 349 | 300 | 232 | 4882 | 537 | 239 | 2 | 941 | 68 | 224 | 101 | 2112 | 5224 | 7336 | 38.61 | 4.18 |
| 200 | 493 | 3692 | 367 | 316 | 243 | 5112 | 566 | 252 | 2 | 990 | 71 | 236 | 106 | 2223 | 5470 | 7693 | 38.46 | 4.16 |

Fixed: Software Development Expenses
Purch: Kiosk Purchase Costs
Site: Site Preparation and Installation Costs
Phone: Phone Line Installation
CT: Caltrans Contract Management (@ 5%)

KMnt: Kiosk Maintenance
SMnt: Software Maintenance
Supp: Supplies
Lines: Annual Phone Line Charages
HWDC: Health and Welfare Data Center
Lic: Annual License Fees

## Table 4.4 Kiosk Cost Analysis (by number of kiosks)
## 5 Year Lifetime

| INSTALLATION COSTS ($'000s) | | | | | | | ANNUAL OPERATING COSTS ($'000s/yr) | | | | | | | SUMMARY COSTS ($'000s/year) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ksks | Fixed | Purch | Site | Phone | CT | TOT | CTInt | SMnt | Supp | Lines | HWDC | Lic. | | Operat. | Instal. | Total | Total/ Kiosk | Cost/ Use ($) |
| 10 | 493 | 185 | 18 | 16 | 36 | 748 | 28 | 13 | 0 | 50 | 4 | 12 | 5 | 111 | 182 | 293 | 29.35 | 3.18 |
| 20 | 493 | 389 | 37 | 32 | 47 | 977 | 57 | 25 | 0 | 99 | 7 | 24 | 11 | 222 | 238 | 461 | 23.03 | 2.49 |
| 30 | 493 | 554 | 55 | 47 | 57 | 1207 | 85 | 38 | 0 | 149 | 11 | 35 | 16 | 333 | 294 | 628 | 20.93 | 2.27 |
| 40 | 493 | 738 | 73 | 63 | 68 | 1437 | 113 | 50 | 0 | 198 | 14 | 47 | 21 | 445 | 350 | 795 | 19.87 | 2.15 |
| 50 | 493 | 923 | 92 | 79 | 79 | 1666 | 141 | 63 | 1 | 248 | 18 | 59 | 26 | 556 | 406 | 962 | 19.24 | 2.08 |
| 60 | 493 | 1108 | 110 | 95 | 90 | 1896 | 170 | 76 | 1 | 297 | 21 | 71 | 32 | 667 | 462 | 1129 | 18.82 | 2.04 |
| 70 | 493 | 1292 | 129 | 110 | 101 | 2126 | 198 | 88 | 1 | 347 | 25 | 83 | 37 | 778 | 518 | 1297 | 18.52 | 2.00 |
| **77** | 493 | 1422 | **141** | **122** | **109** | **2287** | **218** | **97** | **1** | **381** | **27** | **91** | **41** | **856** | **558** | 1414 | **18.36** | 1.99 |
| 80 | 493 | 1477 | 147 | 126 | 112 | 2355 | 226 | 101 | 1 | 396 | 28 | 94 | 42 | 869 | 574 | 1464 | 18.30 | 1.98 |
| 90 | 493 | 1662 | 165 | 142 | 123 | 2585 | 255 | 113 | 1 | 446 | 32 | 106 | 48 | 1000 | 630 | 1631 | 18.12 | 1.96 |
| 100 | 493 | 1846 | 184 | 158 | 134 | 2815 | 283 | 126 | 1 | 495 | 36 | 118 | 53 | 1112 | 687 | 1796 | 17.98 | 1.95 |
| 110 | 493 | 2031 | 202 | 174 | 145 | 3045 | 311 | 139 | 1 | 545 | 39 | 130 | 58 | 1223 | 743 | 1965 | 17.87 | 1.93 |
| 120 | 493 | 2215 | 220 | 189 | 156 | 3274 | 339 | 151 | 1 | 594 | 43 | 142 | 64 | 1334 | 799 | 2132 | 17.77 | 1.92 |
| 130 | 493 | 2400 | 239 | 205 | 167 | 3504 | 368 | 164 | 1 | 644 | 46 | 153 | 69 | 1445 | 855 | 2300 | 17.69 | 1.91 |
| 140 | 493 | 2585 | 257 | 221 | 178 | 3734 | 396 | 176 | 1 | 693 | 50 | 165 | 74 | 1556 | 911 | 2467 | 17.62 | 1.91 |
| 150 | 493 | 2789 | 276 | 237 | 189 | 3963 | 424 | 189 | 2 | 743 | 53 | 177 | 79 | 1667 | 967 | 2634 | 17.56 | 1.90 |
| 160 | 493 | 2954 | 294 | 252 | 200 | 4193 | 453 | 202 | 2 | 792 | 57 | 189 | 85 | 1778 | 1023 | 2801 | 17.51 | 1.90 |
| 170 | 493 | 3138 | 312 | 288 | 211 | 4423 | 481 | 214 | 2 | 842 | 61 | 200 | 90 | 1890 | 1079 | 2968 | 17.46 | 1.89 |
| 180 | 493 | 3323 | 331 | 284 | 222 | 4652 | 509 | 227 | 2 | 891 | 64 | 212 | 95 | 2001 | 1135 | 3135 | 17.42 | 1.89 |
| 190 | 493 | 3508 | 349 | 300 | 232 | 4882 | 537 | 239 | 2 | 941 | 68 | 224 | 101 | 2112 | 1191 | 3303 | 17.38 | 1.88 |
| 200 | 493 | 3692 | 367 | 316 | 243 | 5112 | 566 | 252 | 2 | 990 | 71 | 236 | 106 | 2223 | 1247 | 3470 | 17.35 | 1.88 |

Fixed: Software Development Expenses
Purch: Kiosk Purchase Costs
Site: Site Preparation and Installation Costs
Phone: Phone Line Installation
CT: Caltrans Contract Management (@ 5%)

KMnt: Kiosk Maintenance
SMnt: Software Maintenance
Supp: Supplies
Lines: Annual Phone Line Charages
HWDC: Health and Welfare Data Center
Lic: Annual License Fees

Figure 4-l Cost/Use (5 Year Lifetime)

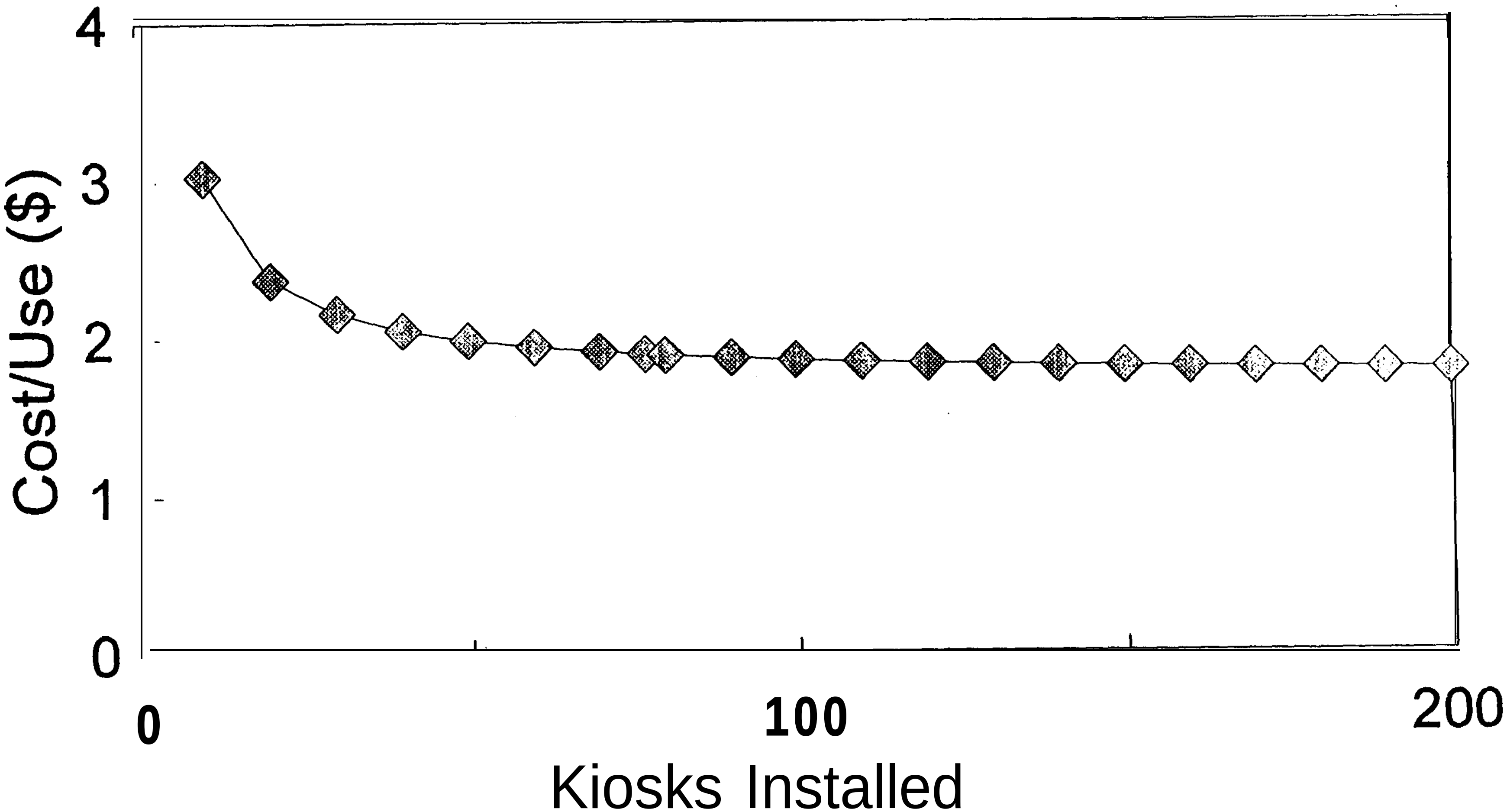


Figure 4-2 Annual Cost %s (1 year)

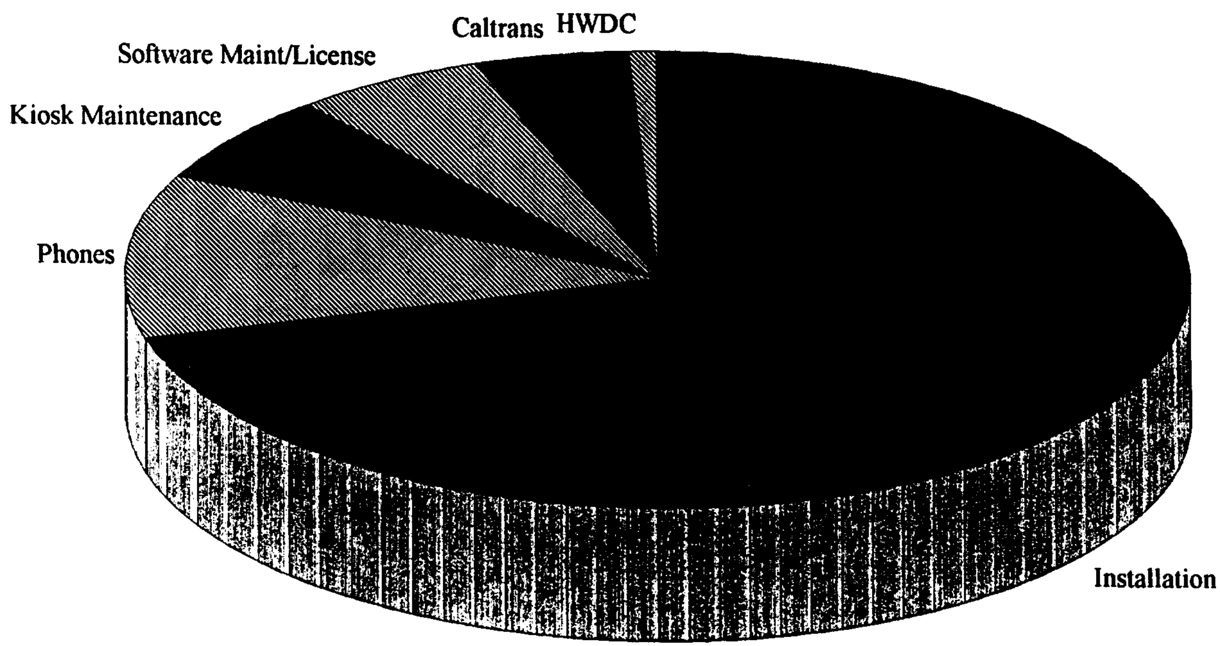


Figure 4-3 Annual Cost %s (5 year)

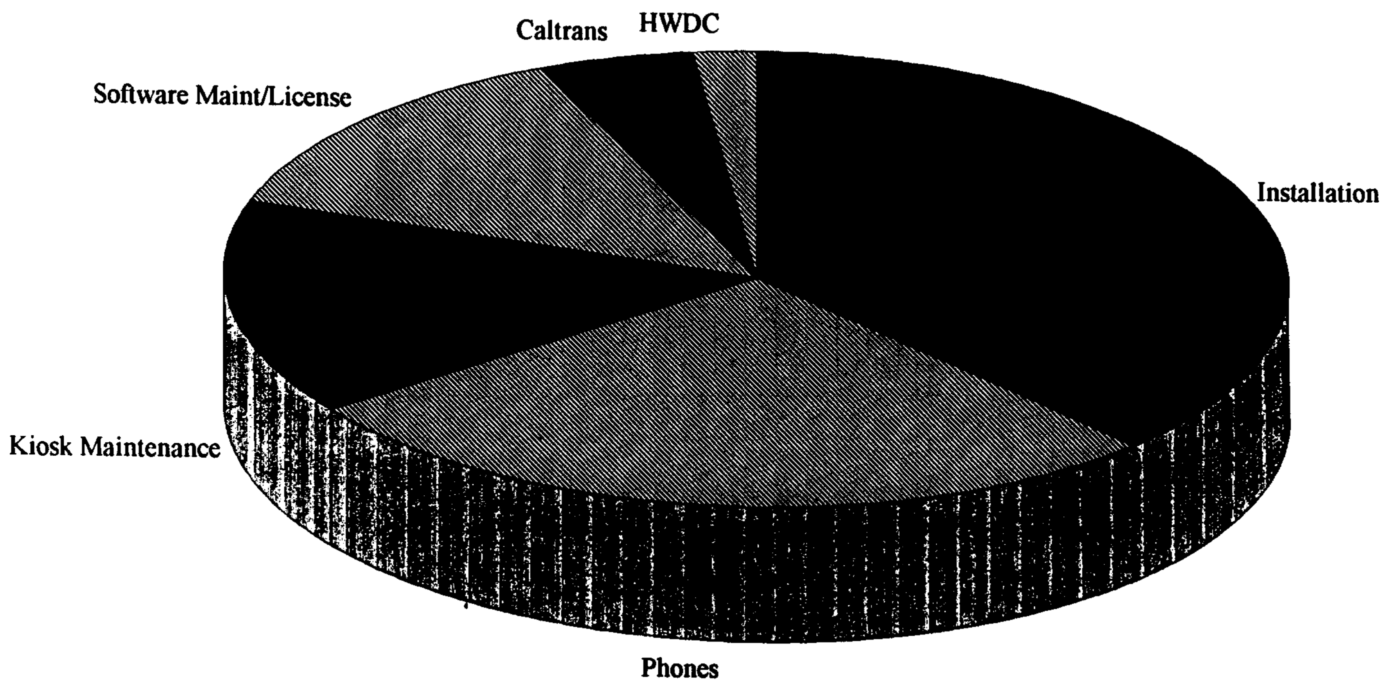


Figure 4-4 ARMS Cost/Use ($)

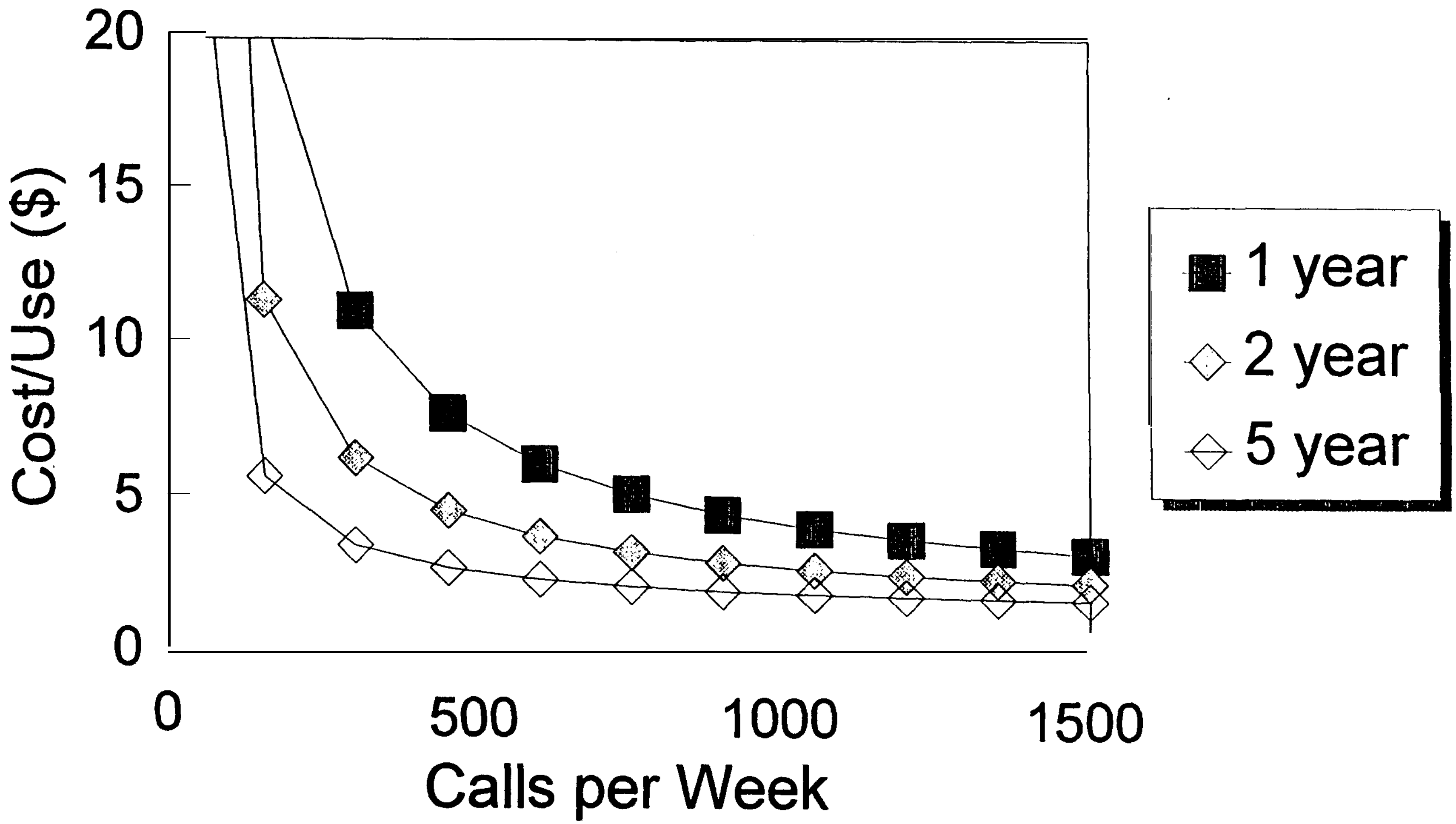


**Table 4.5 ARMS Cost Analysis (by calls per week)**

| | | | | TOTAL ANNUALIZED COST ($) | | | | | COST/USE ($) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | *Lifetime* | | | | | *Life time* | | | | |
| Ports | Calls/ Week | Initial Develop | Annual Operate | 1 year | 2 year | 3 year | 4 year | 5 year | 1 year | 2 year | 3 year | 4 year | 5 year |
| **1** | **27.4** | **152605** | **4284** | **156,889** | **83,167** | **58,630** | **46,390** | **39,068** | **110.11** | **50.37** | **41.15** | **32.56** | **27.42** |
| 1 | 150 | 152605 | 10523 | 163,128 | 89,406 | 64,869 | 52,629 | 45,307 | 20.91 | 11.46 | 8.32 | 6.75 | 5.81 |
| 2 | 300 | 152605 | 21046 | 173,651 | **99,929** | **75,393** | 63,152 | 55,830 | 11.13 | 6.41 | 4.83 | 4.05 | 3.58 |
| 3 | 450 | 152605 | 31570 | 164,175 | 110,452 | 85,916 | 73,675 | 66,354 | 7.87 | 4.72 | 3.67 | 3.15 | 2.84 |
| 4 | 600 | 152605 | 42093 | 194,698 | 120,976 | 96,439 | 84,199 | 76,877 | 6.24 | **3.88** | 3.09 | 2.70 | 2.46 |
| 5 | 750 | 152605 | 52616 | 205,221 | 131,499 | 106,962 | **94,722** | 87,400 | 5.26 | 3.37 | 2.74 | 2.43 | 2.24 |
| 6 | 900 | 152605 | 63139 | 215,744 | 142,022 | 117,485 | 105,245 | 97,923 | 4.61 | 3.03 | 2.51 | 2.25 | 2.09 |
| 7 | 1050 | 152605 | 73662 | 226,267 | 152,545 | 128,009 | 115,768 | 108,447 | 4.14 | 2.79 | 2.34 | 2.12 | 1.99 |
| 8 | 1200 | 152605 | 84186 | 236,791 | 163,068 | 138,532 | 126,292 | 118,970 | 3.79 | 2.61 | 2.22 | 2.02 | 1.91 |
| 9 | 1350 | 152605 | 94709 | 247,314 | 173,592 | 149,055 | 136,815 | 129,493 | 3.52 | 2.47 | 2.12 | 1.95 | 1.84 |
| 10 | 1500 | 152605 | 105232 | 257,837 | 184,115 | 159,578 | 147,338 | 140,016 | 3.31 | 2.36 | 2.05 | 1.89 | 1.80 |

Clearly, the level of usage is far too low to gain sufficient scale economies, resulting in a truly enormous cost. To push costs into a more reasonable range, usage would have to increase by a factor of 50 or more. Even then, the cost would still be well over $1 per call. Again, these cost estimates are conservative.

If installation is viewed as a sunk cost, the cost per use drops to **$2.96/call** at the current level of usage. Because installation costs are dominant, cost per use drops significantly, but still exceeds reasonable levels. As mentioned earlier, this estimate assumes that no ongoing expense is needed for marketing, and that Caltrans invests minimally in project management.

In conclusion, it appears that the service cannot be justified on financial grounds, even if sunk costs are not considered. If sunk costs are considered, the cost per use is far from reasonable.

PC **Software No** significant cost analysis was performed for this element. We believe that because the system was never implemented as intended, it is impossible to draw valid conclusions on the financial viability of the concept. Additional investment, of uncertain amount, is required to develop the PC Software into the multi-modal product that was intended.

As a crude analysis, the PC software has consumed $63,419 in cost to date, with a distribution of 500. Simply dividing the cost by the distribution, this amounts to roughly $127 per copy. Based on survey results, it appears that only one in four copies of the software were actually in use, yielding a cost of $507 per *used* copy. In either case, costs are quite high, relative to commercial software of similar functionality. However, because the software was available on the Internet, more copies could have been downloaded, expanding the software's distribution and lowering the cost.

### 4.3 Comparative Costs

The cost effectiveness of Smart Traveler can be analyzed relative to alternative means of acquiring travel information. According LACMTA, it costs **$.32** to process each phone call received at its telephone information center. This does not include capital costs and the cost of maintaining databases. However much of these costs are required for both Smart Traveler and their regular customer information line. Hence, the cost of serving customers through kiosks appears to be considerably higher then serving calls by telephone. Cost information was also requested from CTS, but was unavailable.

## 4.4 Cost Reduction Strategies

A number of possibilities exist to reduce cost per use in the deployment of *future* systems:

### Kiosk

Elimination of multi-media capabilities (e.g., videos) would significantly reduce.the.cost of developing software (eliminating, for instance, the need to develop videos), the cost of acquiring hardware, and the cost of maintaining hardware. In addition, more than 25 percent of annual cost is attributed to recurrent communication charges and more than 5 percent of installation costs are attributed to phone line-installation. An alternative design, in which all information is stored remotely could potentially greatly reduce costs. This could be accomplished by providing a CD-ROM or floppy diskette containing bus schedule data and ridematch data (or perhaps eliminating ridematch data altogether). However this would provide some additional cost for loading information onto kiosks. An alternative would also be to utilize the Internet to access databases instead of entirely by phone lines. Careful selection of sites, focusing on transit terminals and shopping centers could increase usage per kiosks, and also reduce cost per use. (However, maintenance cost per kiosk may rise. As discussed later, the number of failures per kiosk is positively correlated with the average usage per day). In total, these changes have the potential for reducing cost below $1 per use in any new implementation of a Smart Traveler like system.

### ARMS

ARMS could be re-directed toward automating CTS' existing phone service, instead of focusing on the one-time trip. This would not only reduce software development expenses (by eliminating the most trouble-prone feature: automated messaging), but also greatly expand the set of potential users, without requiring additional promotional expense. Promotion should become a part of CTS' regular mailings, rather than operate as an independent activity. If marketing cost can be reduced significantly without sacrificing call volume, the system would be more attractive.

### PC Software

PC software has the potential for much wider distribution. The software is now available via the Internet, providing distribution at near zero marginal cost. The software could also be promoted through PC outlets, possibly at zero cost.

# CHAPTER 5 KIOSK USER EVALUATION

## 5.1 Research Design

The functional characteristics evaluation has concentrated on elements associated with the design of the user interface. In this second element of kiosk evaluation the actual operation of the kiosks in the field is considered. There are three data sources used:

1. The automated data which tracks the nature and number of touches of the screen by each individual user.

2. Site field observations of the kiosks.

3. Survey results from a mail back survey distributed to users at four kiosk locations.

The three data sources are discussed in the following sections.

### 5.1.1 Automated Kiosk Data

Smart Traveler kiosks display a continuous video referred to as an "attract loop" when the machine is not being activated by a user. The attract loop is broken when the screen is touched, and a welcoming screen containing icons and text appears. The kiosk user can activate the menu options by touching the screen icons and text. Each touch is logged by task element and time by the kiosk computer software, thus creating a data log file. The data log file is stored on the hard drive of each kiosk. These log files are periodically polled and transferred to the HWDC system. Original plans called for an automated procedure to pull and read the log files, as well as to generate usage reports. This automated procedure was not implemented; thus file manipulation and report generation had to be performed manually.

Raw data files for a seven month period (June 28, 1994 to January 31, 1995) were obtained from HWDC. A program was written to extract information for each of the kiosks and create a data file of use for twenty selected menu items by julian day, time and language. The menu items were selected to 1) identify the type of information accessed by users, and 2) determine whether users were able to navigate the entire process required to obtain transit or ridesharing information. The duration of each transaction was also included.

HWDC also collects data on maintenance requests as described in Chapter 2. These data are valuable for cleaning the kiosk data files, because they allow us to identify days on which we know the kiosks to be malfunctioning. Analysis of kiosk usage must account for days when the kiosk is not in service. Maintenance data were available for the period May 1994 to January 1995. In this period the data identify 69 kiosks with a total of 226 days in maintenance. Kiosk data for the same period were selected and were matched by kiosk ID and julian day, resulting in the deletion of 894 kiosk days. Aggregation procedures were then applied to these data files to give the duration of transactions in seconds and hours, the total count of commands in use and counts of use of a given command. The analysis is based on the available days of data for 75 kiosks.

### 5.1.2 Site Field Observation of the Kiosks

The research team conducted field observations to evaluate the kiosks in the context of their location. It was postulated that differences in levels of kiosk use can be expected to be a function of:

- the type of site where they are located;
- the level of activity in the immediate vicinity of the kiosk;
- the relative quality of the area where the kiosk physically stands;
- other factors such as the maintenance and operating condition of the kiosk.

It was anticipated that data collected at each site should help in the interpretation of the automated data and perhaps even help in illuminating responses to the kiosk user surveys. Field observations of 44 kiosks were conducted in May, June and July 1994, immediately following installation of the kiosks.

### 5.1.3 Kiosk User Survey

The kiosk user surveys were conducted in order to determine user responses and perceptions of the kiosks. This survey was performed to meet the requirements of the earthquake funded portion of the study and consequently, the survey had to take place shortly after the kiosks were installed. Given the short time period available, the only practical approach available was to distribute surveys to users and observers of kiosk on site and provide prepaid envelopes for survey returns.

Three locations were selected on the basis of relatively high estimated foot traffic. They were:

- A kiosk located in an upscale food court serving two downtown high rise office towers.

- A kiosk located in a high pedestrian traffic area in a suburban shopping mall with up market retail outlets.

- A kiosk located in a food court in an urban shopping mall with more middle market retail outlets.

A fourth location was added when the first location yielded a low response:

- A kiosk location in a downtown plaza with a luxury hotel, multiple eating facilities and a major anchor store.

The range of locations selected for the distribution of the surveys had the benefit of giving a mix of survey respondents even if the method of distribution was non-random and biased by self-selection.

The survey had three limitations. First, the kiosks had only recently been activated, and for many users this was their first opportunity to use Smart Traveler. It was therefore not possible to ask questions about repeated use or whether kiosk use had influenced travel decisions. Second, the survey was conducted only in English, again because of the limited time available. Finally the survey had to be as short and simple as possible in order to maximize the response rate. The survey instrument is included as Appendix C.

## 5.2 Analysis

### 5.2.1 Patterns of Kiosk Use

As noted above, the automated data analysis is based on log data from 75 kiosks over six months. In addition to excluding days when the kiosks were not in operation, we also deleted outlier transactions, e.g. those with variable values beyond the 99.9 percentile. The clean file includes 222,657 transactions (separate uses) over 9,852 kiosk-days. Average usage is thus based on the number of days of data available for each kiosk.

**Average daily usage**

There is some judgement involved in defining kiosk use. We define “use” in terms of transactions, and measure a transaction as each time the main menu item is selected. We define a “touch” as each time the attract loop is broken. The attract loop is broken whenever the screen is touched, whether or not the kiosk is actually used. On the other hand, it is possible to return to the main menu item one or more times during a single “use” session. Thus our measure of use is a count of how many times the users begin a command sequence, and not the number of people who may have used the kiosk. Table 5.1 gives the mean, standard deviation and range for number of days, as well as average transactions per day for the 75 kiosks. The number of days of data per kiosk has a large range, reflecting differences in data polling as well as kiosk downtime.

**Table 5.1 Average Kiosk Use - 75 Kiosks**

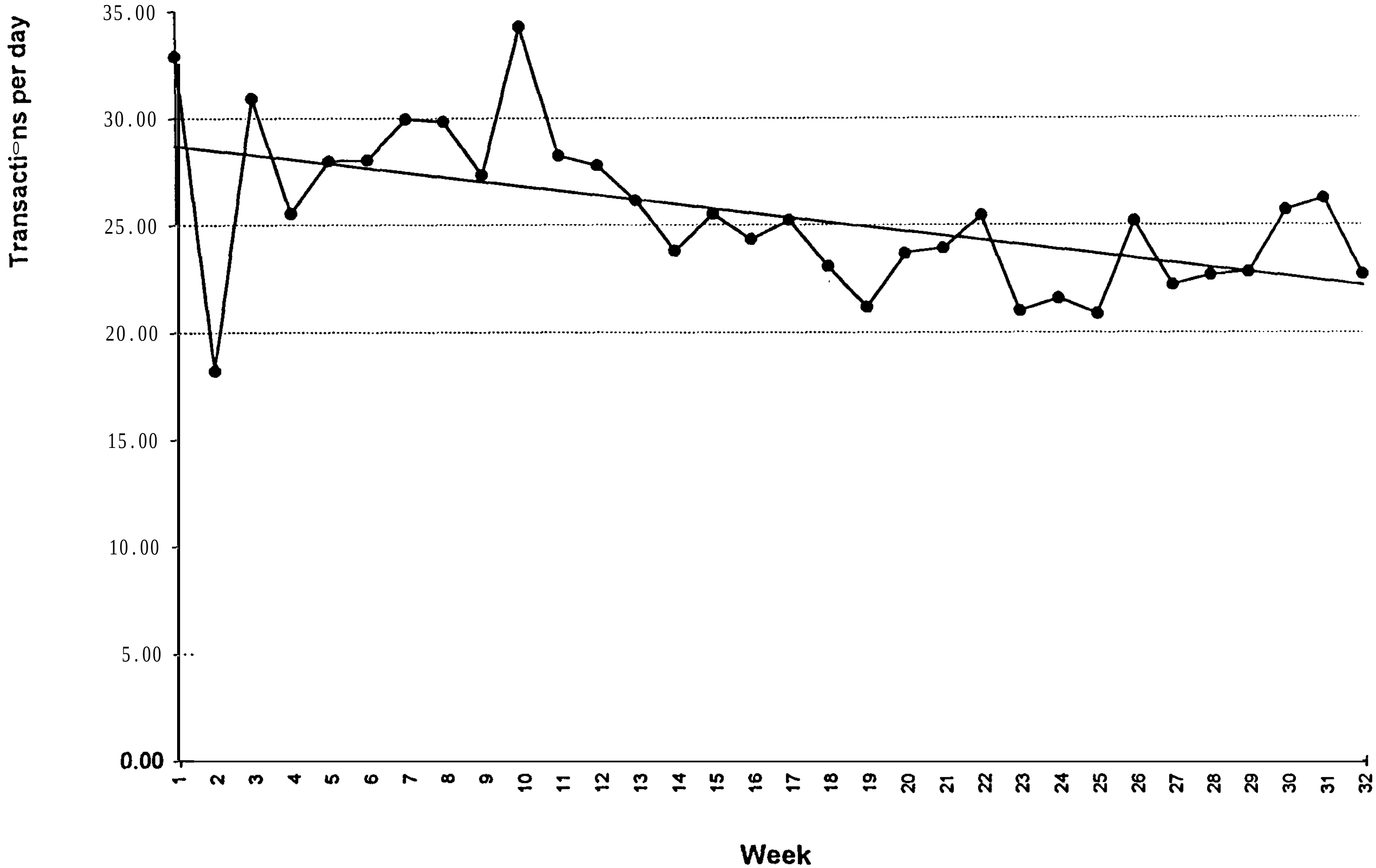
| TOTAL KIOSKS | USE DAYS | TRANSACTIONS PER DAY |
|---|---|---|
| Average | 131.3 | 25.3 |
| Std. deviation | 39.4 | 16.5 |
| Range | 32 - 190 | 3 - 62 |

Average daily usage is also quite variable. The kiosk with the highest average daily use is located in Union Station in the downtown area of Los Angeles. The remaining four of the top five locations are shopping malls. Of the five least used kiosks, three are in office complexes, one is in a grocery store, and one is in a City Hall.

**Usage trends**

Figure 5.1 shows average weekly usage (as transactions/day/kiosk) over the analysis period. We estimated a simple regression to determine whether there was any significant trend in kiosk usage. The slope coefficient estimate is -0.21, with standard error of 0.06 and significance level of 0.001, indicating a slight decline in usage over the demonstration period. The regression line is also plotted in Figure 5.1. The small magnitude of the decline suggests substantial repeat use of the kiosks, since at most locations the potential user market is relatively fixed. For example, new users at a shopping mall are a function of the turnover rate of mall patrons. If people tend to be one-time users of the kiosks, we would see a sharp drop in use after the first few months.

Figure 5.1 Weekly Average Number of Transactions Per Day



The automated data also makes it possible to examine the duration of a kiosk usage transaction. As might be expected, the distribution of duration is skewed toward short durations. The average duration is 4.66 minutes; 41 percent of all uses are 3 minutes or less, and 80 percent are 6 minutes or less. Combining the average usage and duration data reveals that the kiosks are idle most of the time. The average kiosk is in use less than two hours per day. Even accounting for peaks in daily demand patterns, it appears that the kiosks are operating far below their capacity.

**Effects of day of week and location**

Differences in usage by day of week and location were analyzed. Table 5.2 shows the data aggregated to kiosks by day of week. The single highest day is Saturday, followed by Friday and Sunday; the differences, however, are not statistically significant.

**Table 5.2 Average Daily Use by Day of Week**

| DAY OF WEEK | | NUMBER OF DAYS | GROUP AVERAGE |
|---|---|---|---|
| Sunday | | 1121 | 25.32 |
| Monday | | 1398 | 24.20 |
| Tuesday | | 1513 | 25.38 |
| Wednesday | | 1497 | 24.75 |
| Thursday | | 1512 | 24.85 |
| Friday | | 1516 | 26.02 |
| Saturdav | | 1295 | 26.74 |
| Total sample average | 25.3 | | |
| N | 9852 | | |

Kiosk location, as expected, is an important explanatory factor for differences in use. Kiosk locations were categorized as follows: shopping centers, grocery stores, discount stores, office and other. The "other" category includes transportation facilities, hospitals, libraries and other hard to classify locations. An analysis of variance was conducted using the location categories and a dummy variable for weekday/weekend. The independent effect of location and the joint effect of location with weekday/weekend are significant.'

'F-statistic = 38.11, sig. = .000, N = 521.

These differences are further illustrated in Table 5.3, which gives average daily usage for each type of location, by weekday and weekend. As would be expected, usage is higher on weekends than weekdays at the retail locations, while office locations have little usage on weekends. However, even on weekdays the office locations have less use than any but grocery store locations. Because the "other" category includes such a diverse set of locations no conclusions should be drawn about the patterns detected for this group.

**Table 5.3 Group Means, Average Daily Usage by Location and Time of Week**

| | SHOPPING CENTER | GROCERY STORE | DISCOUNT STORE | OFFICE | OTHER |
|---|---|---|---|---|---|
| Weekend | 50.60 (32) | 22.77 (16) | 52.97 (12) | 5.40 (42) | 19.70 (44) |
| Weekday | 39.06 (80) | 16.13 (40) | 37.44 (30) | 20.70 (110) | 25.52 (115) |

( ) = number of observations in each group

We conducted a dummy variable regression to determine the relative effect of location and time of week on average daily usage. Results are given in Table 5.4. All variables except the grocery dummy and weekday dummy are significant. The value of the constant is close to the actual sample mean value, and the $R^2$ is reasonable. Because all the coefficients are effectively in the same units, they can be interpreted directly. The shopping center and discount stores have much higher average usage than the sample as a whole. The equation predicts a use rate of about 40 uses per day for these types of locations, about 60 percent higher than the sample average. On the other hand, the equation predicts about 15 uses per day for office locations -- about 60 percent lower than the sample average.

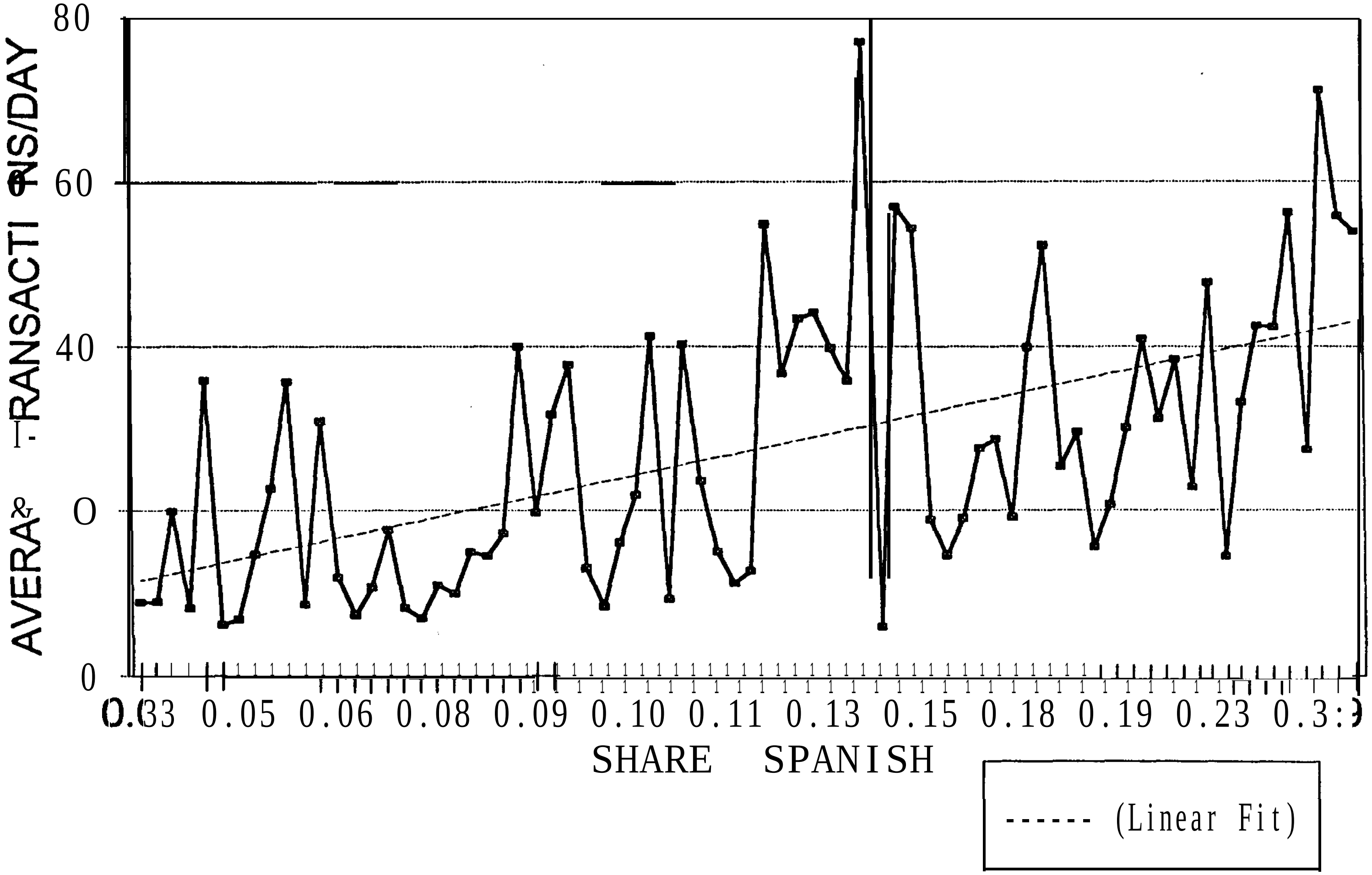
**Table 5.4 Regression Results, Dependent Variable = Average Daily Usage**

| VARIABLE | COEFF | T-STATISTIC | SIG. OF T |
|---|---|---|---|
| Weekday | 1.81 | 1.209 | .227 |
| Shopping Center | 18.49 | 9.722 | .000 |
| Office | -7.44 | 4.265 | .000 |
| Discount Store | 18.16 | 6.740 | .000 |
| Grocery Store | -5.22 | 2.212 | .027 |
| Constant | 22.60 | 13.842 | .000 |
| N = 521 | | | |
| $R^2$ (adj) = .316 | | | |

**Usage by language**

The kiosk menus can be accessed in English or Spanish. Spanish accounts for 17 percent of the kiosk daily average uses. Again, there is great variation across kiosks, with Spanish use ranging from 10 percent (a kiosk located in an upscale shopping mall in the Thousand Oaks area) to 53 percent (a kiosk located at a Pic'N'Save in central Los Angeles). There is a positive relationship between daily kiosk use and the share of Spanish transactions, as illustrated in Figure 5.2. We estimated a simple linear regression (the regression line is also plotted in Figure 5.2); the slope coefficient estimate is 97.9, with standard error of 17.3 and significance of .001. The magnitude of the coefficient suggests an increase of about one transaction per day for every percentage point increase in the Spanish share.

Figure 5.2 Average Transactions per day
vs Share Spanish



### Explaining Patterns of Kiosk Use

If kiosk use were equally attractive to all passers-by, the level of usage would simply be determined by the level of pedestrian traffic in the area of the kiosk. Thus one explanation for higher use at retail locations is that such locations get more pedestrian traffic. This hypothesis cannot be rigorously tested because average traffic per site is not known. However, our field site observations included a subjective assessment of activity levels associated both within the buildings where the kiosks are located (site area) and for the area within 15-20 feet of the kiosk (kiosk area).

Table 5.5 gives site and area activity ratings for the top five, middle four, and bottom five kiosk locations for which complete field information is available. Unfortunately, the five actual middle kiosk locations were not part of the field site observations. We therefore use the four locations that were closest to the median for which site observation data were available. These subjective assessments are quite consistent with level of usage. All of the top performing kiosks are located at very busy sites. However, the same is true for three of the four moderate usage sites, suggesting that high traffic is not a sufficient condition for a high rate of kiosk use. As expected, the low usage sites are rated as having low or moderate activity.

**Table 5.5 Average Daily Use, Site and Area Activity Level, Selected Kiosks**

| CATEGORY | AVERAGE USE/DAY | SITE ACTIVITY | KIOSK AREA ACTIVITY |
|---|---|---|---|
| High Usage | | | |
| Union Station | 62 | high | high |
| Antelope Valley Mall | 60 | high | high |
| Pasadena Plaza | 59 | high | high |
| Sherman Oaks Galleria | 58 | high | high |
| Panorama Mall | 58 | high | high |
| Moderate Usaae | | | |
| Fox Hills Mall | 29 | high | high |
| Lucky #408 | 27 | high | high |
| LA County Hall of Admin | 19 | high | high |
| Von's #1 11 | 19 | medium | medium |
| Low Usage | | | |
| NBC | a | low | low |
| Burbank City Hall | 7 | low | low |
| Pasadena Towers | 6 | medium | medium |
| Von's #8 Palmdale | 6 | low | low |
| Warner Center | 3 | medium | medium |

Total traffic is also a function of the number of hours per day that the kiosk is available. Retail locations have more hours per day of exposure than office complexes. We examined the information on hours of operation to determine whether we could test directly for an effect. We found that hours of operation are clearly established at retail sites and have little variability within location categories, but this is not the case at other sites. Many office complexes are open at night or on weekends, for example, yet little business activity takes place at these times. We conclude that the stated hours of operation are not a good indicator of pedestrian traffic at kiosk sites.

Another explanation for the patterns we have observed may be associated with the purposes for which the kiosks are being used. Traveler information systems are typically aimed at the work trip. The commuter is the stereotypical user, i.e., the car driver checks the freeway map before departure; the prospective transit user or carpooler searches for bus routes or carpool partners in order to change his commute mode. Office locations thus seem appropriate. However, it may be that kiosk information is more relevant and beneficial for non-routine trips, i.e., for tourists, for non-work destinations, or for new work trips. High usage at shopping centers and other retail locations suggest that kiosk use is more of a leisure time activity; travelers are gathering information about possible future trips, rather. than for their current trip. Even for commuting,. travelers may find it more convenient to learn about alternative modes during their off hours.

Anecdotal evidence suggests that kiosks may not be a very convenient way to obtain real-time travel information. In a focus group discussion held at one of the office complexes, participants noted that while it would be interesting to access the freeway map to check on traffic conditions before leaving for home, it was not worth a trip to the kiosk to do so. Having access to the map in the office on their PC was considered to be greatly-superior.

**Use of menu items**

We examined the use of specific menu items in order to determine the type of information most frequently requested by users. We selected the entry point command to each information category for this purpose. Obtaining transit or ridesharing information is more difficult than obtaining other types of information, because of the amount of information the user must provide. We anticipated that users might have difficulty navigating the entire process, resulting in many fewer completions than initial requests. We therefore selected additional menu items within the transit and ridesharing menu groups so that we could examine the completion rates for these items.

Table 5.6 gives average daily usage for the entry point commands. The Smart Traveler introduction is the first screen that appears once the menu system is activated and asks for a language selection. Selecting the language allows the user to proceed to the main menu screen. Instructions on how to use the kiosk are requested frequently, suggesting that many people are unfamiliar with the kiosk technology and need some help to use it.

Among the three types of transportation data available, requests for bus and train routes and schedules are the most frequently requested, followed by the freeway conditions map. Rideshare matchlisting is least frequently requested. The information videos follow the same order, with MTA bus and train information being requested more than any other information item. It is interesting to consider why requests for transit information are so much more frequent than requests for match list information. It is possible that match list information is already easily accessible at the work place or via the well-publicized rideshare telephone numbers. Transit information is not as easily accessible. There are many different bus and train operators in the region, and there is no widely recognized telephone information source.[2] Moreover, ridematching applies only to work travel, while transit is used for all types of trips.

[2]MTA provides information for Metrolink and the municipal bus operators, but prospective riders may not know it.

**Table 5.6 Average Daily Usage of Menu Items**

| COMMAND | AVERAGE DAILY USE |
|---|---|
| Smart Traveler introduction (entry screen) | 25.78 |
| Main menu | 25.31 |
| How to use the kiosk | 6.98 |
| Current freeway conditions map | 4.81 |
| About Caltrans (video) | 2.87 |
| Rideshare/carpool matchlisting | 2.10 |
| Ridesharing information (video) | 1.33 |
| Transit routes and schedules | 5.08 |
| MTA bus and train information (video) | 5.15 |

If we add up the usage rates for the entry points requesting some form of mode or route information (freeway map, rideshare match, transit routes), we find that these requests account for about 47 percent of the total daily average transaction rate. Video requests account for about 37 percent, and the "how to" menu accounts for 26 percent. Combining all of these accounts for 64 percent of the total, meaning that about 16 percent of the transactions end without accessing any additional menu items.

We compared menu usage in Spanish to that of total usage. Spanish language users access the "how to" menu more frequently (51 percent of the total Spanish daily average transaction rate), and request some additional menu item less frequently (79 percent) than English users. As **a** result, the total share of actual mode or route requests is lower for Spanish than for English users. Within the individual modes (freeway, rideshare, transit), Spanish language requests are greater than expected only for rideshare matchlisting and information. However, the rate of actually obtaining a printed match list is very low.

We noted earlier that obtaining ridematching or transit information requires several steps, and that some users may not succeed in completing the entire process. Tables 5.7 and 5.6 show that there is a large drop-off for both types of information. The transit information branch begins by asking for the city and street names where the trip begins. If the user misspells a street name, or if the street is not part of the MTA data base, or if there is more than one street with the same or similar name (e.g. Sixth Street, Sixth Avenue), the computer may not recognize the origin point. The trip origin review command is used even more frequently that the transit request command, indicating that many users must repeat or revise this information.

The "review trip information" command is discretionary and is not often used. Once the trip origin and destination information is processed, the computer provides a summary of the itinerary, complete with bus or train arrival and departure times, precise stop locations, and specific transfer information. The user can request a print-out of the itinerary. It appears that about half of those who request transit information proceed through the menu and obtain a print-out.

**Table 5.7 Use of Transit Routes and Schedules Menu**

| COMMAND | AVERAGE DAILY USE |
|---|---|
| Transit routes and schedules | 5.08 |
| Review trip origin city and streets | 5.56 |
| Review trip destination city and streets | 2.20 |
| Review trip information | 1.32 |
| Print trip itinerary | 2.46 |

The use pattern for rideshare matchlisting is quite different from that of transit (Table 5.6). First, less than half of those who request matchlisting get as far as reviewing work schedule or trip origin information. Second, there is a much smaller share of users who obtain a printed match list (about 13 percent). Note that the small share is not accounted for by the lack of an available match (last row of Table 5.6). These results are difficult to interpret; one possibility is that the process is simply too slow compared to the service provided at the workplace or by CTS, the regional rideshare agency.

**Table 5.8 Use of Rideshare Matchlisting Menu**

| COMMAND | AVERAGE DAILY USE |
|---|---|
| Rideshare matchlisting | 2.10 |
| Review work start/leave time | 1.05 |
| Review carpool origin city and streets | 1.oa |
| Review carpool destination city and streets | 0.37 |
| RideStar match list | 0.28 |
| No rideshare matches found | 0.08 |

### 5.2.2 Smart Traveler Kiosk Users

We turn now to our kiosk user survey results. A total of 1,785 surveys were distributed to kiosk users and observers; 325 were returned, yielding a response rate of 18.2 percent. Table 5.9 gives survey distribution and responses by location for the 304 surveys for which distribution location information was recorded. Three of the four sites had very similar response rates.

**Table 5.9 Survey Distribution and Return by Survey Location**

| LOCATION | DISTRIBUTED | RETURNED' | PERCENT RESPONSE |
|---|---|---|---|
| Food court, downtown office center | 132 | 25 | 18.9 |
| Up-scale suburban mall | 445 | 88 | 19.8 |
| Middle market urban mall | 775 | 110 | 14.2 |
| Downtown mixed use plaza | 433 | 81 | 18.3 |

*21 surveys had missing distribution location information

As noted earlier, the kiosk user survey is not based on a random sample of kiosk users or potential kiosk users. In fact, we have no information on the population of kiosk users. The population of potential kiosk users is determined by the kiosk locations. Few of the kiosks are located in areas that serve large numbers of lower income households, and consequently we would not expect to find many individuals from lower income households among the kiosk users. In addition, survey response is generally correlated with education and income, and the surveys were written only in English, thus eliminating non-English speakers from the sample population.

It is therefore useful to compare characteristics of survey respondents with those of the Los Angeles County population. Table 5.10 gives gender, employment, education and income level for survey respondents and Los Angeles County population, taken from the 1990 Census. As expected, survey respondent characteristics are quite different from the general population. They are more likely to be employed, are more educated, and have higher household incomes. Although our survey respondents are not representative of the general population, they likely are representative of the potential users at the locations where the surveys were conducted.

**Table 5.10 Comparison of LA County and Survey Respondent Characteristics**

| CHARACTERISTIC | IA COUNTY (%) | SURVEY (%) |
|---|---|---|
| Gender | | |
| Male (%) | 49.4 | 56.8 |
| Female (%) | 51.6 | 43.2 |
| Employment | | |
| Employed (%) | 62.0 | 81.5 |
| Not employed (%) | 38.0 | 18.5 |
| Education | | |
| No high school diploma | 30.0 | 0.3 |
| High school diploma | 21.0 | 19.0 |
| Some college | 27.0 | 41.0 |
| College degree | 22.0 | 40.0 |
| Household Income | | |
| up to $34,999 | 50.0 | 32.0 |
| $35,000 to $49,999 | 17.0 | 20.0 |
| $50,000 to $99,999 | 25.0 | 38.0 |
| $100,000 or more | a.0 | 10.0 |

**Respondent Work Travel Characteristics**

As noted in Table 5.10, most survey respondents are employed. Of those employed, 63 percent work 40 hours or more per week. Vehicle access and ownership is extensive among those employed; 66 percent report household ownership of two or more vehicles, and 62 percent report having a vehicle available to drive to work. An additional 10 percent report having a vehicle available to drive "sometimes." Just 4 percent report having no household vehicles, and 8 percent do not have a vehicle to drive to work.

Given the level of vehicle access, there is a higher than expected use of public transit for the trip to work, as shown in Table 5.11, where work trip mode shares for survey respondents and Los Angeles County workers are listed. The drive-alone share is close to the regional average, and the carpool share is slightly lower. Survey respondents also have longer trips to work. Reported mean travel time and distance are respectively 36 minutes and 19.6 miles, with medians of 30 minutes and 15 miles. The LA County 1990 census data gives a mean travel time of 26.5 minutes. An annual survey of Los Angeles metropolitan area commuters reports a mean distance of 16.5 miles and travel time of 31 minutes in its 1994 survey report (Commuter Transportation Services, 1994).

**Table 5.11 Usual Mode of Travel To Work, Percent Shares, Survey and LA County**

| MODE OF TRAVEL TO WORK | SURVEY (%) | IA COUNTY (%) |
|---|---|---|
| Drive Alone | 70.3 | 72.1 |
| Carpool with others | 12.6 | 16.0 |
| Bus or train | 13.8 | 6.6 |
| Vanpool | 0.8 | n/a |
| Walk or bike | 1.6 | 4.0 |
| Other | 0.8 | 1.3 |
| N | 249 | 4,002,048 |

Further examination of the survey data revealed that the downtown mixed use plaza survey site generated a large proportion of transit users: 24 of the 64 commuters (37 percent) used bus or rail transit, compared to 9 percent for commuters surveyed at the downtown office site, 7 percent at the urban mall, and none at the suburban mall. The mixed use plaza is adjacent to the Metro subway line, and is one of the most "transit accessible" locations in downtown.

### Kiosk Users and Perceptions of Use

Most of the survey respondents had used the kiosk.[3] Respondents were asked whether they were aware of a Smart Traveler kiosk at the survey location, and, if so, whether they used the kiosk. Eighty one percent of the 325 respondents were aware of the kiosk, and of this group 84 percent had used the kiosk. Given that the kiosks are a new technology, it is possible that willingness to use the kiosks and perceptions about the kiosks are related to individual characteristics such as education level or gender. For example, people with college degrees may have had more exposure to computers than high school graduates. We conducted cross-tabulations of kiosk awareness and use with education level, income level, and gender. Only the results on gender and use were significant. While 83 percent of males and 79 percent of females were aware of the kiosk, 90 percent of males and 75 percent of females who were aware of the kiosks actually used them.[4] The greater

[3]Surveyors were instructed to distribute surveys to people in the vicinity of the kiosk.

[4]Chi-square = 11.30, df = 1, n = 262, sig. = .001.

propensity of males to use the kiosk may indicate a greater interest or willingness to try out the kiosk on the part of men, or may reflect joint use. When couples use the kiosk, the male may be more likely to navigate the menus.

Respondents who had used the kiosks were also asked whether they found them easy to use, whether they would use the kiosk again or encourage others to use the kiosk. Results are quite positive, as shown in Table 5.12, and suggest that the kiosks have been well designed for their intended use. Users were also asked whether there were any improvements that they would like to see made to the kiosks. Recommendations for improvement were made by 62 percent of those who had used the kiosk. Of those responding to the question, the most frequently mentioned comment was the need to make the kiosk quicker (24%). We conducted cross-tabulations to determine whether perceptions about using the kiosks were associated with individual characteristics and found none to be significant. Apparently kiosk users are self-selected; those not favorably inclined to using the kiosk do not even try to use them.

**Table 5.12 Perceptions of the Kiosks**

| QUESTION | EASY | NEITHER | DIFFICULT | N |
|---|---|---|---|---|
| How easy or difficult did you find the Smart Traveler Kiosk to use? | 79% | 16% | 5% | 217 |
| | Yes | No | | |
| Would you use the Smart Traveler Kiosk again? | 85% | 15% | | 219 |
| Would you encourage other people to use Smart Traveler Kiosk services? | 88% | 12% | | 214 |

Users of Smart Traveler Kiosks were then asked about the particular menu items that they had used, whether they found the given item easy to use, and whether they found the information obtained to be useful. Table 5.13 gives the frequency of menu items requested in rank order. The freeway conditions map is by far the most commonly requested menu item, followed by MTA bus and train routes. Rideshare or transit videos and carpool information are requested much less frequently. Note the difference in these results compared to those of the automated data. Since our surveys were conducted soon after the kiosks were installed, these responses may reflect more experimentation with the system. Once the novelty wears off, there may be less interest in viewing the freeway conditions map. Finally, the vast majority of those who used a given menu item found the information useful and stated that they would use the kiosk again to obtain such information.

As noted earlier, we have no information on whether kiosk users have acted on the information they received. In order to get some indication of willingness to use the information, we asked respondents whether they used the menu item just to see how the kiosk works, and whether they actually requested information. Most users (90 percent or more, depending on the item) were experimenting, but the majority also requested and obtained transit (83 percent) or rideshare (67 percent) information. In the case of the freeway conditions map, 71 percent of those who used the map stated that they would use it before starting a trip.

**Table 5.13 Menu Items Requested**

| ITEM | YES | NO | N |
|---|---|---|---|
| Did you request freeway conditions map? | 83% | 17% | 218 |
| Did you request MTA bus and train routes? | 56 | 44 | 220 |
| Did you request rideshare or MTA bus and train videos? | 28 | 72 | 217 |
| Did you request the carpool service? | 26 | 74 | 217 |

## 5.3 Conclusions on Smart Traveler Kiosks

### Extent of Use

Our survey results show a very positive response to the Smart Traveler Kiosks, yet the average usage of the kiosks is quite low. The kiosks are in use only a few hours per day. How can these results be explained? One explanation is that the kiosks were installed with minimal marketing effort. Although the kiosks are large and have a continuous moving light display across the top denoting them as Smart Traveler kiosks, there is no information at the site that describes what they do. Passers-by must be curious enough to seek out what the kiosks offer. Given this absence of descriptive information, kiosk location becomes more important. For example, the Union Station kiosk is adjacent to the MTA ticket office, while the kiosk in Fox Hill Malls is in the food court. It is likely that the function of the Kiosk is more obvious in Union Station, where people are traveling, purchasing tickets, etc., than in a shopping mall food court.

A second explanation is that some of the kiosks have maintenance problems. In a location where a lot of repeated use might be expected (e.g., office locations), frequent breakdowns would discourage kiosk use. Eliminating days when the kiosks were not working would not control for this effect. Our analysis of maintenance data shows this not to be the case. Of the top ten failure locations, only one (KLA61) is among the bottom five performers in terms of usage.

**How Kiosks are Used**

Our analysis suggests that kiosks are used either for non-routine trip planning or for trips to be made at some future time. Most of the kiosk usage takes place in non-work environments, where people apparently have the time available to explore travel options. Use for future trip planning seems quite logical. For transit information, Kiosks have a considerable advantage over telephone enquiries. Users can obtain transit information for more than one trip, and they can obtain print-outs of specific trip itineraries. Given the size and complexity of transit services in the Los Angeles area, print-outs are likely very helpful. Easily accessible transit information may be particularly valuable to tourists. Our results imply a kiosk deployment strategy oriented to train stations and other major transportation facilities, large hotel complexes and shopping malls, and not to employment centers.

There is also evidence of high levels of use in locations that serve lower income households (e.g., discount stores in the central city area). These locations also show above average use of the Spanish menus, suggesting that the kiosks are being used by those who are most likely to be transit dependent. Kiosks may prove to be an effective means of reaching such groups, and should be considered for social welfare and employment offices, as well as major shopping areas.

Finally, the lack of use of the kiosks in office locations suggests that kiosks are not an effective way to provide more "real-time" travel information. On-line services delivering information directly to users at their desks is likely to be the preferred media interface. This is an element of the Smart Traveler Program that is still in development?

[5] The Caltrans freeway traffic conditions map has just become available via World Wide Web. This service is not part of Smart Traveler.

# CHAPTER 6 AUTOMATED RIDEMATCHING SERVICE USER EVALUATION

## 6.1 Research Design

ARMS tests the potential market for an automated telephone service which allows users to find carpool matches for long term carpool partners as well as one day matches for special purposes. The expected benefits for users are:

1. Potential increase in speed in finding carpool partners
2. Added convenience of having a computer call and leave messages automatically
3. New "instant" one-day-only service.

In Chapter 3 we considered whether the product developed met the technical requirements of being a user friendly interface which is also accurate and fast. In this section we consider the more difficult problem of defining the characteristics of the potential market for this product, attempt to track the actual use made of the service and to collect information from both users and non users about their responses to ARMS and their attitudes towards such on-line information services. Finally, through experimentation with use of the service we seek to test the relative ease or difficulty in finding a ride.

There are three data sources for analyzing use and responses to this Smart Traveler element:

1. The automated data which tracks each call to the I-800 COMMUTE number including the use of RIN/PIN codes to access the automated ridematching data base.
2. Telephone surveys with a sample of users and non-users of the service.
3. The results from experimenting with use of the service.

### 6.1.1 Automated Data

As with the Smart Traveler kiosks, this telephone and computer based service is potentially a rich source of data. The carrier, (Pacific Bell) can generate detailed reports of use of this service and can track the use of each menu function by time of day and day of week. It is possible to trace how many potential matches are found for each user following through with a valid request i.e. entering valid RIN/PIN codes and trip times. These data also indicate whether or not messages were recorded and sent to those on the match list. Individual users can also be identified from these records, and a sample of users can be drawn for survey purposes. The limitations of the automated data are that they cannot indicate whether or not those potentially matched with the user either: responded to the request or, eventually provided the trip. As noted in Chapter 3, technical malfunctions obviously compromised the automated out-dial function of ARMS. Thus the automated data provides only suggestive information about ARMS usage as will be further discussed in section 6.2.

### 6.1.2 User and Non-User Surveys

The project falls into two distinct phases:

(I) The Earthquake response phase
(II) The post earthquake response phase.

As discussed in section 1.4.1, the funding associated with the Northridge earthquake caused resources for survey work to be heavily concentrated in the first four months of the project. Delays associated with the implementation of ARMS caused an alteration in the plan to conduct user surveys after implementation. To take advantage of the available resources a “before” and “after” survey were implemented. The re-designed survey effort sought first to learn about the potential market for such services and whether the necessary conditions for the success of such a service were likely to be present in the target population. A second survey three months later was used to further expand this research and also try to identify actual users. A final survey of actual users was administered in April 1995 at the end of the project.

**Survey 1:** For this first survey a random sample of 3,800 recipients of the Smart Traveler ARMS marketing materials, was drawn from the population of 68,000. This sample falls into two groups:

0 employees in companies that have requested that ridematching be restricted at all times to matches between their own employees

0 employees with no such restriction.

The survey took place in July of 1994 and resulted in a sample of 399 respondents living within the target area. All respondents were asked whether they could be re-interviewed in the future and 338 (85 percent) indicated that they would be willing to be re-interviewed. See Appendix E for the survey instrument used and Appendix F for descriptive statistics.

**Survey 2:** In October, three months after the full introduction of the ARMS service, respondents were re-contacted and 306 agreed to be interviewed. Unfortunately only four users of the service were found within this group, and there was still a very low awareness of the Smart Traveler Program. The researchers had anticipated a low incidence of users and had therefore included in the survey a number of questions intended to elicit information about concerns when seeking rideshare partners and also establishing the frequency of necessary conditions which would make the one time ridesharing option attractive. See Appendix G for the survey instrument used and Appendix H for descriptive statistics.

**Survey 3:** This survey was intended to obtain information regarding user satisfaction with ARMS. The sample was drawn from telephone records of users. The survey was performed at the end of the evaluation project in April of 1995. The sample of users of the ARMS system was drawn from telephone records of usage of the system in January, February and March 1995. During this period the automated voice messaging system was still not always functioning correctly. Twenty six users were contacted and asked about their experiences with using the ARMS system. See Appendix I for the survey instrument used.

### 6.1.3 The ARMS Experiment

The objective of the experiment was to determine whether the ARMS system is effective in locating ridematches. The experiment was not intended to measure the propensity of individuals to use the system -- just to assess whether the system would work if a person wanted to use it. The effectiveness is measured in part by estimating the probability that a person on the ridematch list offers a ride when requested. This probability was combined with the distribution of the number of matches per list to estimate the probability that a person seeking a ride would find a match. For example, if the probability that a person offers a ride is .30, and there are 2 people on the ridematch list, then the probability of finding a match from the list is roughly .50 (or, to be exact, $1 - .7 \cdot .7$).

## 6.2 Use Tracked Through Automated Data

### System Usage

Usage data were collected for a 21 week period, from the week of October 22, 1994, to the week of March 11, 1995. Due to software errors, calls could not be counted for the portion of the test preceding October 22. Usage was counted in the following ways:

(1) Total number of calls to the I-800-COMMUTE line (which includes information in addition to carpools).

(2) Total number of attempts to use the system.

(3) Total number of valid users (i.e., number who successfully entered RIN and or PIN access numbers).

Figure 6-l plots I-800-COMMUTE calls and ARMS calls (attempted uses) by week. As shown, the ARMS calls consistently account for about 20 percent of the total calls, a reasonably large percentage since I-800-COMMUTE covers a much larger region than ARMS. (The ARMS target population was 68,000 compared with the regional database of circa 600,000). This is less surprising when it is remembered that I-800-COMMUTE is only one means of contacting CTS, and many seeking ridematching help will either phone CTS directly or work through a third party, i.e. their transportation coordinator.

The total attempted usage of ARMS exceeds 100 in 1 out of 21 weeks and exceeds 50 in 5 out of 21 weeks. Usage was highest in January and February of 1995, likely due to bad weather and traffic conditions. Figure 6-2 plots attempted uses and valid uses by week. Average use is 34 per week. This includes some repeated, sequential calls from the same individuals, and so overstates actual average usage to some degree.

Figure 6-l 800-COMMUTE vs. ARMS Usage

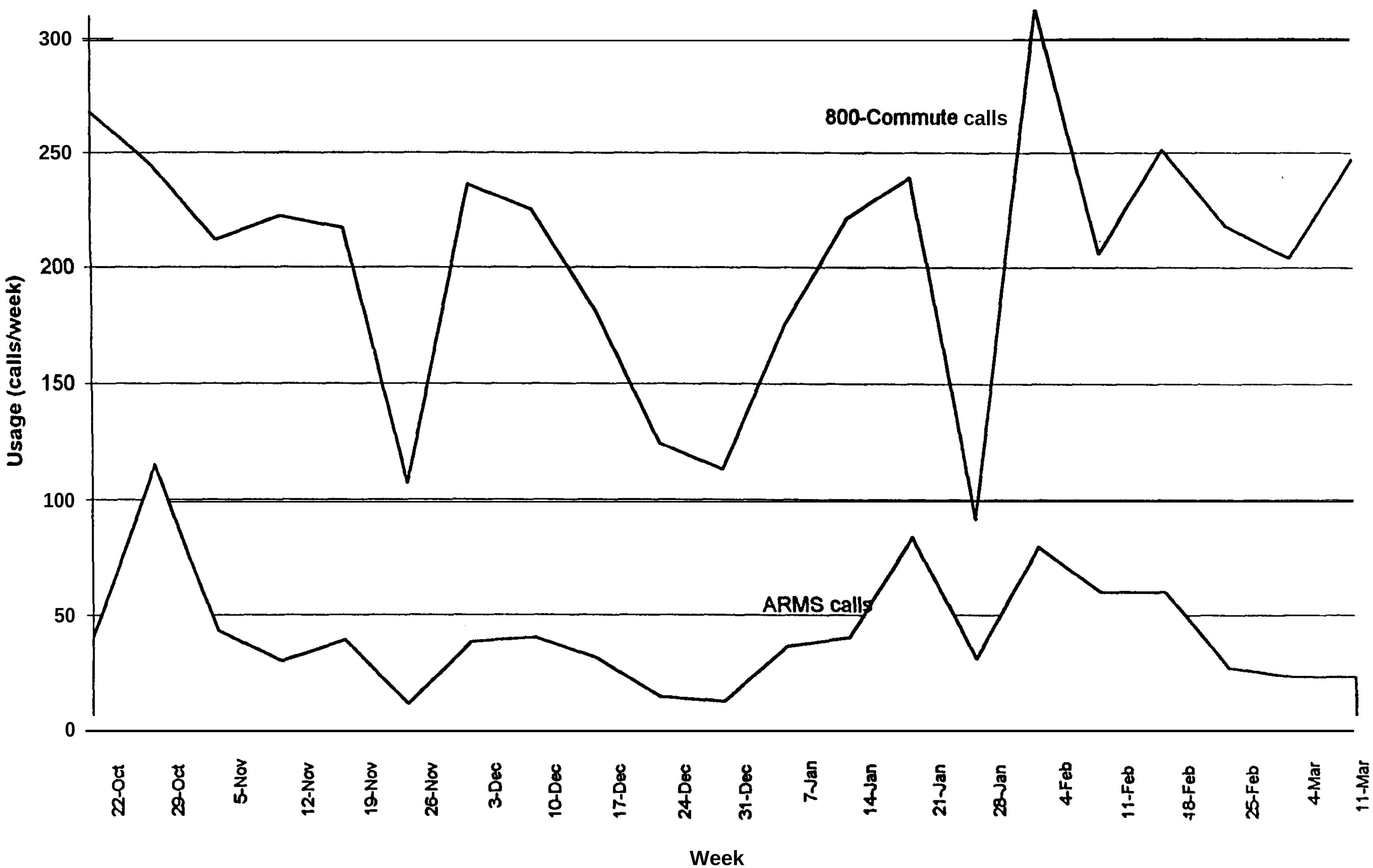
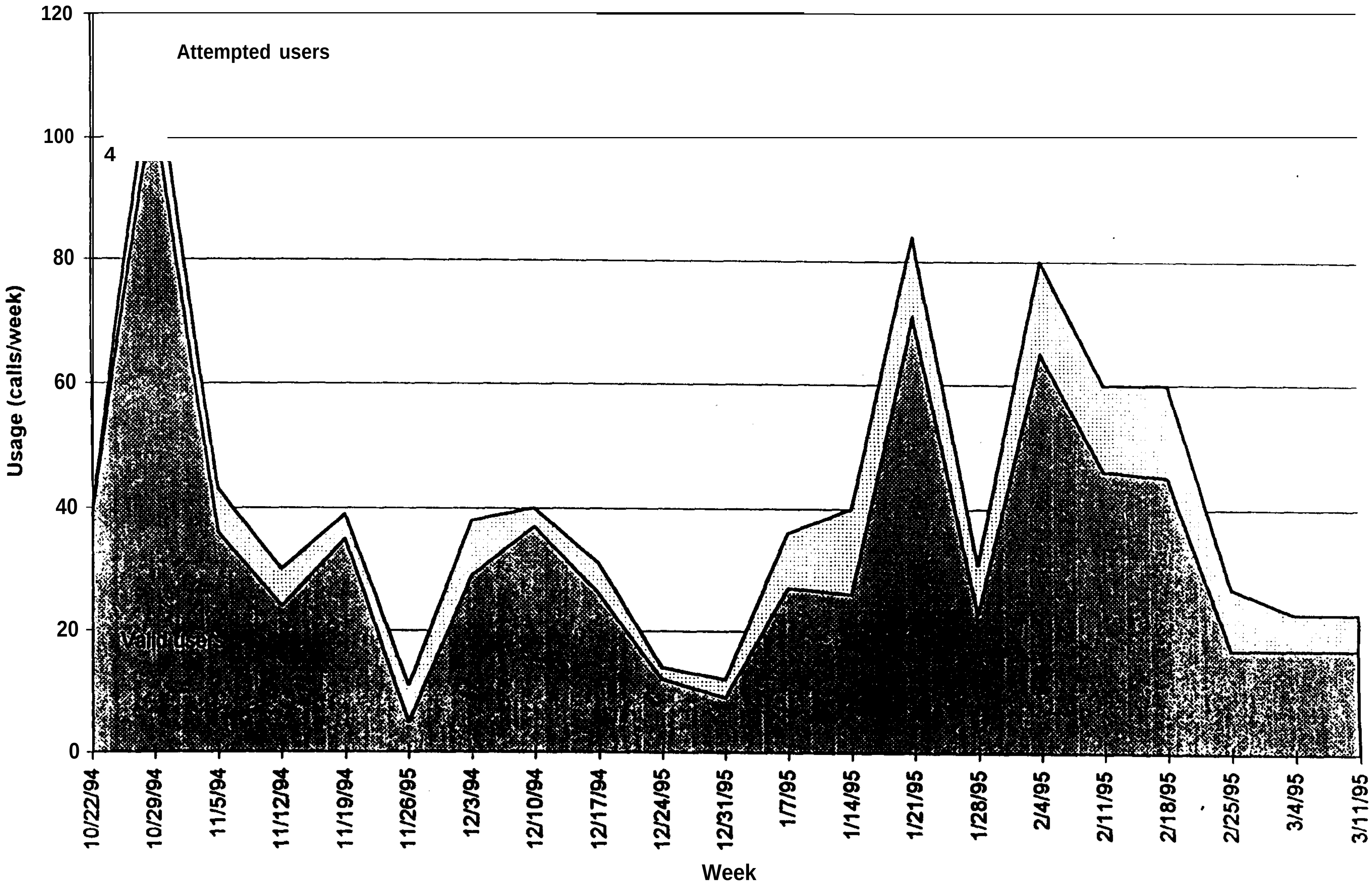


Figure 6-2 ARMS System Usage



Average usage per week is summarized in Table 6.1. In addition to the statistics discussed earlier, the table shows that roughly one in eight users changed their start time, one in eight change their leave time, and one in four changed both their start and leave time. In total, roughly 40 percent of the users altered their start or leave time prior to accessing their ridematch list.

**Table 6.1 ARMS System Average Weekly Usage**

| CALL TYPE | AVERAGE/WEEK | % OF NON-SEQUENTIAL USERS |
|---|---|---|
| 800 COMMUTE | 205 | Not applicable |
| Attempted Users | 42 | Not applicable |
| Valid Users | 34 | Not applicable |
| Start time change only | 4 | 12% |
| Leave time change only | 4 | 12% |
| Start & leave time change | 6 | 18% |
| No change/incomplete | 20 | 58% |

To put the average of 34 users in a wider context, if the system were expanded to the entire CTS database, then ten times more users could be expected, i.e. 340 users per week or 49 users per day. CTS handles 800 calls per week and generates 1,000 match lists per week by telephone. They generate a total of 17,000 match lists per week, the majority directly through employers. A fully operational ARMS service would therefore represent only 2% of the match list requests.

## 6.3 Results of the Automated Ridematching Telephone Surveys

### 6.3.1 Surveys 1 and 2, Characteristics of the Respondents

#### Purpose of the Surveys

An important role of these surveys was to try and determine whether the necessary conditions for a market for ARMS were indeed present in the target population. Such a market requires demand for the one day only ridematching service and a supply or willingness amongst the target population to meet that need. We wanted to know why people would want to use such a service, for what purpose and with what likely frequency. We also wanted to establish whether there is a population willing to offer rides in such circumstances and to use the information to try and estimate the size of the potential market.

**Social Demographic Characteristics**

The sample was drawn from a specific group of commuters who were registered with CTS, the regional ridesharing agency. For this reason we would expect them to differ from a random sample of commuters drawn from the same area. Table 6.2 gives gender, education and income level for the respondents to the first survey. Althaugh the survey respondents are not representative of the general population, they are likely to be representative of the potential users of this service i.e. the working population.

**Table 6.2 Survey Respondent Characteristics**

| CHARACTERISTIC | SURVEY PERCENT |
|---|---|
| Gender: | |
| Male | 54% |
| Female | 46% |
| Education: | |
| No High School Diploma | 1.3% |
| High School Diploma | 8.3% |
| Some College | 26.6% |
| College Degree | 62.9% |
| Household Income: | |
| Up to 34,999 | 23.8% |
| $35,000 to $49,999 | 20.6% |
| $50,000 to $99,999 | 41.3% |
| $100,000 plus | 14.2% |

**Respondent Work Travel Characteristics**

As expected, 89 percent of the survey respondents are employed, and 89 percent work forty hours or more per week. Vehicle access and ownership is also extensive amongst this group: 73 percent report household car ownership of two or more vehicles, and 92 percent report having a vehicle available to drive to work. An additional 2 percent have a vehicle available to drive "sometimes" with only 5 percent having no vehicle to use for the daily work trip. In the table which follows we compare usual mode of travel to work for the respondents to the first survey with the annual CTS State of the Commute responses for 1994 and LA County Census data for 1990. As can be seen, solo drivers are under represented and all alternative modes are over represented, with the exception of walking and biking. Survey respondents also have longer trips to work than those reported from surveys of the general population. Reported mean travel times and distances respectively are 33 minutes and 19 miles. The LA County census data gives a mean travel time of 26.5 minutes. The CTS 1994 State of the Commute survey reports a mean distance of 16.5 miles and travel time of 31 minutes.

**Table 6.3 What means do you usually travel to work?**

| MODE | SURVEY 1 | LA COUNTY 1990 | CTS 1994 |
|---|---|---|---|
| Drive Alone | 53% | 72.1% | 80% |
| Carpool | 25% | 16.0% | 14% |
| Vanoool | 7% | n/a | 1% |
| Take the bus or train | 11% | 6.6% | 2% |
| Walk or bike | 3% | 4.0% | 2% |
| Other | 1% | 1.3% | 1% |
| N | 394 | 4.002.048 | 2.625 |

The bias in the sample towards alternative modes of transportation indicates that the project is being appropriately targeted to the most likely users of the service. From the point of view of estimating the likely demand for such a service amongst the general population, the bias in the sample can lead to over estimation of potential users.

**Habits and Change in Work Travel Patterns**

In order to gain an understanding of the extent to which respondents use or try modes other than their usual modes of travel, a series of questions were asked about use of other modes. Of the 53 percent of the sample who drive alone, 18 percent use an alternative mode once or twice a week, most frequently carpooling.

The table below indicates alternative modes tried by those who say they consistently drive alone to work.

**Table 6.4 What other modes have you tried and would you try them again? Those who consistently drive alone**

| MODE | HAVE TRIED | WOULD TRY AGAIN |
|---|---|---|
| Carpooling | 44% | 80% |
| Vanpooling | 7% | 58% |
| The Bus | 20% | 54% |
| Walking or Biking | 11% | 58% |
| Train | 4% | 71% |
| Total in sample | 171 | |

As can be seen not only have a high proportion tried carpooling but a very high proportion would consider doing so again. This table would seem to indicate a willingness to try alternatives. The same question was put to the group who usually carpool with the following results.

**Table 6.5 What other modes have you tried and would you try them again? Those who carpool**

| MODE | HAVE TRIED | WOULD TRY AGAIN |
|---|---|---|
| Driving Alone | 86% | 70% |
| Vanpooling | 11% | 8% |
| The Bus | 34% | -21% |
| Walking or Biking | 14% | 7% |
| Train | 5% | 5% |
| Total in sample | 99 | |

This group not surprisingly has a lot of experience with solo driving and they also indicate a strong willingness to revert to that mode. These results are of interest to this evaluation in that they indicate that mode choice is not necessarily as static as it would seem from simple statistics. One recent source of information on turnovers in modes of travel for the journey to work is a panel study undertaken by the University of California at Irvine. A comparison was made of the reported mode of travel to work for 918 respondents. After eighteen months 33 percent of the respondents had changes their mode of travel. (Wei Ping, 1995) If indeed individuals are switching fairly regularly it would suggest that there is indeed a role for continued and perhaps improved rideshare matching and other information services.

### 6.3.2 Survey Results

The research team wished to evaluate whether there was reason to think that there was a likely demand for the services offered by ARMS. Firstly, respondents were asked which alternatives they used when either their car was not available to drive alone or their carpool was unavailable. The results were as follows.

**Table 6.6 Mode of travel to work when car is unavailable - of those who usually drive**

| ALTERNATIVE MODE | FREQUENCY | PERCENT |
|---|---|---|
| Use another household vehicle | 38 | 27% |
| Ride with spouse or other family member | 27 | 19% |
| Rent a car | 10 | 7% |
| Arrange carpool with co-workers | 38 | 27% |
| Use bus or train | 18 | 13% |
| Take time off work | 2 | 1% |
| Other | 9 | 6% |
| Total | 142 | 100% |

As can be seen from these results, 46 percent have a solution at home by either using another household vehicle or riding with a spouse or family member. Also a large number (27 percent) arrange to carpool with co-workers. The remainder have a variety of solutions available including renting cars and using transit. Few it seems have no available alternative.

**Table 6.7 Mode of travel when carpool is not available**

| ALTERNATIVE MODE | FREQUENCY | PERCENT |
|---|---|---|
| Drive Alone | 73 | 73% |
| Take bus or train | 13 | 13% |
| Arrange alternative carpool | 11 | 11% |
| Other | 2 | 2% |
| Total | 100 | 100% |

The above results indicate that the majority of carpoolers usually have the option of driving alone when their normal carpool partner(s) are not available. The same proportion as solo drivers take the option of using bus or train. We may assume that the convenience of having a car available as an alternative to carpooling is likely to discourage many individuals from searching for a ride with an unknown carpooler just for one day. Currently 11 percent of the respondents indicate that they are able to arrange alternative carpools in such circumstances.

The second survey tried to pursue the question of the frequency with which certain conditions might arise that would create the need either for alternative travel 'information or the possibility of a single day carpool ride. Respondents were therefore asked about how frequently conditions occurred that upset their normal mode choice.

**Table 6.8 How often is your regular means of traveling to work not available, e.g. car is in the shop, carpool partner is on vacation, transit strike etc.?**

| RESPONSE | SURVEY 2 | PERCENT |
|---|---|---|
| Frequently | 3 | 1% |
| Sometimes | 36 | 12% |
| Seldom | 147 | 48% |
| Never | 118 | 39% |
| Don't know /refused | 2 | <1% |
| Total Responses | 306 | 100% |

The results presented above indicate that the majority of the respondents considered that such circumstances were rare rather than common. This is of some importance as it indicates that their need for such information services is likely quite infrequent.

**Table 6.9 How often do you have to work at a different location?**

| RESPONSE | SURVEY 2 | PERCENT |
|---|---|---|
| Frequently | 19 | 6% |
| Sometimes | 45 | 15% |
| Seldom | 72 | 23% |
| Never | 170 | 56% |
| Don't know/refused | 0 | 0% |
| Total Responses | 306 | 100% |

The results above indicate that the majority of respondents work consistently at the same location which indicates that they would not be seeking alternative routes or carpool partners for alternative destinations with great frequency. However, this is an occurrence that happens frequently or sometimes for 21 percent of the sample. The variances appear to be much greater in work hours rather than location as the following table indicates.

**Table 6.10 How often are your work hours different from usual?**

| RESPONSE | SURVEY 2 | PERCENT |
|---|---|---|
| Freauentlv | 93 | 30.4% |
| Sometimes | 67 | 21.9% |
| Seldom | 7 3 | 23.9% |
| Never | 73 | 23.9% |
| Don't know /refused | 0 | 0% |
| Total Responses | 306 | 100% |

Given the sample characteristics i.e. registered carpoolers, higher income and education levels, we may assume that changes in work hours are more likely to involve working late or arriving early for meetings than formal shift changes involving large groups of employees. Under these circumstances it is most likely that individuals will chose to drive alone rather than seeking the insecurity of arranging single day ridesharing. However if one carpooled to work and then discovered the need to stay later finding an alternative carpool partner leaving later might perhaps be attractive.

Another approach to trying to understand the likelihood that this group of respondents would be receptive to the concept of ARMS was further tested with a series of attitude questions. Table 6.11 below gives the responses.

**Table 6.11 Respondents were asked whether they agreed or disagreed with the following statements.**

| | AGREE | DISAGREE | REFUSED |
|---|---|---|---|
| I have my own car and have no need for transit or carpooling information | 37% | 62% | 1% |
| I can always listen to the radio for traffic information | 85% | 14% | 1% |
| I do not like using machines to get information | 24% | 74% | 2% |
| I do not give rides to people that I don't know | 75% | 23% | 2% |
| I do not take rides from people that I don't know | 80% | 20% | 0 |
| Transit does not take me where I want to go | 46% | 48% | 6% |
| Total Respondents | 394 | | |

These results offer some interesting insights. The majority consider transit and carpooling information to be of value to them personally. It is acknowledged that the radio is a significant source of traffic information. The majority appear to feel comfortable with accessing information via machines. These responses would appear to be supportive of the concept of both Smart Traveler and the particular ARMS application.

However, the concept underlying the element offering "instant" ridesharing for single occasions looks as though it will lack support if the parties do not know each other, since this car-pooling sympathetic group appears to be clear that they will neither give nor take rides from people they do not know. In both cases women agreed even more strongly than men with these statements. This would seem to suggest that an ARMS type service limited to the employees of one company might have a better chance of promoting the "ride just for the day" concept.

The second survey was used to explore factors of relevance when seeking carpool partners. A summary of the findings are given in Tables 6.12 and 6.13 below.

**Table 6.12 A summary of responses to questions about factors of importance when seeking a regular carpool partner**

| FACTORS | NOT AT ALU NOT VERY IMPORTANT | SOMEWHAT IMPORTANT | EXTREMELY IMPORTANT/VERY IMPORTANT |
|---|---|---|---|
| Good safe driver | 1% | 5% | 94% |
| Car in good condition | 1% | 12% | 87% |
| Does/does not smoke | 18% | 10% | 72% |
| Same sex | 88% | 7% | 5% |
| Works @ your company | 27% | 39% | 34% |
| Lives in your neighborhood | 17% | 40% | 42% |

The factors selected by the researchers were drawn partly from personal experience and were supplemented with the results of focus group interviews used to establish functional requirements for a real-time ridesharing system under investigation by researchers at the University of California, Davis (Kowshik et al., 1993), as well as preparatory work performed for the implementation of the Houston Smart Commuter Project, (Gelb Consulting Group, Inc. 1991). Both studies identified safety and security concerns.

These results indicate safety concerns with regard to both car and driver as being of great importance. These concerns can presumably be addressed if one knows or meets a driver when choosing carpool partners. Knowing whether or not a potential partner does or does not smoke also emerged as a factor of significance. Finding a partner of the same sex is considered to be an unimportant factor. Working at the same company was rated as important by only one third of the respondents but living in the same neighborhood was rated more highly.

**Table 6.13 A summary of responses to questions about factors of importance when seeking a one time carpool partner**

| FACTORS | NOT AT ALU NOT VERY IMPORTANT | SOMEWHAT IMPORTANT | EXTREMELY IMPORTANT/VERY IMPORTANT |
|---|---|---|---|
| Good safe driver | 1% | 11% | 88% |
| Car in good condition | 5% | 20% | 75% |
| Does/does not smoke | 18% | 10% | 72% |
| Same sex | 88% | 7% | 5% |
| Works @ your company | 54% | 24% | 22% |
| Lives in your neighborhood | 42% | 36% | 22% |

Concern for safety with regard to car and driver are also considered to be very important in the event of seeking a one time ride. Unlike regular car-pooling this concern cannot be addressed in advance of accepting a ride using the ARMS system. Knowledge of smoking habits is just as important as it would be when seeking a regular carpool partner. Arranging a ride with someone from your own company or who lives in the neighborhood were both considered to be of lesser importance than when seeking a regular carpool partner.

**Summary Of Findings With Regard To The Potential Market For ARMS**

The target group of CTS registrants is clearly a most appropriate test group for this element of the FOT. They are a group that make considerable use of alternative modes, and many have previously tried other modes of travel. There are indications that use of ARMS services is likely to be infrequent, because the regular means of travel to work is seldom or never unavailable to most respondents. Also, the majority (79 percent) seldom or never change their work location. However, over fifty percent indicate variability in work hours. While this might suggest an opportunity to experiment with the "one day only" service, it is more likely that the majority would chose to drive alone if they know in advance that their hours will differ from normal. Of those who normally carpool 73 percent say that they drive alone when their carpool is not available and a further 13 percent used the alternative of bus or train. For those who carpool and later discover a need to stay late there might be a role for the "one day only" service. However, there is other attitudinal evidence to suggest that this might not be an attractive service. The majority of respondents say that they will neither give rides to people they do not know, nor will they take rides from people they do not know. Other concerns of importance are knowing whether the potential carpool partner is a good and safe driver with a car in good condition, and to a lesser extent whether they either live in your neighborhood and or work at your company. Such concerns could not easily be resolved if one does not have the opportunity to meet a potential carpool partner in advance. This suggests that the "one day only service" would have difficulty in meeting such reservations unless the matches are made with people already known to you, e.g. who work in your company or neighborhood. In this case it would be likely that the individual would deal directly with such persons, rather than using the ARMS system. Use of the automated service to find long term carpool partners appears to have no more drawbacks then any other means of acquiring a list of potential carpool partners. Long term compatibility can be established by lengthy telephone conversations, seeking references and personal meetings. Such efforts would be impractical for single trips.

From the information gained about market potential for the ARMS one day service it is possible to consider estimates of market size. The following worked example is an illustration of an attempt to estimate a possible order of magnitude for this service.

1. Assume 1,000 employees registered with CTS

2. Using the results of the ARMS random survey
   53 percent drive alone, 25 percent carpool and 22 percent use other modes
   We assume all those who drive alone or carpool i.e. 780 employees could be potential users of ARMS for one day rides.

3. Using the results of the survey responses about what respondents do when their car or carpool are not available we may assume that 20 percent of those who drive alone(106) and 15 percent(38) of the ridesharers have no very convenient alternative and are therefore likely to be a potential market of 144.

4. If we assume that the need arises twice per year, that would be 288 potential uses per year or 0.8 uses per day per 1,000 people.

5. Given the target market population of 68,000 we might expect 54 people per day to find a use for the service.

While it is easy to modify the above assumptions the indications are that the market for such a service will always be extremely small.

**Survey 3: Results of the ARMS User Survey**

As has been explained, this survey was undertaken at the end of the evaluation period. Its primary purpose was to elicit reactions from ARMS users. The sample can be used to offer insights into the use of the service and supplements the two previous surveys which investigated the potential market and also the automated data which has measured all known transactions. Given the small number of system users from which we could sample, as well as the project completion deadline, it was decided to conduct open ended interviews with a small sample of users. There were 11 male respondents and thirteen women respondents. Their regular work travel mode characteristics were as follows:

| | |
|---|---|
| Drive alone | 15 |
| Carpool | 4 |
| Vanpool | 2 |
| Bus | 1 |
| Train | 2 |
| Other | 1 |
| Total | 25 |

Table 6.14 below shows the frequency with which the respondents had tried using the service.

**Table 6.14 How many times did you use the service?**

| NUMBER OF TIMES USED | NUMBER OF RESPONDENTS | PERCENTAGE OF USERS |
|---|---|---|
| 1 | 8 | 32% |
| 2 | 7 | 28% |
| 3 | 3 | 12% |
| 5 | 2 | 8% |
| 10 | 2 | 8% |
| 20 | 2 | 8% |
| 30 | 1 | 4% |
| TOTAL | 25 | 100% |

The majority, 60 percent had tried the service at just one or two times.

Of particular interest is the type of use that was made of the ARMS services.

Respondents were asked: did you use the service to find?

| | | |
|---|---|---|
| 1. | A new carpool partner | 21 |
| 2. | A ride just for the day | 0 |
| 3. | Tried both of the above | 2 |
| 4. | Neither, exploring the system | 1 |
| TOTAL | | 24 |

The most important information that we received was that the overwhelming majority were using the system to search for new carpool partners and not for one time rides. Eighty eight percent of these respondents reported success in getting a list of people to contact. They had an average of nine names on each list. Of the twenty one people who attempted to contact the names on the list, only one used the automated voice mail service. (It is not known whether this service was available to all respondents at the time they were using ARMS). Only three out of nineteen people went on to arrange a ride with a carpool partner.

Respondents were asked whether they were happy with the service. Sixteen answered YES. The eight people unhappy with the service gave the following reasons.

Why were you unhappy with the service?

1. I could not find anybody to cat-pool with because there are not enough people in the database

2. Not enough names in the database and therefore it didn't work out.

3. I like live people to help me not automation.

4. The lists are outdated. I was given the same list before, and there was no one compatible on it.

5. Information is not up to date, and other people were unaware of even why I was calling.

6. I couldn't find anyone to carpool with

7. I was just investigating my options. I was given the same list on two different occasions after I requested a new list.

8. I was given the same list before. There was no one compatible on the old list.

Problems with the database are clearly the most common reason for complaint. This is not a problem which is unique to the Smart Traveler project. Instead it reflects the difficulty and expense of maintaining and up-dating such a large database on a regular basis. There are an estimated 600,000 names in the CTS database.

Despite the problems identified, 95 percent of the respondents said that they would try using the system again. This presumably is a reflection of their commitment to carpooling despite the disappointment of not always being able to find compatible partners. The users were split almost equally over whether their use of ARMS would be frequent or only occasional or infrequent.

Respondents were asked whether they had ever been contacted by others using this automated phone service and who had been looking for a carpool partner or ride just for one day? Three out of the twenty five respondents said YES. One of these respondents had been contacted by four callers the remaining two had been called once. One respondent claimed to have responded positively by offering carpool space or a ride on one occasion. Reasons given for not doing so were as follows:

1. Incompatible requirements
2. Our hours did not match
3. No match
4. It was for an emergency only

## 6.4 ARMS Experiment

### 6.4.1 Experimental Design

To conduct the experiment, it was first necessary to register a group of "fictitious persons" (FP) representing individuals seeking ridematches. Each FP was given a unique name, a residential location, a work location and a work time. Residences were scattered throughout the San Fernando Valley and other areas affected by the Northridge Earthquake. To ensure that a relatively large number of matches would be generated, a Downtown Los Angeles site was used for the work location. This resulted in at least ten matches per FP, which is the maximum number that can be provided by ARMS. The average trip length was 20 miles with a range of 5 to 33 miles. Work times were also varied within the experiment. (For details of the experimental design see Appendix. J)
The experiment was conducted over a period of 40 days, between February and April, 1995. On each day, a confederate attempted to find a ridematch for one or two FPs. A total of 42 rides were sought (referred to as "*trials*"), which resulted in attempts to contact 420 people (referred to as "calls"). The experiment was designed to measure the effects of three factors, described below

**Automated Versus Manual Dialing:** In 60 percent of trials, the automated messaging system was used; in the remaining 40 percent, the confederate manually called each person on the ridematch list.

**Ride Home Versus Round-trip:** In half of the trials, only a ride home was sought. In the remaining 50 percent, a round-trip was requested for the following day.

**Time of Travel:** The work times were varied as follows, with 1/3 of trials in each category: start work at 7:30 a.m., leave work at 4:00 p.m.; start at 8:30 a.m., leave at 5:00 p.m.; start at 9:30 a.m., leave at 6:00 p.m.. Varying work times ensured that there would be little overlap between ridematch lists among trials, meaning that few people would be contacted twice for a ride.

Combining the three design factors, a total of 12 combinations are possible for each trial (auto versus manual; ride home versus round trip; and 4:00, 5:00 or 6:00 departures from work). With 15 FP registered, most FP were assigned to 3 different combinations (three FP were assigned to just two combinations). Furthermore, for each FP, a different departure time was used in each trial, and a different combination of auto/manual and ride home/round trip was used in each trial. Assignments were stratified to ensure that the three departure times, along with the ride home/round trip options, were equally represented among automated and manual rides.

In conducting the experiment, a confederate (male) assumed the identity of the FP. He phoned into the system between 9:00 a.m. and 12:00 p.m., either to access the ridematch list or to automatically record and send a message. In the case of manual matching, the confederate then began to immediately phone the individuals on the ridematch list to seek a ride (typically work numbers). If there was no answer, a message requesting a ride would be left on voice mail or with whoever answered. No follow-up calls would be made, ‘unless the message was returned (the confederate would stay by the phone for the next 4 hours to accept return calls). If the phone rang without answer, or there was a busy signal, up to 5 attempts would be made to reach the individual, spaced at 30 minute intervals.

In the case of automated matching, the confederate recorded a scripted message for automatic messaging. ARMS is designed to make up to 5 attempts to leave the message, spaced at 30 minute intervals. The system is also designed not to leave messages with answering machines. After the experiment, the system generated "out-dial report" was inspected to determine which individuals were successfully contacted.

Common scenarios were utilized in phone calls. For the emergency ride home, the confederate stated that his car had broken down and that he needed a ride home. For the round-trip, the confederate stated that his car would be in the garage the following day, and that he needed a ride to and from work. In a sense, these scenarios upper-bound the probability of finding a ridematch. Our belief is that people are more willina to offer rides in response to "emergencies", as opposed to " casional carooolina needs."

In cases where a ridematch was found, arrangements were made for when and where to meet the ridematch, and how to identify each other. The confederate later called back to cancel the ride, stating that his car was now working.

The following data were recorded during the experiment:

0 Fictitious person name/location

- 0 Time for which ride is requested
- 0 Time phone calls were made/received
- 0 Sex of person contacted
- 0 Whether or not contact is made
- 0 Whether or not a ride is offered
- 0 When a ride is offered, any conditions or qualification (e.g., deviation from desired departure time, intermediate stops, etc.)
- 0 When a ride is not offered, any reason offered (e.g., not driving, unwilling to share rides, etc.)

### 6.4.2 Experimental Results

**Manual Feature**

The manual ridematch feature was moderately successful in locating ridematches. Nine percent of the calls resulted in an unconditional offer, and an additional 11 percent resulted in a conditional ride offer, yielding an overall success rate of 20 percent. The conditional rides typically resulted in a significant deviation from desired departure time or route (e.g., additional stops, possibly as part of a carpool). In a few cases, a conditional ride might entail an initial trip by rail coupled with a ride home by car from the train station. Also, it should be noted that in a small number of cases the person contacted wanted to "check-up" on the FP with his employer prior to offering a ride.

The remaining 80 percent of calls were classified as: (1) never (16 percent), (2) not today (28 percent), and (3) no response (36 percent). The "never" category included people who could not offer a ride (e.g., they stated they did not drive), people who had relocated, and a small number of people who were absolutely unwilling to offer a ride under any circumstance. The "not today" category included people who's travel patterns were altered for that day (e.g., they were visiting **a** remote site), people who were not working that day, and people who did not drive to work on that day. Finally, the "no response" category included people who could not be reached due to a busy signal or no answer, and people who did not return messages.

In summary, most of the people contacted as part of the experiment did not exhibit an outright resistance to offering **a** one-time ride. Rather, rides were not offered for a great range of logistical reasons, the most common of which was that the person simply could not be reached. Furthermore, the success rate was high enough to suggest that a persistent caller would have a reasonable chance of finding a ride.

Table 6.15 compares success rates across different classes of calls: ride-home vs. round-trip, departure time, and sex of person called. Findings follow:

- The unconditional success rate is larger (statistically significant at 5% level) for ride-home than for round-trip. The total success rate is only significantly larger at the 15% level.

- Differences in success rate among departure times are not statistically significant.

- While the success rate was higher when calling females than males, the difference is not statistically significant.

Looking beyond the numbers, the confederate encountered a somewhat more positive attitude toward offering rides for the "ride-home" case and when calling females. In the case of a ride-home, people tended to view the situation as a true emergency. The burden of offering a one-way trip was also lighter than a round-trip. These advantaoes outweiahed the disadvantage that a smaller lead time was available to arranae a ride-home than a round-trip. which would take place the following dav. In the case of females, the difference appeared to be that they were easier to reach and had fewer constraints related to the trip home than males.

**Automated Feature**

Though persistence may pay off in using the manual feature, it appears that few people would be lucky enough to find a match when using the automated feature. The first obstacle is in accessing the feature. The feature could not be accessed at all in 12 out of 24 trials, likely due to inconsistencies in the way people are coded into the ridematch database. In addition, during a short period of the experiment, the feature was inaccessible to all of the FP.

The remaining 12 trials generated 120 names for ridematches. Of these 120 names, the ARMS system stated that 14 were ineligible to receive automated messages. Hence the system relayed messages to 106 individuals. Of these 106 calls, just

**Table 6.15**

**ARMS Experiment** **Percentage Rides Offered**

**Manual Ride**

| | Sample size | Unconditional | % Unconditional | Conditional | % Conditional | Total % |
|---|---|---|---|---|---|---|
| Ride Home (One Way) | 91 | 12 | 13.2% | 10 | 11.0% | 24.2% |
| Round-trip | 91 | 4 | 4.4% | 10 | 11.0% | 14.4% |
| 4:oo | 61 | 7 | 11.5% | 8 | 13.1% | 24.6% |
| 5:00 | 61 | 3 | 4.9% | 7 | 11.5% | 16.4% |
| 6:00 | 60 | 6 | 10.0% | 5 | 0.3% | 10.3% |
| Male | 56 | 7 | 12.5% | 3 | 5.4% | 17.9% |
| Female | 115 | 10 | 8.7% | 17 | 14.8% | 23.5% |

2 conditional rides were offered, yielding a success rate of 1.67 percent per name on the ridematch list. In the vast majority of cases (93 percent), the automated call was not returned at all.

It is impossible to determine the exact reason why calls were not returned. Examination of the ARMS "out-dial" report suggests that the automated message system did not perform as designed during the experiment. Problems included:

1. The out-dial system appeared to be down for extended periods

2. Many of the out-dial phone calls were not placed until one or two days after the message was recorded

To summarize, the automated messaging feature performed poorly for either, or both of two reasons:

1. Individuals were unwilling to return or listen to automated phone calls
2. The automated phone calls were not placed at proper times.

Whatever the cause, the result is the same for an ARMS user: the system did not perform at a satisfactory level.

Prediction of Matching Probability

As a final step, the success probability was used to predict the likelihood that an average person using the system would be successful in finding a ride match on a dynamic basis. This was accomplished for both the manual and automated systems. As input, a probability distribution was obtained from CTS for the number of matches generated per ridematch list. This distribution was truncated at 10, as the system is only capable of generating/calling up to 10 matches:

| Matches | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Probability | .2 | .1 | .07 | .055 | .055 | .04 | .035 | .031 | .027 | .023 | .36 |

Because 20 percent of the ridematch lists have no names, at best 80 percent of potential users could find a ridematch through use of ARMS. The chance of finding a match increases as the number of matches increases. Taking into account the probability distribution of names per list, and the likelihood that any individual would offer a ride when contacted, the overall success probability was determined. Based on experimental results for the manual system, our estimated success probability for unconditional matches is .09 per call, yielding an overall success rate of .34

(assuming that the match seeker calls everyone on his or her match list). A 95% confidence range is .048 to .132 for success per call, and .21 to .44 for overall success. Based on these data, a person stands a less than even chance of finding an ***unconditional*** ride match using the manual feature.

Combining unconditional and conditional offers, the success probability for the manual system is .20 per call, yielding an overall success rate of .545 (assuming that the match seeker calls everyone on his or her match list). A 95% confidence range is .0142 to .258 for success per call, and .459 to .603 for overall success. Based on these data, a person stands a slightly better than even chance of finding a ride match, assuming that he or she phones everyone on his or her ridematch list.

The success rate for the automated system is much less than for the manual system. Assuming that the feature is accessible, our estimated success probability for finding a match is .0167 per call (no unconditional rides were offered), yielding an overall success rate of .083. A 95% confidence range is 0 to .035 for success per call, and 0 to .16 for overall success. Based on these data, few people would successfully find a ridematch using the automated feature.

It should be borne in mind that the success estimates come from an emergency situation (a car breaking down). The likelihood of finding a match for occasional carpooling needs would be lower for two reasons: (1) the database is populated with data on work-trips, likely resulting in fewer matches per list, and (2) people are less likely to offer rides for non-emergency trips. Therefore, to conclude, experimental evidence suggests that ARMS is not a viable system for forming flexible carpools.

### 6.5 Conclusions on ARMS

The automated data indicate a low level of use of the ARMS service for all purposes. Valid users averaged 34 calls per week from the target population of 68,000 persons registered with CTS.

The surveys of the potential market indicate that the FOT used an appropriate group to test ARMS. However, the service is likely to be used infrequently. In the case of the "one day only" service there is a fundamental attitudinal problem which will severely limit the market for this service i.e. respondents said they will neither give nor take rides from people they do not know. These findings were confirmed by the survey of actual ARMS users. ARMS is not being used for "one day only" rides but is being used by those searching for regular car-pool partners. These individuals indicated a continued interest in using the service for this purpose. The ARMS experiment sought to test the system through experimentation. Unconditional offers of lifts for the one day only service were offered in only 9 percent of cases and a further 11 percent had conditions attached. It is not known whether any of these offers would have translated to actual rides. This part of the evaluation would also seem to confirm that the one day only service has limited appeal or viability.

# CHAPTER 7 PC MODEM

## 7.1 Research Design

The Smart Traveler PC Modem software was intended to bring the full features of the Smart Traveler Kiosks to the desk of anyone with a personal IBM-compatible computer, color monitor and a modem. Version 1 was first released in March 1994. This version allowed the individual to view the Caltrans freeway map which displays traffic conditions over an extensive network of freeways in Southern California. Specific dot colors correspond to ranges of traffic speed which can be interpreted from the legends on the screen. The intention is to bring information about congested traffic areas to the attention of people before they set out on a trip. Such information should help individuals modify their routes or adjust their schedule if their usual route is congested. Because the full feature software was never developed, testing this concept as a media interface for traveler information was greatly limited.

There are special characteristics of a software package that create evaluation difficulties. Records were kept of all those who were sent the software, but there were no constraints on copying the diskettes. There is therefore no clearly identifiable population of users. Second, although all transactions are logged by the MTA computer, there is no means of obtaining information from the PC user. The only automated data is a count of the number of times that the MTA ports are polled by outside users. The constraints on resources precluded any major survey work to track down users of this Smart Traveler feature. Instead a limited number of telephone interviews were undertaken with known recipients of the software to gain some insight into its' installation and use. The interviews were informal and were structured around the need to establish whether the software had been installed and used and if used, for what purposes.

The two data sources for analyzing use and responses to this Smart Traveler element are therefore:

1. Automated data which tracks the number of times that the MTA ports transmit the MODCOMP data in response to a modem based request.

2. Telephone interviews with a sample of recipients of the Version 1 Smart Traveler software.

### 7.1.1 Automated Data

These data were obtained from the Management Information Services Department of the LA MTA. They give a count of the number of uses of the system identified by Julian day and hour of day. The data were available in this form for the period August 1, 1994 to

March 31, 1995. This is a period of 35 weeks. A total of 83,155 uses were recorded in this period. The table below shows average daily use by day of week.

**Table 7.1 Average daily use by day of week**

| | MEAN | STD. DEVIATION | CASES |
|---|---|---|---|
| All Days | 342.2 | 122.9 | 243 |
| Mondays | 415.3 | 44.6 | 35 |
| Tuesdays | 402.1 | 47.9 | 35 |
| Wednesdays | 415.2 | 36.2 | 35 |
| Thursdays | 429.4 | 41.2 | 35 |
| Fridays | 413.0 | 37.1 | 35 |
| Saturdays | 150.7 | 21.0 | 34 |
| Sundays | 150.9 | 23.2 | 34 |

As can be seen there is a high consistency of use during the week with circa 400 uses per day. At the weekends use drops down to 150 uses per day.

In Figure 7-l we have plotted the number of uses per day for all weeks. The upper part of the plot shows weekday use and the lower part of the plot the weekend use. There appears to be surprising consistency throughout the period. The start up period from March to August is not available, possibly explaining why there appears to be no build up in use over time.

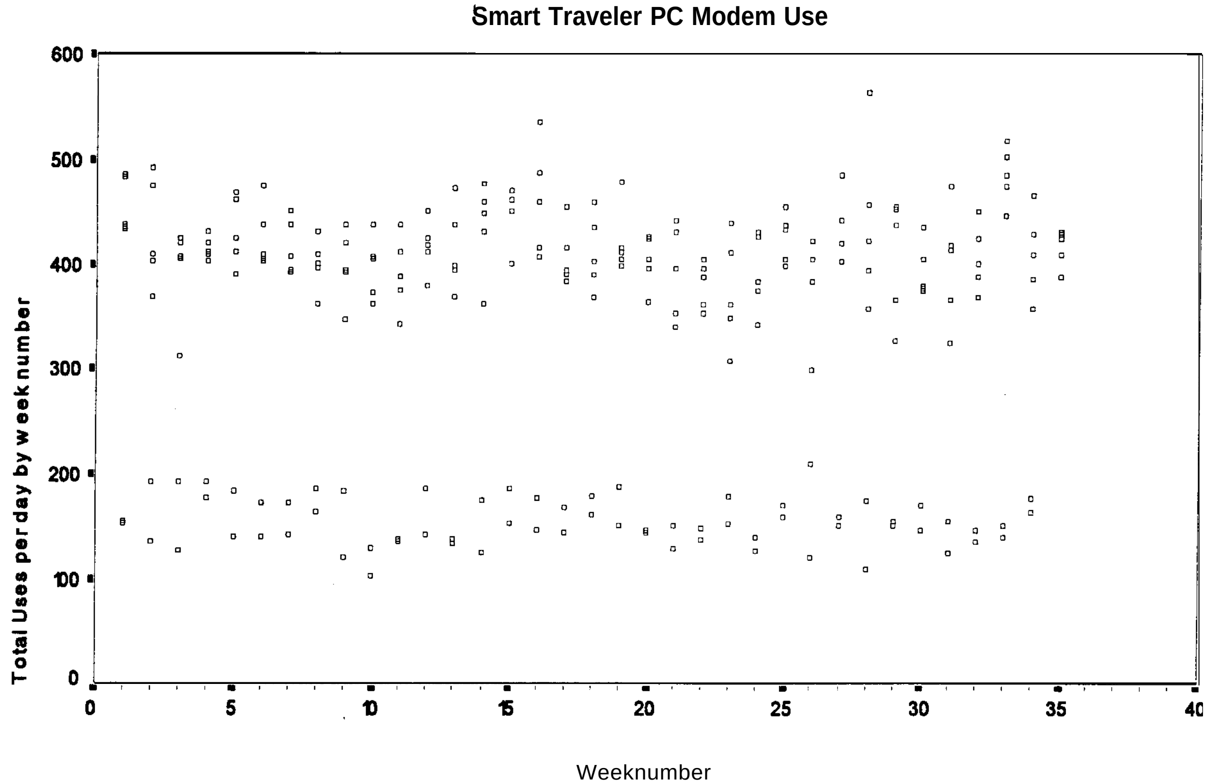



Figure 7-l

Finally in Figure 7-2 we have plotted use by hour of the day. The pattern shows use beginning around 5 a.m. and peaking from 7- 9 a.m. Use peaks at 3 p.m. and falls off completely only after 7 p.m. This is consistent with an expected pattern of use by commuters.

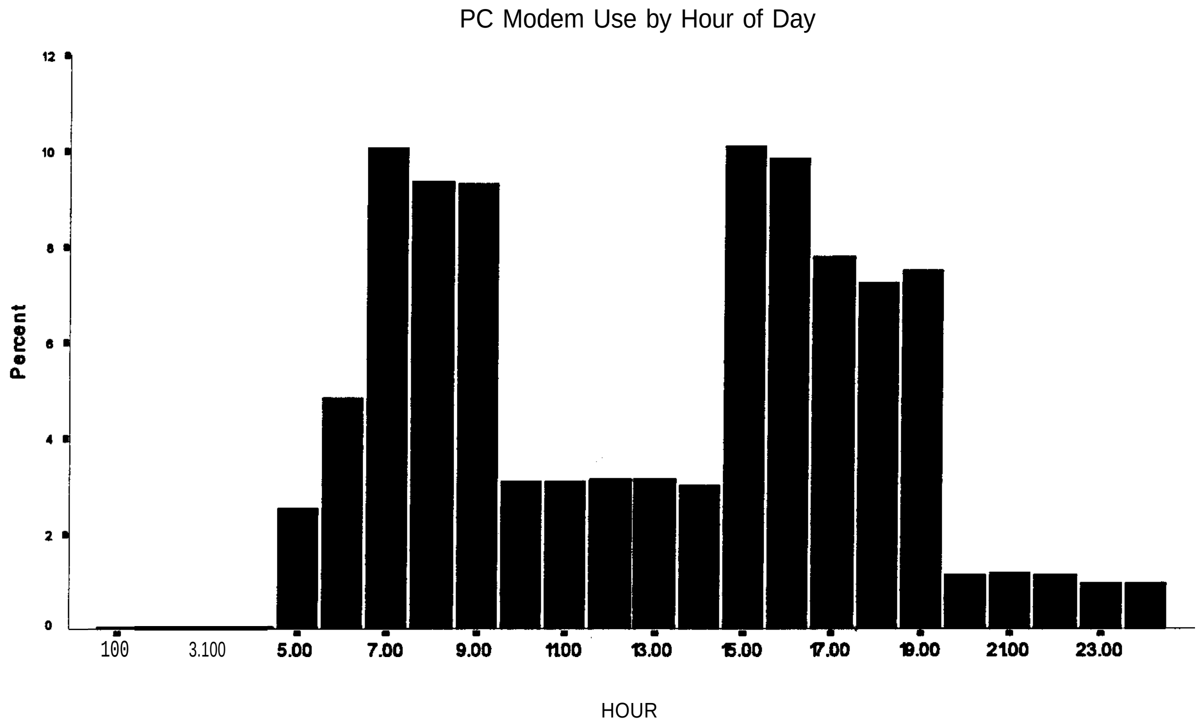



Figure 7-2

Given that Caltrans estimates that they have distributed a total of only 500 diskettes the average daily use indicated from these data is high and would appear to indicate that there is a demand for such a service. A possible explanation for the relatively high use of the service was offered by the Project Manager at the MTA. Some companies have apparently hooked up the system to give continuous displays for employees. It is not known how many users are accessing the system using the Internet.

### 7.1.2 Interviews with Recipients

From the Caltrans records of circa 325 software recipients(multiple copies were requested in some cases) a random sample was drawn for interview. The majority of the sample were mailed their software in the Spring of 1994 and the interviews were performed in late March of 1995. The intent was to ask respondents about their experiences with installing and using the free Smart Traveler package. It was expected that this would supply insights both into the free and somewhat random distribution process as well as indicate whether some users really did find that it helped to inform their route choices and times of departure.

Twenty one recipients responded to the interview request (about 80 telephone calls were necessary to gain this response). Those involved were employed either by companies or government agencies in Los Angeles. The results were not encouraging. Fourteen of the recipients (67 percent) had not installed the software, five had experienced installation difficulties to various degrees and ultimately only five (21 percent) current users were found (two had stopped for different reasons). The results of the interviews with this unscientific sample raise a number of important questions:

1. Was the distribution method targeted appropriately for a Field Operational Test (FOT) of the software, i.e. to those with the equipment to be able to use it?

2. Was the information supplied with the software package sufficient?

3. Would a follow-on effort have been helpful?

Some of the comments made in the course of the interviews aid in a discussion of these questions.

**THE NON-USERS OF THE SYSTEM**

**Technical/Equipment Problems**

- “I was sent a whole set of things but I don’t currently have a modem”

- I tried to install it but need an equipment upgrade which we have requested and hope for action eventually”

- “I’ve never installed it, I have too much else on my computer.”

- “We wanted to install it on a monitor in the building but we haven’t been able to get a dedicated line so we have never used it.”

- "We have never installed it. What I really need is a version that could link into e-mail so that all our employees could use it".

- I tried to install it but I kept getting error messages. I think it is probably something to do with Wincompro which is a windows based system, when the package was non-windows".

- "It was installed and I found it really neat and easy to use, but shortly afterwards my computer ran out of memory and I couldn't use it any more".

- "I couldn't install it because I have no modem on my PC."

- I couldn't install it on my computer because the modem is on COM 3 which this package won't support."

**Other Reasons for Non-Installation and Use**

- "Caltrans sent it to me and I never used it and sent it back because it was no use to me".

- "I received it but I've been too busy to use it."

- "We received it but never installed it because a Smart Traveler Kiosk was put in the next building and we use that sometimes."

- "I haven't ever had time to install it and use it."

- "We never installed it because they put a kiosk in the building **-** so we use that instead **-** we really like the printouts of the bus routes that you can get out of it."

- "We never installed it. We have a very sophisticated traffic control center and lots of information and data so we never got around to it."

- "We never installed it and never used it. We are currently working on something else similar."

- "I use the cable T.V."

This small sample of recipients offers a number of interesting insights into the distribution process.

1. The screening process using a mailout of information and a return postcard or those wishing to receive the software was not successful in insuring that potential users had the necessary equipment.

2. Free distribution of the software also seems to have been a problem. Quite a few respondents appear to have had no motivation for even trying something which had been distributed free of charge. It is unclear whether they had read the accompanying materials or not. A follow up phone call offering help and more in-depth explanation of the value of the package might have helped encourage more individuals to at least experiment with the package.

3. Several respondents gave as a reason for not installing the software the fact that they had a Smart Traveler Kiosk in the vicinity to use instead. Others commented that they wanted something that would be available to all employees either through e-mail or centralized monitors and therefore had not bothered to install it for themselves. These comments are of interest because they indicate that the recipients themselves seem to have missed the point that there is considerable personal benefit in being able to access the Caltrans traffic information at the desk without walking anywhere. This may well indicate a failure in the marketing information provided. It also reinforces the suggestion that follow on phone calls would have been appropriate for this FOT in order to encourage wider experimentation with the system prior to the full release of the expected version 2.

4. The range of technical problems mentioned suggests that there are a number of issues to be addressed in future versions of such software.

## THE CURRENT USERS OF THE SOFTWARE PACKAGE

The five users could be characterized as being mildly enthusiastic about the system and were using it on a fairly regular basis. Their comments suggest both uses and limitations of the system.

One respondent vanpooled from Orange County to Los Angeles (a distance of about 45 miles one way) with nine other people. He had heard about Smart Traveler at a booth during Rideshare Week (an annual event). He had experienced difficulty in obtaining the software but eventually tracked it down (The Caltrans general information number said they had never heard of it). He was unable to install the software at work because of a complex network modem access problem. He did however install it on a P.C. at home. He explained that the length of their commute trip means that they do not base route decisions purely on Smart Traveler information but mix it in with continually monitoring the radio traffic reports in order to decide what to do. This group has real route choices and frequently modifies its route. He commented that you have to know the area well (as his group do) in order to be able to identify the freeways because the labeling is not particularly clear. This respondent said that he occasionally uses it weekends but usually forgets.

A second respondent had received the package directly from Caltrans and claimed to use the system almost daily. He explained that such things really appeal to him. He uses it before leaving the office to drive home and will frequently switch from the freeway to surface streets if he sees that his homebound trip is likely to be delayed.

A third regular user also claimed to use the system before going home in the evenings. Again she commented that she would change her route if it looks like there is a problem on the freeway. This respondent commented that others in her office also find the information useful. Her concern was that she would have liked to have been able to make the information more widely available to employees at "the plant who do not come to the office before they leave the site". "Some means of displaying the information , like a printout would be great".

A fourth user who is a transportation consultant had been unable to install the software on her own PC in her office but had been successful with an alternative machine in another room. The result was sporadic use due to the inconvenient location. This respondent lives in an area where the same information is available on cable-tv during peak periods. Smart Traveler was useful for the off-peak periods. The respondent found it useful to take a look before leaving for meetings. The information could influence both departure times and routes selected.

The fifth user, an employee transportation coordinator for a large company, was plainly disappointed that only the freeway conditions element was available. She did not feel that on its own it was particularly beneficial. In the recent extremely wet weather she had found it frequently impossible to get through to check on the flood conditions, "for an hour at a time". (This was also an experience shared by the research team members in the same circumstances). This respondent commented that if the full version were available they would plan on making it available at prime locations throughout the building for their 4,000 employees. The carpool information and transit itinerary planning would help reduce her workload.

## USERS WHO STOPPED USING THE SYSTEM

One respondent who described herself as an infrequent user said that she had used it to check for sig alerts. This then gave her the choice either to change her route or just to give herself more time to get to her destination. This respondent commented that she had been unable to get through a while back and had assumed that the "system had been turned off and had therefore stopped using it.

A second respondent had found the system on installation "really neat and easy to use". However almost immediately his computer had run out of memory and he had been unable to use it any more. He commented that they had called the "Caltrans installation number but no one ever called back".

## 7.2 Conclusions

Our two data sources give rather different insights into this element of Smart Traveler. The fact that on weekdays a little over 400 uses are recorded every day suggests that there is indeed a market for this information. The times of daily use are also consistent with it being used for trip planning purposes before leaving to drive to work and before leaving to drive home. What we cannot know from these data is how the information affects decisions with regard to route changes and timing of departures.

From the point of view of a Field Operational Test(FOT) of one of the Smart Traveler elements, the PC modem media interface has proven to be an unsatisfactory experiment. Had it been known that version 2 would not be implemented the evaluation would have been planned differently. This experience suggests the following conclusions.

0 Despite the best efforts of those implementing the project, software was distributed to some of those who lacked the necessary equipment to test it. In future tests where equipment and correct installation is essential to test the product it would seem wise to expend effort on follow up calls.

0 Following up on participants in the course of the test period to check for problems and offer additional explanation and encouragement would be extremely valuable and could help in widening the potential group trying to use such a system beyond the experienced computer users. It would also feed back information to developers of later versions of the package.

0 Abandoning the test after the distribution of version 1 without proceeding to test the value of the full version frustrated the participants, was wasteful of resources and undermined the purpose of the FOT by severely limiting the value of the test.

0 With hindsight it probably would have been preferable to have designed the Version 2 element under less pressure and with the expectation that it should be monitored and evaluated in a separate FOT.

Insights from the system as tested yields the following conclusions.

0 A number of minor technical problems will need to be fixed in any future version e.g. allowing modem access by Corn 3. Producing a Windows version would also eliminate some problems. Clearly such software needs to be flexible and adaptable to satisfy different machine configurations.

0 On the graphical interface making the freeways easier to identify through better labeling and zooming capabilities would be helpful. As an aid to those who would like to be able to post information for employees as they leave their building. A listing of sig alerts and traffic advisories which could print from screen at frequent intervals would be useful.

0 If such traveler information is to be available in emergency conditions such as extreme weather and earthquakes, sufficient capacity would have to be built into the system. Inability to use the system during flood conditions in Los Angeles was frustrating and undermined one of the objectives of such a traveler information system.

0 Preliminary indications are that currently only a limited group of users access the freeway information to help with route and scheduling choices. Those that do so find it useful but not to the exclusion of other sources of information such as radio traffic reports.

# CHAPTER 8 CONCLUSIONS

The purpose of the Smart Traveler Demonstration Evaluation has been to conduct a comprehensive analysis of technical feasibility, reliability, cost and user acceptance of the three Smart Traveler elements. In this chapter we summarize our findings in two parts: first, findings regarding each Smart Traveler element, and second, regarding the Demonstration itself.

## 8.1 Smart Traveler Elements

### 8.1.1 Kiosks

The kiosks provided a new medium for obtaining pre-trip traveler information. The kiosks provided information on all three of the major travel modes in a reasonably user-friendly way, and made this information accessible in a wide variety of locations. Our survey results indicated a high degree of user satisfaction, yet the overall usage rate was low, relative to the cost of providing the kiosk service. Low usage combined with high capital and operating costs yielded a (total) cost per use of about $2.00 (five-year lifetime), notably higher than for example a traditional telephone information system.

There are two sets of factors that may explain observed usage levels. The first is related to kiosk deployment. As noted in Chapter 5, the kiosks were installed with no marketing or formal public introduction. There were no flyers available, and there was no person on-site that could explain the kiosk functions or answer questions. The only indication of the kiosk's function was a moving light display across the top of the unit. Thus, passers-by had to be curious enough to explore the kiosk, or learn by word of mouth from others who had used the kiosk. Our site visits revealed that many kiosks were placed in rather remote locations (e.g. dark corners), or in locations where most people would not expect to find a traveler information service (e.g. a food court). All of these factors suggest that this test deployment did not exploit the potential market for such services.

The second set of factors has to do with how and when the kiosks were used. First, kiosks were placed in many office buildings, apparently based on the idea that they would provide another means for gathering information on work trip options. Since work trip information has historically been provided at the employment sites (through rideshare coordinators), it was logical to assume that the kiosks would perform a similar function. Instead, kiosks at office locations were used less than at any other type of location. We found that the most heavily used kiosks were located in shopping malls and discount stores. These findings suggest that the kiosks are used in the context of nonwork activities (shopping), when people have time to explore future trip options. Findings also suggest that kiosks may be used more for nonwork trip information. The work trip changes only when the traveler's options change, or when a job or residence change takes place. Nonwork trips are more variable, and therefore may be subject to more information gathering, particularly for the transit dependent traveler or the tourist

Second, there is a question about how frequently travelers need the information provided at the kiosk. Low usage at office locations is reasonable, for example, given the regularity of the commute trip. In addition, taking extra minutes to walk to the kiosk to check the freeway conditions map before leaving work is apparently not something most commuters are inclined to do. Conversely, tourists have a great need for travel information, hence the high usage of kiosks at Union Station and Burbank Airport. Our findings suggest that usage is a function of the level of demand for new trip information. The observed decline in use over the six month observation period may be the result of this demand (e.g. people used the kiosks to get the information they needed, and then had no further need to use them). More research is needed to examine this issue.

Third, the kiosks may not be sufficiently user friendly for some groups. We observed that the use of the help menu was more frequent and the use of specific menu items was less frequent among Spanish language users. It is probable that Spanish language users are less familiar with computer technology and have more trouble providing correct spelling for location information. The result is a low success rate in actually obtaining print-outs of match lists or transit itineraries. Over time, this frustration would deter kiosk use. If kiosks are to be effective for less sophisticated users, the process of obtaining such information should be simplified.

Our analysis of the kiosks leads to the following conclusions.

1. Target the appropriate market. Kiosks are more effective in nonwork environments, and are used more for future trip planning than for immediate travel needs.

2. Market the kiosks. The kiosks need to be introduced and marketed to the public.

3. Establish “ownership” of the kiosks. Maintenance costs and downtime could easily have been reduced had on-site coordinators been compensated for regularly monitoring the kiosks and fixing minor problems as they occurred.

4. Provide a set of information services that are compatible. The freeway conditions map information is useful for a very short time, while rideshare and transit information allows for more extended pre-trip planning. A better combination might be transit information, location and hours of operation of public agencies, schools and hospitals, movie theater listings, etc.

5. Pay special attention to the less sophisticated user. If the benefits of new technology are to be realized by all segments of society, software design will have to be oriented to novice users. This is a particular challenge in providing transit or rideshare information, because of the need for specific location and schedule information.

### 8.1.2 ARMS

The ARMS demonstration provided some valuable lessons for future ATIS development. ARMS has proven to be a low use and therefore high cost system that is not used for its primary designated purpose, i.e. making occasional one day only ridesharing arrangements. The users interviewed were almost exclusively interested in finding regular rideshare partners, not in finding a one time carpool.

Unfortunately, the system was not designed to maximize their chances of finding new regular rideshare partners if their departure times from home or work needed to be permanently changed. In order to protect the integrity of the CTS data base such changes could only be made by going through an operator. Hence, opportunities to be matched with those newly added to the data base would require repeated use of the ARMS service. The only real value for users seeking regular partners was therefore to experiment with adjusted departure times to see if changing times would result in more matches. Only 40 percent of ARMS users appear to have been making changes of any sort, suggesting either that users have real constraints on their departure times and don't change them very often, or that users were not aware of ARMS' purpose. The overall conclusion on ARMS is that it offers a service for which there is little demand.

Our survey research showed that commuters have other, preferred alternatives for those occasions when they cannot use their regular means of travel to or from work. Those who regularly carpool usually have a car available and use the alternative of driving alone. Those who regularly drive alone get rides from other household members or fellow workers. That is, one-time ride needs are accommodated within the individual's ***personal, familiar*** family and social network. It is much easier to make travel arrangements with people one encounters at home or on the job than it is by making numerous phone calls and waiting for an appropriate match. There is also less personal risk associated with relying on one's familiar network of people.

Prior studies support our results. For example, another type of one-time service is the guaranteed ride home. Such programs are actually seldom utilized. Those who rideshare value the availability of the service, yet rarely have the need to use it (Polena and Glazer, 1991).

Our survey also showed that most people are not inclined to give or take rides from people they don't know. This finding is not new. Margolin et al (1978) found that 87 percent of their sample wanted to meet prospective partners at least once before making carpool arrangements and 39 percent felt that they would have to actually know the people first to consider carpooling with them. The study considers that people did not want to become involved with others they know nothing about. They comment; “it does not appear to be the computerized matching in itself so much as the fact that the system does not include a person who could be contacted in the neighborhood or at work and who would know something about the combined personal and business situation of a cat-pool” (p. 11). In a focus group study, Gelb Consulting Group, Inc. (1991) found that respondents raised concerns of both safety and security with regard to “instant carpooling”. They also report indications that individuals would be more likely to ask for a ride than to give one. Finally, there was a more positive reaction reported with regard to ridesharing confined to pools limited to “affinity groups” i.e. within corporations or sub-divisions.

Such results help give some insight into why car-pools are so frequently formed between family members, neighbors and co-workers. Indeed data from the greater Los Angeles Metropolitan Area indicates that 43 percent of all carpools are composed solely of family members, co-workers are the next most common type of carpooling partners at 40 percent, friends and neighbors account for 16 percent and non-household relatives for 3 percent. There is some overlap between categories as multiple responses are possible (State of the Commute, 1993).

In contrast to our conclusions about the kiosks, the extremely low usage of ARMS is not explained by the absence of marketing. The problem is more fundamental; the vast majority of commuters have no need or inclination to use such a service.

A technical issue related to the absence of demand for flexible ridesharing is the lack of responses to automated ride request messages. Our ridematching experiment showed that responses to the personal request of the caller were answered far more frequently than the automated requests. The automated messages are apparently easier to ignore -- further reducing the effectiveness of the system.

The further lesson of ARMS is that technically complex systems require careful development and monitoring. The problems that occurred with the system were quite minor with respect to the technology, yet they made the system useless for extended periods of time to those seeking matches through the automated system. These technical problems persisted throughout the demonstration period, because the system was not consistently monitored. An accurate reporting system for detecting problems and monitoring system usage was never established during the demonstration period.

Our analysis of ARMS leads to the following conclusions.

1. **Conduct an assessment of potential demand before investing in costly automated systems.** The Smart Traveler surveys and other literature

sources strongly suggest that there is unlikely to be a significant market for one-time rideshare services. Some basic market analysis is a small investment to make, compared to building such **a** system.

2. **Make sure that users understand the services provided.** Most users of ARMS were looking for a regular carpool; the system should have shifted them to the CTS operator early in the menu.

3. **Establish effective monitoring and reporting procedures.** The technical problems could easily have been corrected, had an effective monitoring system been in place.

4. **Make sure that the new service is a real improvement over existing conventional systems.** ARMS users looking for regular carpool partners and desiring to change their records permanently in terms of arrival or departure times needed to go through the operator rather than using the automated system. Unless they did this, individuals with compatible times added to the data base over time could not be matched with them.

### 8.1.3 PC MODEM

The Version 1 software made the Caltrans freeway conditions map accessible to the (suitably equipped) home or office personal computer. The limited analysis we were able to conduct suggests that the software is used extensively, given the number of copies that were distributed. The software is also used at the expected times: on weekdays during peak traffic periods. It appears that there is significant demand for obtaining real-time traffic information from one's desk.

As with the other Smart Traveler elements, problems with Version 1 largely had to do with the circumstances of the FOT. Version 1 was not adequately marketed, and information distributed with the software was limited. Such problems are easily solved.

The increasing use of the Internet and of local area networks makes it possible to disseminate the freeway conditions information much more extensively than is possible with the software. Indeed, discussions with the MTA program manager suggested that several users had installed the software on network systems and had the map polled at regular intervals. This is one explanation for the high observed usage. A network-based system (e.g. via World Wide Web) would make the information widely accessible. Adding transit and ridesharing information would provide users easy access to a complete menu of travel options.

Shifting to a network medium has the disadvantage of limiting the potential market. Although on-line services are growing at an explosive rate, use remains concentrated among highly educated (and affluent) professionals. It is difficult to justify providing a service supported by public funds that is restricted to this segment of the population.

## 8.2 THE SMART TRAVELER DEMONSTRATION

The Smart Traveler Demonstration was a very ambitious test of new technology. The increase in project scope that resulted from the Northridge Earthquake greatly complicated an already complex undertaking. Despite the complexity, time pressure and limited resources, all three technologies were developed, installed and tested in the field -- a remarkable achievement. The technical feasibility of each element was demonstrated, and the demonstration provided valuable information for future ATIS development and field testing. This section provides general conclusions on Smart Traveler.

### 8.2.1 Overall conclusions on Smart Traveler

Our evaluation of the three individual elements of Smart Traveler reveals some common themes. First, many of the technical problems could either have been avoided ***or*** quickly solved, had effective monitoring systems been in place. On-site kiosk service coordinators could have checked for loose plugs and replaced paper more quickly than the Cordoba subcontractors. Regular checking of ARMS records would have allowed minor problems to be detected more rapidly. Second, data problems hampered the evaluation of all three elements.

These problems suggest a larger issue: project "ownership." Participants included several public agencies, major private corporations, numerous subcontractors, and the kiosk host sites. Organizational complexity increased as the demonstration shifted and expanded. It became difficult to identify participant roles and areas of responsibility. The pressure of funding deadlines added to these difficulties. It is therefore not surprising that less critical tasks (e.g. data collection) were sometimes not given high priority.

### 8.2.2 Lessons for future evaluations

Finally, the demonstration provided valuable information for future evaluations. Conclusions are presented in this section.

1. **Large-scale demonstrations require significant investment in management and organization.** Demonstrations ought to be no larger that is necessary to adequately test a product or concept. Large scale implementations of demonstrations and a management and organizational burden that should be avoided if possible. In the case of Smart Traveler, the sheer effort of finding locations for 77 kiosks, or in targeting the ARMS service to 68,000 commuters often overwhelmed staff resources. As a result, resources were not available for critical front-end tasks, such

as establishing effective monitoring systems which would have allowed the modification and improvement of the demonstration elements over the life of the project.

2. **Data requirements and management should be established early in the project.** Automated systems have the potential of generating enormous quantities of raw data. Unfortunately, endless amounts of raw data are rarely useful to project managers and evaluators. Advanced technology experiments generate a unique situation, in that managers and evaluators have limited technical expertise, yet they must convey their information needs to technical experts. It is therefore critical to identify data requirements in the project planning phase, communicate these requirements to the technical experts who will handle the data, and develop appropriate data collection/reduction systems to generate the necessary data.

3. **Evaluators should participate in developing the data requirements.** The evaluation team has the most detailed understanding of the information needed for the evaluation. The evaluation team therefore should be involved in the development of the data collection/reduction system. In Smart Traveler, subcontractors were given data reporting requirements before the evaluation team began working on the project. When these data proved inadequate, subcontractors were unwilling or unable to provide additional data.

4. **Structure and timing of the evaluation should allow for analysis of travel impacts**. The key issue in ATIS investment is whether these services have an impact on travel behavior, and therefore on the transportation system. This issue can only be examined over time, as users of the new technology respond to the availability of more timely and extensive travel information. There seems to be a tendency in these demonstrations to require all parts of the evaluation to be completed shortly after the field demonstration. While such timing is appropriate for functional and cost analysis, it is not necessarily appropriate for travel impact analysis.

The Smart Traveler demonstration evaluation results are timely and valuable. Only a few new technology evaluations have been completed, and none have been done on a project of this magnitude. These results can assist in the planning and deployment of the major IVHS Corridor demonstrations, and in ATIS systems under development throughout the US.

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# APPENDIX A

# KIOSK FAILURE DOCUMENTATION

RECORD ID: 00182367 PROBLEM DESCRIPTION: KIOSK IN CONCT STATUS

**PROBLEM REPORTER DATA**

VTAM ID ------------ KLA27P19
REPORTER DEPT ------ ICAL
REPORTED BV ---------STEPHEN BROWNIE
REPORTER PHONE ----- 818-566-8556
ADDRESS -----w-e----
CITY ---------------
SITE ID ------------
CIRCUIT ID ---------
NETWORK NAME -------
SYSTEM NAME --------
PROGRAM NAME --------
APPL NAME -----------
PROBLEM TYPE ------- NETWORK
PROBLEM STATUS ----- CLOSED
SERVICE REQUEST ----
DATE ENTERED ------- 11/22/94
TIME ENTERED ------- 07:13
ENTERED BY --------- JBELL
ENTRY PRIV. CLASS -- LVL1
CICSD ID -----------

**PROBLEM STATUS DATA**

ASSIGNEE NAME -------
ASSIGNEE UNIT/CO ---- LVL1
VENDOR TICKET -------
LINE TYPE -----------
GENERIC TYPE -------
DEVICE MODEL --------
OPERATIONAL ---------- N
TRACKED BY ---------- AVEE
TRACKER UNIT -------- LVL1
CURRENT PHASE ------- PROD
DATE OPENED ---------- 11/22/94
TIME OPENED --------- 07:07
DATE ASSIGNED -------- 11/22/94
TIME ASSIGNED ------- 07:12
FE ONSITE DATE ------
FE ONSITE TIME -----
CURRENT PRIORITY----
TARGET DATE ---------
REPAIR TIME ---------
RESPONSE/TRAVEL -----
CUSTOMER PD TIME ----
OWNING PRIV. CLASS --
DATE LAST ALTERED --- 12/02/94
TIME LAST ALTERED --- 07:29
USER LAST ALTERED --- HWKRUIN
PROBABLE CAUSE --------

**PROBLEM CLOSE DATA**

RESOLVED BY ----------- LLUCERO1
RESLVR UNIT/CO -------- LVL1
FAILING COMPONENT ----- KIO
CAUSE CODE --------- PWR
DATE CLOSED ----------- 11/23/94
TIME CLOSED ------------ 11:18
TOTAL TIME ------------
DUPLICATE COUNT -------
OUTAGE ----------------
PROBLEM STATUS -------- CLOSED
ORIG. PROBLEM NUM ----
CAUSE CHANGE NUMBER ---
FIX CHANGE NUMBER -----
VENDOR PMR NUMBER ---
SERIAL* ------------

ACTION TAKEN: WILL CALL AFTER 08:00 TO SEE IF UNPLUGGED

DETAIL DATA: TELECOMMUNICATIONS INCIDENT RECS=PROBLEM DATE/11/22/94 TIME/07:13 CLAE/LVL 1 RFT/BLMPRPR

DESCRIPTION TEXT: 11/22/94 07:13 HWJYBIN 0645 (JB) NOTICED THIS KIOSK IN CONCT STATUS. CHECKING AND DOING LINETEST.

| | | | |
|---|---|---|---|
| RLSD LOST, AGE: | NO | YES, 208 SEC | NO |
| LINE QUALITY,WORST: | BAD/14,BAD/14 | BAD/52,BAD/52 | GOOD/0- |
| BIPOLAR CODE ERR. AGE: | 0 | 9 ,72 SEC | 0-15/15 |
| REINITIALIZATION,AGE: | N O | YES, 208 SEC | NO |
| FAILURE ALARM, AGE: | NO | IGNORED | NO |
| POWER-OFF ALARM, AGE: | NO | IGNORED | NO |
| DSU/CSU FAILURE: | NO | YES | NO |
| OUT OF SERVC CO, AGE: | VES. B SEC | N/A | NO |
| OUT OF FRAME CO, AGE: | NO | N/A | NO |
| DDS-INIT LOOPBACK. AGE: | NO | N/A | NO |

THIS APPEARS TO BE A SITE WHICH HAS BEEN POWERED DOWN BUT WILL CHECK WITH IBM. SPOKE WITH CONNIE AND SHE KNOWS NOTHING ABOUT THESE SITES. WILL CALL THIS SITE LATE AFTER 08:00 SINCE NO ONE IS ANSWERING. MUST VERIFY IF

# APPENDIX B

# KIOSK SPECIFICATION AND PRICES

## B.2 RIDER B - KIOSK LIST, PRICES, INSTALLATION DATES

RIDER B - KIOSK LIST. PRICES. INSTALLATION DATES, AND ALLIEDINFORMATION

MANDATORY "PRIMARY" KIOSKS

| TYPE | MODEL/ FEAT | QTY | D E S - O N | PURCHASE PRICE PER KIOSK | PURCHASE PRICE ALLKIOSKS |
|---|---|---|---|---|---|
| | HiPAK | 104 | Primary Kiosk (Includes Speakers (qty 2), LED Sign, Alarm System and Lock) | $18,150.00 | $1,887,600.00 |
| | | | Pioneer Laserdisc Player (qty 2) | | |
| | | | Card Reader | | |
| | | | Receipt Printer | | |
| | | | Amplifier | | |
| | | | PIN Pad | | |
| | | | IBM 4019E Laser Printer | | |
| 9557 | KBA | | IBM PS/2 Personal Computer | | |
| | | | 1.4GB of Fixed Disk Storage | | |
| | | | M-Motion Video Adapter/A | | |
| | | | Communications Adapter Cable | | |
| | | | M-Audio Capture/playback Adp/A | | |
| | | | Multi-Protocol Adapter/A | | |
| | | | PS/2 4MB Mem Mod Kit | | |
| | | | ATIOS Components | | |
| | | | Mouse | | |
| | | | IBM Space Saver Keyboard | | |
| 8516 | 001 | | IBM Color Touch Display | | |
| 5872 | AAA | | OS/2 2.0 Base | | |
| 5872 | AAA | | Extended Services V 1 .O | | |
| | | | IM/Engine | | |
| 5871 | AAA | | M-Control Program | | |
| | | | Custom File Transfer Program (Contract award thru g-30-93) | | |
| | | | OR | | |
| | | | Netview DM/2 (After g-30-93) | | |

Scheduled Installation Date: For the first fifteen (15) pilot kiosks, ~~the 90th day after Contract award.~~ For the remaining 89 kiosks, all must be installed by ~~the 210th day of Contract award~~ October 29, 1993 and in accordance with the rollout schedule submitted by the Contractor.

Liquidated damages equal to $100.00 per day. (reference General Terms and Conditions, paragraph 7.a-e).

# APPENDIX C

# KIOSK USER SURVEY

**LOS ANGELES SMART TRAVELER**

The University of Southern California is interested in your opinions regarding travel information services which could be useful to you as a traveler. We are interested in your opinions, whether or not you have used any of the services described below. Please take a few minutes to complete the survey and return it in the attached envelope. Your opinions are very important to us and we appreciate your participation.

1. Are you aware of the new Smart Traveler Kiosk, an automated information system designed to provide travelers with easy access to freeway conditions, MTA bus and train routes and carpool information?

   ❑1 Yes ❑2 **No ➜ (GO TO Q12)**

2. Have you used the Smart Traveler Kiosk?

   ❑1 Yes ❑2 **No ➜ (GO TO Q11)**

3. Overall, how easy or difficult did you find the Smart Traveler Kiosk to use?

   ❑1 Easy ❑2 Neither Easy nor Difficult ❑3 Difficult

4. Did you request **Freeway Conditions?**

   ❑1 **Yes ➜**

   | | | |
   |---|---|---|
   | Did you view the map just to see how the Kiosk works? | ❑1 Yes | ❑2 No |
   | Would you use the map to check freeway conditions before driving somewhere? | ❑1 Yes | ❑2 No |
   | Did you find the freeway conditions map easy to use? | ❑1 Yes | ❑2 No |

   ❑2 No, did not request freeway conditions.

5. Did you request **MTA Bus and Train Routes** (contains routes, schedules and fares)?

   ❑1 Yes ➜

   | | | |
   |---|---|---|
   | Did you use the information just to see how the Kiosk works? | ❑1 Yes | ❑2 No |
   | Did you use the information to check routes, schedules or fares? | ❑1 Yes | ❑2 No |
   | Would you use the Kiosk to get this information again? | ❑1 Yes | ❑2 No |
   | Did you find the MTA bus and train routes easy to use? | ❑1 Yes | ❑2 No |

   ❑2 No, did not request MTA bus and train routes.

6. Did you request **Rideshare or MTA Bus and Train Videos** (short information programs)?

   ❑1 Yes ➜

   | | | |
   |---|---|---|
   | Did you find the videos interesting? | ❑1 Yes | ❑2 No |
   | Did you find the videos useful? | ❑1 Yes | ❑2 No |
   | Did you find the videos entertaining? | ❑1 Yes | ❑2 No |

   ❑2 No, did not request rideshare or MTA bus and train videos.

7. Did you request the **Carpool Service** (it lets you find carpool partners)?

   ❑1 Yes ➜

   | | | |
   |---|---|---|
   | Did you try this just to see how it works? | ❑1 Yes | ❑2 No |
   | Did you use it to look for a carpool partner? | ❑1 Yes | ❑2 No |
   | Did you find it easy to use? | ❑1 Yes | ❑2 No |

   ❑2 No, did not request carpool service.

8. Would you use the Smart Traveler Kiosk again?

❑1 Yes ❑2 No

9. Would you encourage other people to use the Smart Traveler Kiosk services?

❑1 Yes ❑2 No

10. What improvements could be made to the Smart Traveler Kiosk? ____________________

______________________________________________

______________________________________________

11. When thinking about future Kiosk usage, do you agree or disagree with the following statements:

| | Agree | Disagree |
|---|---|---|
| I don't want to wait while someone else is using the Kiosk. | ❑1 | ❑2 |
| I don't have time to use the Kiosk. | ❑1 | ❑2 |

12. Please check whether you agree or disagree with the following statements:

| | Agree | Disagree |
|---|---|---|
| I have my own car and have no need for transit or carpooling information. | ❑1 | ❑2 |
| I have no interest in trying to find alternate routes for my trips. | ❑1 | ❑2 |
| I can always listen to the radio for traffic information. | ❑1 | ❑2 |
| I do not like using machines to get information. | ❑1 | ❑2 |
| I do not give rides to people I don't know. | ❑1 | ❑2 |
| I do not take rides from people I don't know. | ❑1 | ❑2 |
| Transit does not take me where I want to go. | ❑1 | ❑2 |

13. Following the Northridge earthquake, did you use any of the following to get information about travel conditions or alternatives? **(<u>Please check all that apply</u>.)**

❑1 TV. ❑4 Police/CHP ❑7 Consult maps
❑2 Radio ❑5 Rideshare Agency ❑8 Ask friends or family
❑3 Newspapers ❑6 Use 1-800-COMMUTE ❑9 Other

14. Are you employed?

❑1 Yes ➜ On average, how many hours per week do you work? ________ Hours
❑2 **No ➜ (GO TO Q22)**

15. Do you have a vehicle available to drive to work?

❑1 Yes ❑2 Sometimes ❑3 No

16. By what means do you usually travel to work?

❑1 Drive Alone ❑3 Bus or Train ❑5 Walk or Bike

❑2 Cat-pool with Others ❑4 Vanpool ❑6 Other

17. How many miles do you travel to work one way? ________ Miles

18. How many minutes does it usually take for you to travel to work? ________ Minutes

19. How many minutes does it take on a bad day? ________ Minutes

20. Do you usually leave for work at the same time each day?

❑1 Yes ❑2 No

21. We would like to know how your commute was affected in the first month following the Northridge earthquake.

Did you change your normal route to or from work? ❑1 Yes ❑2 No

Did you change the time you started your trip to or from work? ❑1 Yes ❑2 No

Did you work more at home, or at a location closer to home? ❑1 Yes ❑2 No

Did you change your normal means of travel to work? ❑1 Yes ❑2 No

If Yes, what did you do? ______________________________________________

______________________________________________

______________________________________________

22. Which of the following categories includes your age?

| | | |
|---|---|---|
| ❑1 16-19 | 03 30 - 39 | ❑5 50 - 59 |
| ❑2 20 -29 | 04 40 - 49 | ❑6 60 or Older |

23. How many motor vehicles, including automobiles, trucks, vans, and highway motorcycles are owned or leased by members of your household?

________ Motor Vehicles

24. Not counting yourself, how many people are there in your household in each of the following age groups?

| | |
|---|---|
| Number of Household Members Under 6 Years Old | ____________ |
| Number of Household Members 6 - 15 Years Old | ____________ |
| Number of Household Members 16 - 19 Years Old | ____________ |
| Number of Household Members 20 - 59 Years Old | ____________ |
| Number of Household Members 60 Years Old or Older | ____________ |

25. W h a t i s y o u r h o m e zipcode?

26. How much school have you completed?

❑1 Have Not Graduated from High School
❑2 High School Graduate -- High School Diploma or Equivalent
❑3 Some College, but no Degree
❑4 College Degree (including Graduate)

27. Which category represents your combined total household income?

| | | |
|---|---|---|
| ❑1 Less than $20,000 | ❑4 $50,000 to $64,999 | ❑7 $100,000 or More |
| ❑2 $20,000 to $34,999 | ❑5 $65,000 to $79,999 | |
| ❑3 $35,000 to $49,999 | ❑6 $80,000 to $99,999 | |

28. Are you:

❑1 Male ❑2 Female

**Thank you for taking the time to complete this survey. Your responses will contribute to future traveler information systems. Please return the completed survey in the addressed pre-paid envelope provided to:**

Elrick and Lavidge, Inc.
111 Maiden Lane, 6th Floor
San Francisco, CA 94106

Distribution Date /__________

Distribution Location 1 2 3 4

# APPENDIX D

## DESCRIPTIVE STATISTICS FOR KIOSK USER SURVEY

**AGE 22** **Age groups of participants**

| Value Label | 'Value | Freauencv | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| **No** Answer | 0 | 6 | 1.8 | 1.8 | 1.8 |
| 16-19 | 1 | 16 | **4.9** | **4.9** | 6.8 |
| 20-29 | 2 | 81 | **24.9** | **24.9** | 31.7 |
| 30-39 | 3 | 95 | **29.2** | **29.2** | 60.9 |
| 40-49 | 4 | 71 | 21.8 | 21.8 | 82.8 |
| 50-59 | 5 | 31 | **9.5** | **9.5** | 92.3 |
| 60 or above | 6 | 2 5 | 7.7 | 7.7 | 100.0 |
| | Total | 325 | 100.0 | 100.0 | |

Valid Cases 325 Missing Cases 0

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**AGREE 11-l** **Don't want to wait while others using Kiosk**

| Value Label | Value | Freauencv | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| No Answer | 0 | 12 | 3.7 | 4.5 | 4.5 |
| Agree | 1 | 143 | 44.0 | 54.2 | 58.7 |
| Disagree | 2 | 109 | 33.5 | 41.3 | 100.0 |
| | | 61 | 18.8 | Missing | |
| | Total | 325 | 100.0 | 100.0 | |

Valid Cases 264 Missing Cases 61

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**AGREE 11-2** **Don't have time to use Kiosk**

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| No Answer | 0 | 21 | 6.5 | 8.0 | 8.0 |
| Agree | 1 | 51 | 15.7 | 19.3 | 27.3 |
| Disagree | 2 | 192 | 59.1 | 72.7 | 100.0 |
| | | 61 | 188 | Missing | |
| | Total | 325 | 100.0 | 100.0 | |

Valid Cases 264 Missing Cases 61

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**AGREE 12-l** **Have own car and no need for transit or CP**

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| No Answer | 0 | 13 | 4.0 | 4.0 | 4.0 |
| Agree | 1 | 134 | 41.2 | 41.2 | 45.2 |
| Disagree | 2 | 178 | 54.8 | 54.8 | 100.0 |
| | Total | 325 | 100.0 | 100.0 | |

Valid Cases 325 Missing Cases 0

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**AGREE 12-2** **No interest in finding alternate routes**

| Value Label | Value | Freauencv | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| No Answer | 0 | 13 | 4.0 | 4.0 | 4.0 |
| Agree | 1 | 43 | 13.2 | 13.2 | 17.2 |
| Disagree | 2 | 269 | 82.8 | 82 8 | 100.0 |
| | Total | 325 | 100.0 | 100.0 | |

Valid Cases 325 Missing Cases 0

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**AGREE 12-3** **Can always listen to radio for info**

| Value Label | Value | Frequencv | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| No Answer | 0 | 15 | 4.6 | 4.6 | 4.6 |
| Agree | 1 | 181 | 55.7 | 55.7 | 60.3 |
| Disagree | 2 | 129 | 39.7 | 39.7 | 100.0 |
| | Total | 325 | 100.0 | 100.0 | |

Valid Cases 325 Missing Cases 0

**AGREE 12-4** **Don't like using machine for info**

| Value Label | Value | Frequencv | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| No Answer | 0 | 12 | 3.7 | 3.7 | 3.7 |
| Agree | 1 | 42 | 12.9 | 12.9 | 16.6 |
| Disagree | 2 | 271 | 83.4 | 83.4 | 100.0 |
| | Total | 325 | 100.0 | 100.0 | |

Valid Cases 325 Missing Cases 0

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**AGREE 12-5** **Not giving rides to people I don't know**

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| No Answer | 0 | 14 | 4.3 | 4.3 | 4.3 |
| Agree | 1 | 213 | 65.5 | 65.5 | 69.8 |
| Disagree | 2 | 98 | 30.2 | 30.2 | 100.0 |
| | Total | 325 | 100.0 | 100.0 | |

Valid Cases 325 Missing Cases 0

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**AGREE 12-6** **Not taking rides from people I don't know**

| Value Label | Value | Freauency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| No Answer | 0 | 15 | 4.6 | 4.6 | 4.6 |
| Agree | 1 | 216 | 66.5 | 66.5 | 71.1 |
| Disagree | 2 | 94 | 28.9 | 28.9 | 100.0 |
| | Total | 325 | 100.0 | 100.0 | |

Valid Cases 325 Missing Cases 0

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**AGREE 12-7** **Transit doesn't take me to where I want**

| Value Label | Value | Freauencv | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| No Answer | 0 | 28 | 8.6 | 8.6 | 8.6 |
| Agree | 1 | 137 | 42.2 | 42.2 | 50.8 |
| Disagree | 2 | 160 | 49 2 | 49 2 | 100.0 |
| | Total | 325 | 100.0 | 100.0 | |

Valid Cases 325 Missing Cases 0

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**AWARE I** **Aware of Kiosk or not**

| Value Label | Value | Freauency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| **Yes** | 1 | 264 | 81.2 | 81.2 | 81.2 |
| No | 2 | 61 | 188 | 188 | 100.0 |
| | Total | 325 | 100.0 | 100.0 | |

Valid Cases 325 Missing Cases 0

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**CARPL 7-I Requested Carpool service?**

| Value Label | Value | Freauencv | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| Yes | 1 | 56 | 17.2 | 25.8 | 25.8 |
| No | 2 | 161 | 49.5 | 74.2 | 100.0 |
| | | 104 | 32.0 | Missing | |
| No Answer | 0 | 4 | 1.2 | Missinq | |
| | Total | 325 | 100.0 | 100.0 | |

Valid Cases 217 Missing Cases 108

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**CARPL 7-2 Tried just to see how car pool works?**

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| Yes | 1 | 50 | 15.4 | 90.9 | 90.0 |
| No | 2 | 5 | 1.5 | 9.1 | 100.0 |
| | | 269 | 82.8 | Missing | |
| No Answer | 0 | 1 | .3 | Missing | |
| | Total | 325 | 100.0 | 100.0 | |

Valid Cases 55 Missing Cases 270

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**CARPL 7-3 Use it to look for car pool partners?**

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| Yes | 1 | 37 | 11.4 | 67.3 | 67.3 |
| No | 2 | 18 | 5.5 | 32.7 | 100.0 |
| | | 269 | 82.8 | Missing | |
| | 0 | 1 | .3 | Missinq | |
| | Total | 325 | 100.0 | 100.0 | |

Valid Cases 55 Missing Cases 270

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**EMPL 14-2 Average working hours per week?**

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| Hours | 5 | 1 | .3 | .4 | .4 |
| Hours | 8 | 1 | .3 | .4 | .8 |
| | 15 | 3 | .9 | 1.1 | 1.9 |
| | 20 | 4 | 1.2 | 1.5 | 3.4 |
| | 22 | 1 | .3 | .4 | 3.8 |
| | 25 | 2 | .6 | .8 | 4.5 |
| | 30 | 10 | 3.1 | 3.8 | 8.3 |
| | 31 | 2 | .6 | .8 | 9.1 |
| | 32 | 5 | 1.5 | 1.9 | 11.0 |
| | 35 | 8 | 2.5 | 3.0 | 14.0 |
| | 36 | 3 | .9 | 1.1 | 15.2 |
| | 37 | 1 | .3 | .4 | 15.5 |
| | 38 | 1 | .3 | .4 | 15.9 |
| | 39 | 2 | .6 | .8 | 16.7 |
| | 40 | 118 | 36.3 | 44.7 | 61.4 |
| | 44 | 2 | .6 | .8 | 62.1 |
| | 45 | 16 | 4.9 | 6.1 | 68.2 |
| | 48 | 14 | 4.3 | 5.3 | 73.5 |
| | 49 | 1 | .3 | .4 | 73.9 |
| | 50 | 28 | 8.6 | 10.6 | 84.5 |
| | 52 | 1 | .3 | .4 | 84.8 |
| | 55 | 3 | .9 | 1.1 | 86.0 |
| | 58 | 1 | .3 | .4 | 86.4 |
| | 60 | 10 | 3.1 | 3.8 | 90.2 |
| | 65 | 1 | .3 | .4 | 90.5 |
| | 80 | 1 | .3 | .4 | 91.7 |
| | 88 | 1 | .3 | .4 | 92.0 |
| | 99 | 21 | 6.5 | 8.0 | 100.0 |
| | | 61 | 18.8 | **Missing** | |
| | Total | 325 | 100.0 | **100.0** | |

Valid Cases 264 Missing Cases 61

**CARPL 7- 4 Car pool service easy to use?**

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| Yes | 1 | 50 | 15.4 | 92.6 | 92.6 |
| No | 2 | 4 | 1.2 | 7.4 | 100.0 |
| | | 269 | 82.8 | Missing | |
| | 0 | 2 | .6 | Missing | |
| | Total | 325 | 100.0 | 100.0 | |

Valid Cases 54 Missing Cases 271

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**EASYUSE- 3 Kiosk easy or difficult to use?**

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| No Answer | 0 | 4 | 1.2 | 1.8 | 1.8 |
| Easy | 1 | 172 | 52.9 | 77.8 | 79.6 |
| Neither | 2 | 34 | 10.5 | 15.4 | 95.0 |
| Difficult | 3 | 11 | 3.4 | 5.0 | 100.0 |
| | | 104 | 32.0 | Missing | |
| | Total | 325 | 100.0 | 100.0 | |

Valid Cases 221 Missing Cases 104

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**EMPL 14-4 Are you employed?**

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| Yes | 1 | 264 | 81.2 | 81.5 | 81.5 |
| No | 2 | 60 | 18.5 | 18.5 | 100.0 |
| No Answer | 0 | 1 | .3 | Missing | |
| | Total | 325 | 100.0 | 100.0 | |

Valid Cases 324 Missing Cases 1

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**EVERUSE 2** **Ever used Kiosk or not?**

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| Yes | 1 | 221 | 68.0 | 83.7 | 83.7 |
| No | 2 | 43 | 13.2 | 16.3 | 100.0 |
| | | 61 | 18.8 | Missing | |
| | Total | 325 | 100.0 | 100.0 | |

Valid Cases 264 Missing Cases 61

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**EVER USE 2** **Ever used Kiosk or not?**

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| Yes | 1 | 221 | 68.0 | 83.7 | 83.7 |
| No | 2 | 43 | 13.2 | 16.3 | 100.0 |
| | | 61 | 18.8 | Missing | |
| | Total | 325 | 100.0 | 100.0 | |

Valid Cases 264 Missing Cases 61

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**GENDER 28** **Gender of participants**

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| Male | 1 | 183 | 56.3 | 56.8 | 56.8 |
| Female | 2 | 139 | 42.8 | 43.2 | 100.0 |
| No Answer | 0 | 3 | .9 | Missinq | |
| | Total | 325 | 100.0 | 100.0 | |

Valid Cases 322 Missing Cases 3

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**INCOME 27 Household income level**

| Value Label | Value | Freauencv | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| $20,000 - 34,999 | 2 | 100 | 30.8 | 32.4 | 32.4 |
| $50,000 - 64,999 | 4 | 123 | 37.8 | 39.8 | 72.2 |
| >=$100,000 | 7 | 86 | 26.5 | 27.8 | 100.0 |
| No Answer | 0 | 16 | 4.9 | Missing | |
| | Total | 325 | 100.0 | 100.0 | |

Valid Cases 309 Missing Cases 16

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**MAP 4-I Requested freeway conditions map?**

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| **Yes** | 1 | 180 | 55.4 | 82.6 | 82.6 |
| **No** | 2 | 38 | 11.7 | 17.4 | 100.0 |
| | | 104 | 32.0 | Missing | |
| No Answer | 0 | 3 | .9 | Missing | |
| | Total | 325 | 100.0 | 100.0 | |

Valid Cases 218 Missing Cases 107

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**MAP 4-2 View map just to see how Kiosk works?**

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| **Yes** | 1 | 163 | 50.2 | 94.2 | 94.2 |
| **No** | 2 | 10 | 3.1 | 5.8 | 100.0 |
| | | 145 | 44.6 | Missing | |
| No Answer | 0 | 7 | 22 | Missinq | |
| | Total | 325 | 100.0 | 100.0 | |

Valid Cases 173 Missing Cases 152

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**MAP 4-3 Use map to check freeway conditions?**

| Value Label | Value | Freauencv | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| **Yes** | 1 | 120 | 36.9 | 71 .o | 71.0 |
| No | 2 | 49 | 15.1 | 29.0 | 100.0 |
| | | 145 | 44.6 | Missing | |
| No Answer | 0 | 11 | 3.4 | Missing | |
| | Total | 325 | 100.0 | 100.0 | |

Valid Cases 169 Missing Cases 156

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**MAP 4-4 Map easy to use?**

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| **Yes** | 1 | 153 | 47.1 | 91.6 | 91.6 |
| No | 2 | 14 | 4.3 | 8.4 | 100.0 |
| | | 145 | 44.6 | Missing | |
| No Answer | 0 | 13 | 4.0 | Missing | |
| | Total | 325 | 100.0 | 100.0 | |

Valid Cases 167 Missing Cases 158

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**MINUTE I8 Time consume from home to work (minutes)**

| Value Label | Value | Freauencv | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 0 | 1 | .3 | .4 | .4 |
| | 1 | 1 | .3 | .4 | .8 |
| | 3 | 1 | .3 | .4 | 1.1 |
| | 4 | 1 | .3 | .4 | 1.5 |
| | 5 | 6 | 1.8 | 2.3 | 3.8 |
| | 6 | 1 | .3 | .4 | 4.2 |
| | 7 | 2 | .6 | .8 | 4.9 |
| | 8 | 2 | .6 | .8 | 5.7 |
| | 10 | 13 | 4.0 | 4.9 | 10.6 |
| | 12 | 3 | .9 | 1.1 | 11.7 |
| | 13 | 1 | .3 | .4 | 12.1 |
| | 14 | 1 | .3 | .4 | 12.5 |
| | 15 | 26 | 8.0 | 9.8 | 22.3 |
| | 20 | 29 | 8.9 | 11.0 | 33.3 |
| | 22 | 3 | .9 | 1.1 | 34.5 |
| | 25 | 20 | 6.2 | 7.6 | 42.0 |
| | 30 | 30 | 9.2 | 11.4 | 53.4 |
| | 32 | 1 | .3 | .4 | 53.8 |
| | 35 | 12 | 3.7 | 4.5 | 58.3 |
| | 40 | 18 | 5.5 | 6.8 | 65.2 |
| | 45 | 19 | 5.8 | 7.2 | 72.3 |
| | 49 | 1 | .3 | .4 | 72.7 |
| | 50 | 4 | 1.2 | 1.5 | 74.2 |
| | 52 | 1 | .3 | .4 | 74.6 |
| | 55 | 2 | .6 | .8 | 75.4 |
| | 60 | 32 | 9.8 | 12.1 | 87.5 |
| | 65 | 1 | .3 | .4 | 87.9 |
| | 68 | 1 | .3 | .4 | 88.3 |
| | 70 | 3 | .9 | 1.1 | 89.4 |
| | 72 | 1 | .3 | .4 | 89.8 |
| | 75 | 5 | 1.5 | 1.9 | 91.7 |
| | 80 | 1 | .3 | .4 | 92.0 |
| | 90 | 10 | 3.1 | 3.8 | 95.8 |
| | 120 | 2 | .6 | .8 | 96.6 |
| | . 165 | 1 | .3 | .4 | 97.0 |
| No Answer | 999 | 8 | 2.5 | 3.0 | 100.0 |
| | | 61 | 188 | Missing | |
| | Total | 325 | loo.0 | 100.0 | |

Valid Cases 264 Missing Cases 61

**MTA 5-I Requested MTA Bus & Train routes?**

| Value Label | Value | Freauencv | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| **Yes** | 1 | 123 | 37.8 | 55.9 | 55.9 |
| No | 2 | 97 | 29.8 | 44.1 | 100.0 |
| | | 104 | 32.0 | Missing | |
| No Answer | 0 | 1 | .3 | Missing | |
| | Total | 325 | 100.0 | 100.0 | |

Valid Cases 220 Missing Cases 105

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**MTA 5-2 Use B&T just to see how Kiosk works?**

| Value Label | Value | Freauencv | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| **Yes** | 1 | 103 | 31.7 | 89.6 | 89.6 |
| No | 2 | 12 | 3.7 | 10.4 | 100.0 |
| | | 202 | 62.2 | Missing | |
| No Answer | 0 | 8 | 2.5 | Missing | |
| | Total | 325 | 100.0 | 100.0 | |

Valid Cases 115 Missing Cases 210

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**MTA 5-3 Use info to check route, fares, etc.?**

| Value Label | Value | Freauencv | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| **Yes** | 1 | **92** | 28.3 | 82.9 | 82.9 |
| No | 2 | 19 | 5.8 | 17.1 | 100.0 |
| | | 202 | 62.2 | Missing | |
| No Answer | 0 | 12 | 3.7 | Missinq | |
| | Total | 325 | 100.0 | 100.0 | |

Valid Cases 111 Missing Cases 214

**MINUTE I9 Time needed from home to work on bad day**

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 1 | 1 | .3 | .4 | .4 |
| | 3 | 1 | .3 | .4 | .8 |
| | 5 | 2 | .6 | .8 | 1.5 |
| | 6 | 2 | .6 | .8 | 2.3 |
| | 8 | 1 | .3 | .4 | 2.7 |
| | 9 | 1 | .3 | .4 | 3.0 |
| | 10 | 2 | .6 | .8 | 3.8 |
| | 12 | 3 | .9 | 1.1 | 4.9 |
| | 15 | 11 | 3.4 | 4.2 | 9.1 |
| | 17 | 1 | .3 | .4 | 9.5 |
| | 20 | 21 | 6.5 | 8.0 | 17.4 |
| | 22 | 2 | .6 | .8 | 18.2 |
| | 25 | 13 | 4.0 | 4.9 | 23.1 |
| | 27 | 2 | .69 | .80 | 23.9 |
| | 30 | 18 | 5.5 | 6.1 | 34.5 |
| | 25 | 20 | 6.2 | 6.8 | 30.7 |
| | 35 | 15 | 4.6 | 5.7 | 36.4 |
| | 37 | 1 | .3 | .4 | 36.7 |
| | 40 | 19 | 5.8 | 7.2 | 43.9 |
| | 45 | 25 | 7.7 | 9.5 | 53.4 |
| | 50 | 7 | 2.2 | 2.7 | 56.1 |
| | 55 | 2 | .6 | .8 | 56.8 |
| | 60 | 36 | 11.1 | 13.6 | 70.5 |
| | 65 | 2 | .6 | .8 | 71.2 |
| | 70 | 2 | .6 | .8 | 72.0 |
| | 75 | 10 | 3.1 | 3.8 | 75.8 |
| | 80 | 7 | 2.2 | 2.7 | 78.4 |
| | 90 | 23 | 7.1 | 8.7 | 87.1 |
| | 100 | 2 | .6 | .8 | 87.9 |
| | 105 | 1 | .3 | .4 | 88.3 |
| | 120 | 15 | 4.6 | 5.7 | 93.9 |
| | 130 | 3 | .9 | 1.1 | 95.1 |
| | 175 | 1 | .3 | .4 | 95.5 |
| | 180 | 1 | .3 | .4 | 95.8 |
| | 210 | 1 | .3 | .4 | 96.2 |
| **No Answer** | **999** | 10 | 3.1 | 3.8 | 100.0 |
| | | 61 | 188 | Missing | |
| | Total | 325 | loo.0 | 100.0 | |

Valid Cases 264 Missing **Cases** **61**

**MTA 5-4 Want to use Kiosk for B&T info again?**

| Value Label | Value | Freauencv | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| **Yes** | 1 | 101 | 31.1 | 84.2 | 84.2 |
| No | 2 | 19 | 5.8 | 15.8 | 100.0 |
| | | 202 | 62.2 | Missing | |
| No Answer | 0 | 3 | .9 | Missing | |
| | Total | 325 | 100.0 | 100.0 | |

Valid Cases 120 Missing Cases 205

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**MTA 5-5 MTA B&T Routes easy to use?**

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| **Yes** | 1 | **94** | **28.9** | 81.7 | 81.7 |
| No | 2 | 21 | 6.5 | 18.3 | 100.0 |
| | | 202 | 62.2 | Missing | |
| No Answer | 0 | 8 | 2.5 | Missing | |
| | Total | 325 | 100.0 | 100.0 | |

Valid Cases 115 Missing Cases 210

**NU VEH 23 Number of motor vehicles**

| Value Label | Value | Freauencv | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| Yes | 0 | 18 | 5.5 | 5.5 | 5.5 |
| | 1 | 94 | 28.9 | 28.9 | 34.5 |
| | 2 | 141 | 43.4 | 43.4 | 77.8 |
| | 3 | 32 | 9.8 | 9.8 | 87.7 |
| | 4 | 16 | 4.9 | 4.9 | 92.6 |
| | 5 | 4 | 1.2 | 1.2 | 93.8 |
| | 20 | 1 | .3 | .3 | 94.2 |
| No Answer | 99 | 19 | 5.8 | 5.8 | 100.0 |
| | Total | 325 | 100.0 | 100.0 | |

Valid Cases 325 Missing Cases 0

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**QUAK 21-l Changed normal route to or from work?**

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| No Answer | 0 | 4 | 1.2 | 1.5 | 1.5 |
| Yes | 1 | 67 | 20.6 | 25.4 | 26.9 |
| No | 2 | 193 | 59.4 | 73.1 | 100.0 |
| | | 61 | 18.8 | Missing | |
| | Total | 325 | 100.0 | 100.0 | |

Valid Cases 264 Missing Cases 61

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**QUAK 21-2 Changed starting trip time to or from work?**

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| No Answer | 0 | 4 | 1.2 | 1.5 | 1.5 |
| Yes | 1 | 78 | 24.0 | 29.5 | 31.1 |
| No | 2 | 182 | 56.0 | 68.9 | 100.0 |
| | | 61 | 188 | Missing | |
| | Total | 325 | 100.0 | 100.0 | |

Valid Cases 264 Missing Cases 61

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**QUAK 21-3 Worked more at home or a closer site?**

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| No Answer | 0 | 5 | 1.5 | 1.9 | 1.9 |
| Yes | 1 | 27 | 8.3 | 10.2 | 12.1 |
| No | 2 | 232 | 71.4 | 87.9 | 100.0 |
| | | 61 | 188 | Missing | |
| | Total | 325 | 100.0 | 100.0 | |

Valid Cases 264 Missing Cases 61

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**QUAK 21-4 Changed normal means of travel to work?**

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| No Answer | 0 | 5 | 1.5 | 1.9 | 1.9 |
| Yes | 1 | 25 | 7.7 | 9.5 | 11.4 |
| No | 2 | 234 | 72.0 | 88.6 | 100.0 |
| | | 61 | 18.8 | Missing | |
| | Total | 325 | 100.0 | 100.0 | |

Valid Cases 264 Missing Cases 61

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**S-TIME 20 Leave for work at same time each day?**

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| No Answer | 0 | 1 | .3 | .4 | .4 |
| Yes | 1 | 203 | 62.5 | 76.9 | 77.3 |
| No | 2 | 60 | 18.5 | 22.7 | 100.0 |
| | | 61 | 188 | Missing | |
| | Total | 325 | 100.0 | 100.0 | |

Valid Cases 264 Missing Cases 61

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| No Answer | 0 | 4 | 1.2 | 1.5 | 1.5 |
| | 1 | 4 | 1.2 | 1.5 | 3.0 |
| | 2 | 5 | 1.5 | 1.9 | 4.9 |
| | 3 | 5 | 1.5 | 1.9 | 6.8 |
| | 4 | 6 | 1.8 | 2.3 | 9.1 |
| | 5 | 14 | 4.3 | 5.3 | 14.4 |
| | 6 | 14 | 4.3 | 5.3 | 19.7 |
| | 7 | 4 | 1.2 | 1.5 | 21.2 |
| | 8 | 9 | 2.8 | 3.4 | 24.6 |
| | 9 | 2 | .6 | .8 | 25.4 |
| | 10 | 22 | 6.8 | 8.3 | 33.7 |
| | 12 | 11 | 3.4 | 4.2 | 37.9 |
| | 13 | 3 | .9 | 1.1 | 39.0 |
| | 14 | 1 | .3 | .4 | 39.4 |
| | 15 | 26 | 8.0 | 9.8 | 49.2 |
| | 16 | 2 | .6 | .8 | 50.0 |
| | 17 | 4 | 1.2 | 1.5 | 51.5 |
| | 18 | 6 | 1.8 | 2.3 | 53.8 |
| | 20 | 23 | 7.1 | 8.7 | 62.5 |
| | 21 | 4 | 1.2 | 1.5 | 64.0 |
| | 22 | 1 | .3 | .4 | 64.4 |
| | 23 | 4 | 1.2 | 1.5 | 65.9 |
| | 24 | 2 | .6 | .8 | 66.7 |
| | 25 | 16 | 4.9 | 6.1 | 72.7 |
| | 27 | 2 | .6 | .8 | 73.5 |
| | 30 | 19 | 5.8 | 7.2 | 80.7 |
| | 31 | 1 | .3 | .4 | 81.1 |
| | 35 | 6 | 1.8 | 2.3 | 83.3 |
| | 36 | 2 | .6 | .8 | 84.1 |
| | 38 | 1 | .3 | .4 | 84.5 |
| | 40 | 14 | 4.3 | 5.3 | 89.8 |
| | 42 | 1 | .3 | .4 | 90.2 |
| | 43 | 1 | .3 | .4 | 90.5 |
| | 45 | 2 | .6 | .8 | 91.3 |
| | 47 | 1 | .3 | .4 | 91.7 |
| | 48 | 1 | .3 | .4 | 92.0 |
| | 50 | 4 | 1.2 | 1.5 | 93.6 |
| | 60 | 3 | .9 | 1.1 | 95.1 |
| | 65 | 1 | .3 | .4 | 95.1 |
| | 70 | 2 | .6 | .8 | 95.8 |
| | 100 | 1 | .3 | .4 | 96.2 |
| | 120 | 1 | .3 | .4 | 96.6 |
| No Answer | 999 | 9 | 2.8 | 3.4 | 100.0 |
| | | 61 | 18.8 | Missing | |
| | Total | 325 | 100.0 | 100.0 | |

Valid Cases 264 Missing Cases 61

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**TRWORK-16 Means by which travel to work**

| Value Label | Value | Freauencv | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| Drive Alone | 1 | 173 | 53.2 | 70.3 | 70.3 |
| Car pool | 2 | 31 | 9.5 | 12.6 | 82.9 |
| Bus or Train | 3 | 34 | 10.5 | 13.8 | 96.7 |
| Van pool | 4 | 2 | .6 | .8 | 97.6 |
| Walk or Bike | 5 | 4 | 1.2 | 1.6 | 99.2 |
| Other | 6 | 2 | .6 | .8 | 100.0 |
| | | 61 | 18.8 | Missing | |
| No Answer | 0 | 18 | 5.5 | Missing | |
| | Total | 325 | 100.0 | 100.0 | |

Valid Cases 246 Missing Cases 79

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**OTHERS-9 Encourage other people to use Kiosk?**

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| No Answer | 0 | 7 | 2.2 | 3.2 | 3.2 |
| Yes | 1 | 188 | 57.8 | 85.1 | 88.2 |
| No | 2 | 26 | 8.05 | 11.8 | 100.0 |
| | | 104 | 32.0 | Missing | |
| | Total | 325 | 100.0 | 100.0 | |

Valid Cases 221 Missing Cases 104

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**USEAGA-18 Want to use Kiosk again?**

| Value Label | Value | Freauencv | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| No Answer | 0 | 2 | .6 | .9 | .9 |
| Yes | 1 | 186 | 57.2 | 84.2 | 85.1 |
| No | 2 | 33 | 10.2 | 14.9 | 100.0 |
| | | 104 | 32.0 | Missing | |
| | Total | 325 | 100.0 | 100.0 | |

Valid Cases 221 Missing Cases 104

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**VEHICLE-1 5 Have a vehicle to drive to work?**

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| No Answer | 0 | 2 | .6 | .8 | .8 |
| Yes | 1 | 216 | 66.5 | 81.8 | 82.6 |
| Sometimes | 2 | 26 | 8.0 | 9.8 | 92.4 |
| No | 3 | 20 | 6.2 | 7.6 | 100.0 |
| | | 61 | 18.8 | Missing | |
| | Total | 325 | 100.0 | 100.0 | |

Valid Cases 264 Missing Cases 61

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**VIDEO 6-I Requested Ride share or B&T videos?**

| Value Label | Value | Freauencv | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| **Yes** | 1 | 60 | 18.5 | 27.6 | 27.6 |
| No | 2 | 157 | 48.3 | 72.4 | 100.0 |
| | | 104 | 32.0 | Missing | |
| No Answer | 0 | 4 | 12 | Missinq | |
| | Total | 325 | 100.0 | 100.0 | |

Valid Cases 217 Missing Cases 108

**VIDEO 6-2 Video interesting?**

| Value Label | Value | Freauencv | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| **Yes** | 1 | 50 | 15.4 | 84.7 | 84.7 |
| No | 2 | 9 | 2.8 | 15.3 | 100.0 |
| | | 265 | 81.5 | Missing | |
| No Answer | 0 | 1 | .3 | Missinq | |
| | Total | 325 | 100.0 | 100.0 | |

Valid Cases 59 Missing Cases 266

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**VIDEO 6-3 Video useful?**

| Value Label | Value | Freauency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| **Yes** | 1 | 53 | 16.3 | 89.8 | 89.8 |
| Yes | 2 | 6 | 1.8 | 10.2 | 100.0 |
| No | | 265 | 81.5 | Missing | |
| No Answer | 0 | 1 | .3 | Missinq | |
| | Total | 325 | 100.0 | 100.0 | |

Valid Cases 59 Missing Cases 266

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**VIDEO 6-4 Video entertaining?**

| Value Label | Value | Freauency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| **Yes** | 1 | **49** | 15.1 | 84.5 | 84.5 |
| **No** | 2 | 9 | 2.8 | 15.5 | 100.0 |
| | | 265 | 81.5 | Missing | |
| No Answer | 0 | 2 | .6 | Missinq | |
| | Total | 325 | 100.0 | 100.0 | |

Valid Cases 58 Missing Cases 267

# APPENDIX E

# AUTOMATED RIDEMATCHING SURVEY 1

Elrick and Lavidge, inc.
111 Maiden Lane
San Francisco, CA 94108
(415) 434-0536

**FLEXPOOL**
SURVEY OUTLINE

Project #65-2692
July 1, 1994

FINAL

Hello, I'm ______ working for the University of Southern California. May I speak to (NAMED PERSON)?. Today, we are conducting a survey about travel information services that could be useful to you as a commuter. The survey takes only a few minutes and we can assure you that any of your answers will be kept in the strictest confidence.

1.1 Are you employed ?

| | |
|---|---|
| Yes | -1 CONTINUE |
| No | -2 SKIP TO **Q8.0** |
| Don't Know/Refused | -3 SKIP TO **Q8.0** |

1.2 On average, how many hours per week do you work?

_________ Hours Don't Know/Refused -99

1.2.1 How long have you been working in your current job?

| | |
|---|---|
| Less than 6 months | -1 |
| 6 months to 1 year | -2 |
| 1 to 2 years | -3 |
| More than 2 years | -4 |
| Don't Know/Refused | -5 |

1.3 Are you registered with any of the following car-pool or ridematching services? (READ LIST. MULTIPLE RESPONSES OK.)

| | |
|---|---|
| Commuter Transportation Services (CTS) | -1 |
| Your employer's ridematching service | -2 |
| Not Registered | -3 |
| Don't Know/Refused | -4 |

1.4 Do you have a vehicle available to use for your daily trip to work?

| | |
|---|---|
| Yes | -1 |
| Sometimes | -2 |
| No | -3 |
| Don't Know/Refused | -4 |

1.5 How many miles do you travel to work one way?

_________ Miles Don't Know/Refused -99

1.6 How many minutes does it usually take you to travel to work?

_________ Minutes Don't Know/Refused -99

1.7 How many minutes does it take you to travel to work on a bad day?

_________ Minutes Don't Know/Refused -99

1.8 Do you usually leave for work at the same time each day?

| | |
|---|---|
| Yes | -1 |
| No | -2 |
| Don't Know/Refused | -3 |

1.9 By what means do you usually travel to and from work?

| | | |
|---|---|---|
| Drive Alone | -1 | CONTINUE (DRIVE ALONE) |
| Carpool (Including Family Members) | -2 | SKIP TO 43.0 (CARPOOL) |
| Vanpool | -3 | SKIP TO 44.0 (OTHER) |
| Take the Bus | -4 | SKIP TO 44.0 (OTHER) |
| Take the Train | -5 | SKIP TO 44.0 (OTHER) |
| Walking or Biking | -6 | SKIP TO 44.0 (OTHER) |
| Other (Specify) ______________ | -7 | SKIP TO 44.0 (OTHER) |

## DRIVE ALONE SECTION

2.1 Besides driving to work by yourself, do you use any other means of commuting on a regular basis, IF NECESSARY ADD: such as carpooling or taking the bus once or twice a week?

| | | |
|---|---|---|
| Yes | -1 | CONTINUE |
| No | -2 | SKIP TO **Q2.3** |

2.2 What other means of commuting do you use on a regular basis? MULTIPLE RESPONSES OK.

| | | |
|---|---|---|
| Carpooling | -1 | SKIP TO **Q5.0** (DA/CP) |
| Vanpooling | -2 | SKIP TO 46.0 (DA/OTHER) |
| Bus | -3 | SKIP TO 46.0 (DA/OTHER) |
| Train | -4 | SKIP TO 46.0 (DA/OTHER) |
| Other (Specify) ______________ | -5 | SKIP TO 46.0 (DA/OTHER) |

2.3 If your car is not available, such as when it is being repaired, how do you travel to work?

| | |
|---|---|
| Use another household vehicle | -1 |
| Ride with spouse or other family member | -2 |
| Rent a car | -3 |
| Arrange carpool with co-workers | -4 |
| Use bus/train | -5 |
| Take time off work | -6 |
| Other (Specify) ______________ | -7 |
| Don't Know/Refused | -8 |

**2.4a** Thinking back over the time you have worked at your current job, have you tried (INSERT ITEM FROM LIST) to and from work?

| | Yes | **No** |
|---|---|---|
| Carpooling | -1 | -2 |
| Vanpooling | -1 | -2 |
| Bus | -1 | -2 |
| Train | -1 | -2 |
| Walking or Biking | -1 | -2 |

2.4b (FOR EACH "YES" IN **Q2.4a)** Would you try (INSERT RESPONSE TO **Q2.4a)** again?

| | **Yes** | No | Don't Know |
|---|---|---|---|
| Carpooling | -1 | -2 | -3 |
| Vanpooling | -1 | -2 | -3 |
| Bus | -1 | -2 | -3 |
| Train | -1 | -2 | -3 |
| Walking or Biking | -1 | -2 | -3 |

SKIP TO 47.0 (EARTHQUAKE SECTION)

## CARPOOL SECTION

3.0 How long have you been in your current carpool?

_________ Months/Years

3.1 Other than yourself, how many people are in your current carpool?

_________ # of People

3.2 And of those (INSERT # FROM **Q3.1)** people, how many are (INSERT ITEM FROM LIST)? (MULTIPLE RESPONSES OK.)

Members of your Household _________
Non-household Relatives _________
Co-workers _________
Friends or neighbors _________
Someone from a match list _________
Other (Specify) _________

3.3 When your carpool is not available, what do you do?

| | |
|---|---|
| Drive Alone | -1 |
| Take Bus/Train | -2 |
| Arrange Alternative Carpool | -3 |
| Take time off from work | -4 |
| Other (Specify) _____________ | -5 |
| Don't Know/Refused | -6 |

3.4a Thinking back over the time you have worked at your current job, have you tried (INSERT ITEM FROM LIST) to and from work?

| | **Yes** | **No** |
|---|---|---|
| Driving Alone | -1 | -2 |
| Vanpooling | -1 | -2 |
| Bus | -1 | -2 |
| Train | -1 | -2 |
| Walking or Biking | -1 | -2 |

3.4b (FOR EACH "YES)" IN **Q3.4a)** Would you try (INSERT RESPONSE TO **Q3.4a)** again?

| | **Yes** | No | Don't Know |
|---|---|---|---|
| Driving Alone | -1 | -2 | -3 |
| Vanpooling | -1 | -2 | -3 |
| Bus | -1 | -2 | -3 |
| Train | -1 | -2 | -3 |
| Walking or Biking | -1 | -2 | -3 |

SKIP TO 47.0 (EARTHQUAKE SECTION)

## OTHER SECTION

4.0 How long have you been (INSERT FROM Q1.9) to and from work?

_________ Months/Years

4.1a Thinking back over the time you have worked at your current job, have you tried (INSERT ITEM FROM LIST; SKIP ITEMS MENTIONED IN Q1.9) to and from work?

| | **Yes** | **No** |
|---|---|---|
| Driving Alone | -1 | -2 |
| Carpooling | -1 | -2 |
| Vanpooling | -1 | -2 |
| Bus | -1 | -2 |
| Train | -1 | -2 |
| Walking or Biking | -1 | -2 |

4.1b (FOR EACH "YES" IN **Q.4.1a)** Would you try (INSERT RESPONSE TO **Q4.1a)** again?

| | **Yes** | No | Don't Know |
|---|---|---|---|
| Driving Alone | -1 | -2 | -3 |
| Carpooling | -1 | -2 | -3 |
| Vanpooling | -1 | -2 | -3 |
| Bus | -1 | -2 | -3 |
| Train | -1 | -2 | -3 |
| Walking or Biking | -1 | -2 | -3 |

SKIP TO 47.0 (EARTHQUAKE SECTION)

## DRIVE **ALONE/CARPOOL** SECTION

5.0 On average, how many days per week do you **carpool** to and from work?

_________ Days/Week

5.1 How long have you been carpooling (INSERT # OF DAYS FROM **Q5.0)** days per week?

_________ Months/Years

5.2a Are the people in your carpool (READ LIST)? MULTIPLE RESPONSES OK.

| | |
|---|---|
| Members of your Household | -1 |
| Non-household Relatives | -2 |
| Co-workers | -3 |
| Friends or neighbors | -4 |
| Someone from a match list | -5 |
| Other (Specify) __________ | -6 |

5.2b How many (EACH ITEM MENTIONED IN **Q5.2a)** are in your carpool?

| | |
|---|---|
| Members of your Household | _________ |
| Non-household Relatives | _________ |
| Co-workers | _________ |
| Friends or neighbors | _________ |
| Someone from a match list | _________ |

5.3a Thinking back over the time you have worked at your current job, have you tried (INSERT ITEM FROM LIST) to and from work?

| | Yes | No |
|---|---|---|
| Vanpooling | -1 | -2 |
| Bus | -1 | -2 |
| Train | -1 | -2 |
| Walking or Biking | -1 | -2 |

5.3b (FOR EACH "YES IN **Q5.3a)** Would you try (INSERT RESPONSE TO **Q6.3a)** again?

| | Yes | No | Don't Know |
|---|---|---|---|
| Vanpooling | -1 | -2 | -3 |
| Bus | -1 | -2 | -3 |
| Train | -1 | -2 | -3 |
| Walking or Biking | -1 | -2 | -3 |

SKIP TO 47.0 (EARTHQUAKE SECTION)

## DRIVE ALONE/OTHER SECTION

6.0 On average, how many days per week do you (INSERT FROM Q2.2) to and from work?

_________ Days/Week

6.1 (ASK FOR EACH ITEM MENTIONED AT 2.2) How long have you been (INSERT FROM Q2.2) to and from work (INSERT # OF DAYS FROM **Q6.0)** days per week?

_________ Months/Years

6.2a Thinking back over the time you have worked at your current job, have you tried (INSERT ITEM FROM LIST; SKIP ITEM MENTIONED IN Q2.2) to and from work?

| | Yes | No |
|---|---|---|
| Carpooling | -1 | -2 |
| Vanpooling | -1 | -2 |
| Bus | -1 | -2 |
| Train | -1 | -2 |
| Walking or Biking | -1 | -2 |

6.2b (FOR EACH "YES" IN **Q.6.2a)** Would you try (INSERT RESPONSE TO **Q6.2a)** again?

| | Yes | No | Don't Know |
|---|---|---|---|
| Carpooling | -1 | -2 | -3 |
| Vanpooling | -1 | .-2 | -3 |
| Bus | -1 | -2 | -3 |
| Train | -1 | -2 | -3 |
| Walking or Biking | -1 | -2 | -3 |

## EARTHQUAKE SECTION

Now I would like to ask you about how the Northridge earthquake affected your travel to and from work. Thinking back to the first month following the earthquake...

7.0 Did you change your normal route to or from work?

| | |
|---|---|
| Yes | **-1** |
| No | **-2** |
| Don't Know/Refused | -3 |
| Wasn't Living in Area Then | -4 |

7.1 Did you change the time you started your trip to or from work?

| | |
|---|---|
| Yes | -1 |
| No | -2 |
| Don't Know/Refused | -3 |

7.2 Did you work at home, or at a location closer to home?

| | |
|---|---|
| Yes | -1 |
| No | -2 |
| Don't Know/Refused | -3 |

7.3 Did you change your normal means of travel to or from work?

| | |
|---|---|
| Yes | -1 CONTINUE |
| No | -2 SKIP TO 47.5 |

7.4 Which of the following did you do? (READ LIST. MULTIPLE RESPONSES OK.)

| | |
|---|---|
| Drove Alone | -1 |
| Carp001 | -2 |
| Vanpool | -3 |
| Bus | -4 |
| Train | -5 |
| Motorcycle | -6 |
| Walked/Biked | -7 |
| Other (Specify) ______________ | -8 |

7.5 During the first month following the earthquake, did you use any of the following to get information about travel conditions or alternatives? (READ LIST. MULTIPLE RESPONSES OK.)

| | |
|---|---|
| T.V. | -1 |
| Radio | -2 |
| Newspapers | -3 |
| Call Police/CHP | -4 |
| Rideshare Agency | -5 |
| Call 1-800-COMMUTE the Commuter Action Network | -6 |
| Consult Maps | -7 |
| Ask Friends or Family | -8 |
| Any Others ____________________ | -9 |

## SMART TRAVELER QUESTIONS

8.0 Have you heard of "Smart Traveler"?

| | |
|---|---|
| Yes | -1 |
| No/Don't Know/Refused | -2 |

8.1 Have you heard of the traveler information service 1-800-COMMUTE?

| | |
|---|---|
| Yes | -1 CONTINUE |
| No/Don't Know/Refused | -2 SKIP TO **Q8.4** |

8.2 Have you ever called that number? (IF NECESSARY ADD: **1-800-COMMUTE.)**

| | |
|---|---|
| Yes | -1 CONTINUE |
| No | -2 SKIP TO **Q8.4** |
| Don't Know/Refused | -3 SKIP TO **Q8.4** |

8.3 Which service did you request? (READ LIST. MULTIPLE RESPONSES OK.)

| | |
|---|---|
| MTA: Bus or Rail Lines | **-1** |
| Metro Link | **-2** |
| Carpools, Vanpools, Park and Ride Lots in your Area | -3 |
| Caltrans Freeway and State Highway Information | -4 |
| Telecommuting Centers | -5 |
| Don't Know/Refused | -6 |

8.4 Now I would like to know whether you agree or disagree with the following statements:?

| | AGREE | DISAGREE | REFUSED |
|---|---|---|---|
| I have my own car and have no need for transit or carpooling information. | -1 | -2 | -3 |
| I can always listen to the radio for traffic information. | -1 | -2 | -3 |
| I do not like using machines to get information. | -1 | -2 | -3 |
| I do not give rides to'people I don't know. | -1 | -2 | -3 |
| I do not take rides from people I don't know. | -1 | -2 | -3 |
| Transit does not take me where I want to go. | -1 | -2 | -3 |

## CLASSIFICATION SECTION

A. How old are you?

| | |
|---|---|
| Less than 20 | -1 |
| 20 - 29 | -2 |
| 30 - 39 | -3 |
| 40 - 49 | -4 |
| 50 - 59 | -5 |
| 60 or Older | -6 |
| Don't Know/Refused | -7 |

B. In total, how many motor vehicles, including automobiles, trucks, vans and highway motorcycles are owned or leased by members of your household?

_________ # Household Vehicles

C. Not counting yourself, how many people are there in your household by age group?

| | |
|---|---|
| Persons under 6 years old | _________ |
| Persons 6 - 15 years old | _________ |
| Persons 16 - 19 years old | _________ |
| Persons 20 - 59 years old | _________ |
| Persons 60 years or older | _________ |

D. What is your home zipcode?

_________

E. How much school have you completed?

| | |
|---|---|
| Have Not Graduated from High School | -1 |
| High School Graduate | -2 |
| Some College, but No Degree | -3 |
| College Degree (including graduate) | -4 |

F. What is your combined total annual household income? Is it:

| | |
|---|---|
| Less than $20,000 | -1 |
| $20,000 to $34,999 | -2 |
| $35,000 to $49,999 | -3 |
| $50,000 to $64,999 | -4 |
| $65,000 to $79,999 | -5 |
| $80,000 to $99,999 | -6 |
| $100,000 or more | -7 |
| Don't Know/Refused | -8 |

G. Record Respondent's, Gender

| | |
|---|---|
| Male | -1 |
| Female | -2 |

Thank you so much for your help. The University of Southern California plans to continue this study, and may wish to contact you again within the next six months or so. Would you be willing to have us contact you again? If so, would you give me a telephone number and time of day when it would be most convenient for you to talk to us? Thank you again for your cooperation.

Name ______________________________ Phone Number()____ ___________

Best Time to Call ____________________ Work # -1 Home # -2

# APPENDIX F

## DESCRIPTIVE STATISTICS AUTOMATED RIDEMATCHING SURVEY 1

The following frequency tables are for all the non-continuous variables occurred in the first flexpool survey.

CP3.2C Of those cpl with you, # of co-workers?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 0 | 53 | 13.3 | 55.2 | 55.2 |
| | 1 | 22 | 5.5 | 22.9 | 78.1 |
| | 2 | 13 | 3.3 | 13.5 | 91.7 |
| | 3 | 6 | 1.5 | 6.3 | 97.9 |
| | 4 | 1 | .3 | 1.0 | 99.0 |
| | 7 | 1 | .3 | 1.0 | 100.0 |
| | . | 303 | 75.9 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 96 Missing cases 303

CP3.2F Friends or neighbors

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 0 | 90 | 22.6 | 93.8 | 93.8 |
| | 1 | 5 | 1.3 | 5.2 | 99.0 |
| | 2 | 1 | .3 | 1.0 | 100.0 |
| | . | 303 | 75.9 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 96 Missing cases 303

CP3.2M **Of those cpl. with you, # of HH members**

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 0 | 55 | 13.8 | 55.6 | 55.6 |
| | 1 | 34 | 8.5 | 34.3 | 89.9 |
| | 2 | 4 | 1.0 | 4.0 | 93.9 |
| | 3 | 5 | 1.3 | 5.1 | 99.0 |
| | 5 | 1 | .3 | 1.0 | 100.0 |
| | . | 300 | 75.2 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 99 Missing cases 300

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

CP3.2N **Of those cpl with you, # of non-HH relat**

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 0 | 85 | 21.3 | 87.6 | 87.6 |
| | 1 | 10 | 2.5 | 10.3 | 97.9 |
| | 2 | 2 | .5 | 2.1 | 100.0 |
| | . | 302 | 75.7 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 97 Missing cases 302

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

CP3.2O **# of other kinds of people in you cpl.**

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | . | 399 | 100.0 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 0 Missing cases 399

CP3.2S Someone from a match list

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 0 | 92 | 23.1 | 95.8 | 95.8 |
| | 1 | 3 | .8 | 3.1 | 99.0 |
| | 2 | 1 | .3 | 1.0 | 100.0 |
| | . | 303 | 75.9 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 96 Missing cases 303

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

CP3.3 Carpool unavailable, What do you do?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| drive alone | 1 | 73 | 18.3 | 73.7 | 73.7 |
| take bus/train | 2 | 13 | 3.3 | 13.1 | 86.9 |
| arrange/alternative | 3 | 11 | 2.8 | 11.1 | 98.0 |
| other-l | 5 | 2 | .5 | 2.0 | 100.0 |
| | . | 300 | 75.2 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 99 Missing cases 300

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

CP3.4AB Have you tried bus

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 1 | 34 | 8.5 | 34.3 | 34.3 |
| | 2 | 65 | 16.3 | 65.7 | 100.0 |
| | . | 300 | 75.2 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 99 Missing cases 300

CP3.4AD **Over the time you've worked have you tri**

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| yes | 1 | 85 | 21.3 | 85.9 | 85.9 |
| no | 2 | 14 | 3.5 | 14.1 | 100.0 |
| | . | 300 | 75.2 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 99 Missing cases 300

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

CP3.4AT **Have you tried train?**

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 1 | 5 | 1.3 | 5.1 | 5.1 |
| | 2 | 94 | 23.6 | 94.9 | 100.0 |
| | . | 300 | 75.2 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 99 Missing cases 300

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

CP3.4AV **Over the time you worked have you tried**

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| yes | 1 | 11 | 2.8 | 11.1 | 11.1 |
| no | 2 | 88 | 22.1 | 88.9 | 100.0 |
| | . | 300 | 75.2 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 99 Missing cases 300

CP3.4AW **Have you tried walking or biking**

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 1 | 14 | 3.5 | 14.1 | 14.1 |
| | 2 | 85 | 21.3 | 85.9 | 100.0 |
| | . | 300 | 75.2 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 99 Missing cases 300

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

CP3.4BB **Want to try bus again?**

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 1 | 21 | 5.3 | 63.6 | 63.6 |
| | 2 | 12 | 3.0 | 36.4 | 100.0 |
| | . | 366 | 91.7 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 33 Missing cases 366

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

CP3.4BT **Want to try train again**

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 1 | 5 | 1.3 | 100.0 | 100.0 |
| | . | 394 | 98.7 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 5 Missing cases 394

CP3.4BV Want to try van pooling again

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 1 | 8 | 2.0 | 72.7 | 72.7 |
| | 2 | 3 | .8 | 27.3 | '100.0 |
| | . | 388 | 97.2 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 11 Missing cases 388

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

CP3.4BW Want to try walking or biking again?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 1 | 7 | 1.8 | 50.0 | 50.0 |
| | 2 | 7 | 1.8 | 50.0 | 100.0 |
| | . | 385 | 96.5 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 14 Missing cases 385

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

CP3.5BD Want to try driving alone again?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 1 | 69 | 17.3 | 82.1 | 82.1 |
| | 2 | 15 | 3.8 | 17.9 | 100.0 |
| | . | 315 | 78.9 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 84 Missing cases 315

CS_A How old are you?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| <20 | 1 | 3 | .8 | .8 | .8 |
| 20-29 | 2 | 72 | 18.0 | 18.1 | 18.9 |
| 30-39 | 3 | 161 | 40.4 | 40.6 | 59.4 |
| 40-49 | 4 | 87 | 21.8 | 21.9 | 81.4 |
| 50-59 | 5 | 61 | 15.3 | 15.4 | 96.7 |
| >=60 | 6 | 13 | 3.3 | 3.3 | 100.0 |
| | . | 2 | .5 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 397 Missing cases 2

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

CS_B Number of vehicles in household

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 0 | 6 | 1.5 | 1.5 | 1.5 |
| | 1 | 102 | 25.6 | 25.6 | 27.1 |
| | 2 | 178 | 44.6 | 44.7 | 71.9 |
| | 3 | 66 | 16.5 | 16.6 | 88.4 |
| | 4 | 31 | 7.8 | 7.8 | 96.2 |
| | 5 | 10 | 2.5 | 2.5 | 98.7 |
| | 6 | 2 | .5 | .5 | 99.2 |
| | 7 | 1 | .3 | .3 | 99.5 |
| | 8 | 1 | .3 | .3 | 99.7 |
| | 9 | 1 | .3 | .3 | 100.0 |
| | . | 1 | .3 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 398 Missing cases 1

CS_C1 # of persons under 6 years old

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 0 | 307 | 76.9 | 77.3 | 77.3 |
| | 1 | 53 | 13.3 | 13.4 | 90.7 |
| | 2 | 28 | 7.0 | 7.1 | 97.7 |
| | 3 | 9 | 2.3 | 2.3 | 100.0 |
| | . | 2 | .5 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 397 Missing cases 2

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

CS_C2 # of persons 6-15 year old

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 0 | 290 | 72.7 | 73.0 | 73.0 |
| | 1 | 69 | 17.3 | 17.4 | 90.4 |
| | 2 | 27 | 6.8 | 6.8 | 97.2 |
| | 3 | 9 | 2.3 | 2.3 | 99.5 |
| | 4 | 1 | .3 | .3 | 99.7 |
| | 5 | 1 | .3 | .3 | 100.0 |
| | . | 2 | .5 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 397 Missing cases 2

CS_C3 # of person 16-19 years old

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 0 | 349 | 87.5 | 87.9 | 87.9 |
| | 1 | 37 | 9.3 | 9.3 | 97.2 |
| | 2 | 9 | 2.3 | 2.3 | 99.5 |
| | 3 | 2 | .5 | .5 | 100.0 |
| | . | 2 | .5 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 397 Missing cases 2

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

CS_C4 # of person 20 - 59 years old

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 0 | 78 | 19.5 | 19.6 | 19.6 |
| | 1 | 209 | 52.4 | 52.6 | 72.3 |
| | 2 | 68 | 17.0 | 17.1 | 89.4 |
| | 3 | 27 | 6.8 | 6.8 | 96.2 |
| | 4 | 11 | 2.8 | 2.8 | 99.0 |
| | 5 | 2 | .5 | .5 | 99.5 |
| | 6 | 1 | .3 | .3 | 99.7 |
| | 7 | 1 | .3 | .3 | 100.0 |
| | . | 2 | .5 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 397 Missing cases 2

CS_C5 # of persons over 60 years old

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 0 | 344 | 86.2 | 86.6 | 86.6 |
| | 1 | 37 | 9.3 | 9.3 | 96.0 |
| | 2 | 15 | 3.8 | 3.8 | 99.7 |
| | 3 | 1 | .3 | .3 | 100.0 |
| | . | 2 | .5 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 397 Missing cases 2

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

CS_E How much shcool completed

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| less than high shcoo | 1 | 5 | 1.3 | 1.3 | 1.3 |
| high school graduate | 2 | 33 | 8.3 | 8.4 | 9.6 |
| college without degr | 3 | 106 | 26.6 | 26.8 | 36.5 |
| college degree | 4 | 251 | 62.9 | 63.5 | 100.0 |
| | . | 4 | 1.0 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 395 Missing cases 4

CS_F Annual household income

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| <20,000 | 1 | 19 | 4.8 | 5.5 | 5.5 |
| 20,000-34,999 | 2 | 63 | 15.8 | 18.3 | 23.8 |
| 35,000-49,999 | 3 | 71 | 17.8 | 20.6 | 44.5 |
| 50,000-64,999 | 4 | 51 | 12.8 | 14.8 | 59.3 |
| 65,000-79,999 | 5 | 45 | 11.3 | 13.1 | 72.4 |
| 80,000-99,999 | 6 | 46 | 11.5 | 13.4 | 85.8 |
| 100,000 or more | 7 | 49 | 12.3 | 14.2 | 100.0 |
| | . | 55 | 13.8 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 344 Missing cases 55

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

CS_G Gender

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| male | 1 | 216 | 54.1 | 54.1 | 54.1 |
| female | 2 | 183 | 45.9 | 45.9 | 100.0 |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 399 Missing cases 0

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

DA2.1 Use other means besides drive alone

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| yes | 1 | 38 | 9.5 | 18.2 | 18.2 |
| no | 2 | 171 | 42.9 | 81.8 | 100.0 |
| | . | 190 | 47.6 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 209 Missing cases 190

DA2.21 besides drive alone, use carpooling?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| use carpooling | 1 | 20 | 5.0 | 100.0 | 100.0 |
| | . | 379 | 95.0 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 20 Missing cases 379

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

DA2.22 vanpooling

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 2 | 1 | .3 | 100.0 | 100.0 |
| | . | 398 | 99.7 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 1 Missing cases 398

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

DA2.23 bus

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 3 | 11 | 2.8 | 100.0 | 100.0 |
| | . | 388 | 97.2 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 11 Missing cases 388

DA2.24 train

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 4 | 2 | .5 | 100.0 | 100.0 |
| | . | 397 | 99.5 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 2 Missing cases 397

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

DA2.25 other means

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 5 | 3 | .8 | 100.0 | 100.0 |
| | . | 396 | 99.2 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 3 Missing cases 396

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

DA2.26 other-2 (This question does not exist)

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | . | 399 | 100.0 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 0 Missing cases 399

DA2.27 Biking

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 7 | 3 | .8 | 100.0 | 100.0 |
| | . | 396 | 99.2 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 3 Missing cases 396

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

DA2.3 Car unavailable, how you travel?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| another hh vehicle | 1 | 38 | 9.5 | 26.8 | 26.8 |
| ride with family mem | 2 | 27 | 6.8 | 19.0 | 45.8 |
| rent a car | 3 | 10 | 2.5 | 7.0 | 52.8 |
| carpool with co-work | 4 | 38 | 9.5 | 26.8 | 79.6 |
| use bus/train | 5 | 18 | 4.5 | 12.7 | 92.3 |
| take time off work | 6 | 2 | .5 | 1.4 | 93.7 |
| other-l | 7 | 9 | 2.3 | 6.3 | 100.0 |
| | . | 257 | 64.4 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 142 Missing cases 257

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

DA2.3FWB Car not available, use the following?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| friend | 1 | 3 | .8 | 23.1 | 23.1 |
| walk | 2 | 4 | 1.0 | 30.8 | 53.8 |
| borrow a car | 3 | 6 | 1.5 | 46.2 | 100.0 |
| | . | 386 | 96.7 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 13 Missing cases 386

DC5.2A3 **Co-workres**

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| co-workers | 3 | 17 | 4.3 | 100.0 | 100.0 |
| | . | 382 | 95.7 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 17 Missing cases 382

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

DC5.2A4 **Friends or neighbors?**

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| F & N | 4 | 1 | .3 | 100.0 | 100.0 |
| | . | 398 | 99.7 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 1 Missing cases 398

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

DC5.2A5 **Sb from a matchlist?**

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | . | 399 | 100.0 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 0 Missing cases 399

DC5.2A6 **Other 1?**

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | . | 399 | 100.0 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 0 Missing cases 399

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

DC5.2A7 **Other 2?**

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | . | 399 | 100.0 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 0 Missing cases 399

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

DC5.2B1 **How many members of your HH in yor cpl?**

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 1 | 3 | .8 | 100.0 | 100.0 |
| | . | 396 | 99.2 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 3 Missing cases 396

DC5.2B2 # of non-HH relatives in your cpl

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | . | 399 | 100.0 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 0 Missing cases 399

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

DC5.2B3 # of co-workers in your cpl

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 1 | 10 | 2.5 | 58.8 | 58.8 |
| | 2 | 3 | .8 | 17.6 | 76.5 |
| | 3 | 2 | .5 | 11.8 | 88.2 |
| | 4 | 1 | .3 | 5.9 | 94.1 |
| | 18 | 1 | .3 | 5.9 | 100.0 |
| | . | 382 | 95.7 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 17 Missing cases 382

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

DC5.2B4 # of Fs & Ns in your cpl

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 1 | 1 | .3 | 100.0 | 100.0 |
| | . | 398 | 99.7 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 1 Missing cases 398

DC5.2B5 # of persons from matchlist in your cpl

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | . | 399 | 100.0 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 0 Missing cases 399

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

DC5.3A1 Over time worked, tried vanpooling?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| yes | 1 | 1 | .3 | 5.0 | 5.0 |
| no | 2 | 19 | 4.8 | 95.0 | 100.0 |
| | . | 379 | 95.0 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 20 Missing cases 379

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

DC5.3A2 Tried bus?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 1 | 5 | 1.3 | 25.0 | 25.0 |
| | 2 | 15 | 3.8 | 75.0 | 100.0 |
| | . | 379 | 95.0 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 20 Missing cases 379

DC5.3A3 **Tried train?**

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 1 | 1 | .3 | 5.0 | 5.0 |
| | 2 | 19 | 4.8 | 95.0 | 100.0 |
| | . | 379 | 95.0 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 20 Missing cases 379

---

DC5.3A4 **tried walking or biking?**

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 1 | 2 | .5 | 10.0 | 10.0 |
| | 2 | 18 | 4.5 | 90.0 | 100.0 |
| | . | 379 | 95.0 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 20 Missing cases 379

---

DC5.3B1 **Try vanpooling again?**

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 1 | 1 | .3 | 100.0 | 100.0 |
| | . | 398 | 99.7 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 1 Missing cases 398

DA2.4AB **tried bus**

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| yes | 1 | 35 | 8.8 | 20.5 | 20.5 |
| no | 2 | 136 | 34.1 | 79.5 | 100.0 |
| | . | 228 | 57.1 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 171 Missing cases 228

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

DA2.4AC **Over the time you've worked have you tri**

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| yes | 1 | 75 | 18.8 | 43.9 | 43.9 |
| no | 2 | 96 | 24.1 | 56.1 | 100.0 |
| | . | 228 | 57.1 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 171 Missing cases 228

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

DA2.4AT **tried train**

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 1 | 7 | 1.8 | 4.1 | 4.1 |
| | 2 | 164 | 41.1 | 95.9 | 100.0 |
| | . | 228 | 57.1 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 171 Missing cases 228

DA2.4AV Tried vanpooling?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
| --- | --- | --- | --- | --- | --- |
| yes | 1 | 12 | 3.0 | 7.0 | 7.0 |
| no | 2 | 159 | 39.8 | 93.0 | '100.0 |
| | . | 228 | 57.1 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 171 Missing cases 228

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

DA2.4AW tried walking or biking

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
| --- | --- | --- | --- | --- | --- |
| | 1 | 19 | 4.8 | 11.1 | 11.1 |
| | 2 | 152 | 38.1 | 88.9 | 100.0 |
| | . | 228 | 57.1 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 171 Missing cases 228

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

DA2.4BB If yes to bus, want to try again?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
| --- | --- | --- | --- | --- | --- |
| | 1 | 19 | 4.8 | 54.3 | 54.3 |
| | 2 | 16 | 4.0 | 45.7 | 100.0 |
| | . | 364 | 91.2 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 35 Missing cases 364

DA2.4BC **If yes to carpooling, want to try again?**

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| yes | 1 | 60 | 15.0 | 81.1 | 81.1 |
| no | 2 | 14 | 3.5 | 18.9 | 100.0 |
| | . | 325 | 81.5 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 74 Missing cases 325

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

DA2.4BT **If yes to train, want to try again?**

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 1 | 5 | 1.3 | 71.4 | 71.4 |
| | 2 | 2 | .5 | 28.6 | 100.0 |
| | . | 392 | 98.2 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 7 Missing cases 392

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

DA2.4BV **If ye sto vpl, want to try again?**

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 1 | 7 | 1.8 | 63.6 | 63.6 |
| | 2 | 4 | 1.0 | 36.4 | 100.0 |
| | . | 388 | 97.2 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 11 Missing cases 388

DA2.4BW Walking or biking, want to try again?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
| --- | --- | --- | --- | --- | --- |
| | 1 | 11 | 2.8 | 57.9 | 57.9 |
| | 2 | 8 | 2.0 | 42.1 | 100.0 |
| | . | 380 | 95.2 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 19 Missing cases 380

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

DC5.2A1 Are the people in your carpool members o

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
| --- | --- | --- | --- | --- | --- |
| HH members | 1 | 3 | .8 | 100.0 | 100.0 |
| | . | 396 | 99.2 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 3 Missing cases 396

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

DC5.2A2 Are people in you cpl non-HH relatives

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
| --- | --- | --- | --- | --- | --- |
| | . | 399 | 100.0 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 0 Missing cases 399

DC5.3B2 **Try bus again?**

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 1 | 2 | .5 | 40.0 | 40.0 |
| | 2 | 3 | .8 | 60.0 | 100.0 |
| | . | 394 | 98.7 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 5 Missing cases 394

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

DC5.3B3 **Try train again?**

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 2 | 1 | .3 | 100.0 | 100.0 |
| | . | 398 | 99.7 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 1 Missing cases 398

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

DC5.3B4 **Try walking or biking again?**

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 1 | 2 | .5 | 100.0 | 100.0 |
| | . | 397 | 99.5 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 2 Missing cases 397

D06.02 Days vanpooling to work per week

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 2 | 1 | .3 | 100.0 | 100.0 |
| | . | 398 | 99.7 | Missing | |
| | | ------- | ---we-- | e-m---- | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 1 Missing cases 398

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

D06.03 Days to work by bus per week

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 0 | 3 | .8 | 30.0 | 30.0 |
| | 1 | 5 | 1.3 | 50.0 | 80.0 |
| | 3 | 1 | .3 | 10.0 | 90.0 |
| | 5 | 1 | .3 | 10.0 | 100.0 |
| | . | 389 | 97.5 | Missing | |
| | | ------- | W-W---- | W---V-- | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 10 Missing cases 389

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

D06.04 Days to work by train?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 1 | 2 | .5 | 100.0 | 100.0 |
| | . | 397 | 99.5 | Missing | |
| | | ------- | ------- | W--S--- | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 2 Missing cases 397

D06.05 Days biking to work per week?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 0 | 2 | .5 | 40.0 | 40.0 |
| | 1 | 2 | .5 | 40.0 | 80.0 |
| | 4 | 1 | .3 | 20.0 | 100.0 |
| | . | 394 | 98.7 | Missing | |
| | | ------- | ------- | ------- | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 5 Missing cases 394

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

D06.06 Days to work by other means per week?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | . | 399 | 100.0 | Missing | |
| | | ------- | ------- | ------- | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 0 Missing cases 399

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

D06.12 Months & years vpl to work with above da

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 7 | 1 | .3 | 100.0 | 100.0 |
| | . | 398 | 99.7 | Missing | |
| | | ------- | ------- | ------- | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 1 Missing cases 398

D06.13 Months & years to work by bus with above

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 1 | 3 | .8 | 33.3 | 33.3 |
| | 2 | 3 | .8 | 33.3 | 66.7 |
| | 3 | 1 | .3 | 11.1 | 77.8 |
| | 5 | 1 | .3 | 11.1 | 88.9 |
| | 11 | 1 | .3 | 11.1 | 100.0 |
| | . | 390 | 97.7 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 9 Missing cases 390

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D06.14 To work by train at above days per week

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 1 | 1 | .3 | 50.0 | 50.0 |
| | 6 | 1 | .3 | 50.0 | 100.0 |
| | . | 397 | 99.5 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 2 Missing cases 397

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D06.15 Biking to work at above days per week

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 2 | 2 | .5 | 40.0 | 40.0 |
| | 4 | 1 | .3 | 20.0 | 60.0 |
| | 5 | 2 | .5 | 40.0 | 100.0 |
| | . | 394 | 98.7 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 5 Missing cases 394

D06.16 Other means to work at above days per we

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | . | 399 | 100.0 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 0 Missing cases 399

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

DO6.2A1 Tried carpooling

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| Yes | 1 | 8 | 2.0 | 44.4 | 44.4 |
| No | 2 | 10 | 2.5 | 55.6 | 100.0 |
| | . | 381 | 95.5 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 18 Missing cases 381

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

DO6.2A2 Tried vanpooling

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| yes | 1 | 1 | .3 | 5.9 | 5.9 |
| no | 2 | 16 | 4.0 | 94.1 | 100.0 |
| | . | 382 | 95.7 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 17 Missing cases 382

DO6.2A3 **Tried bus**

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| yes | 1 | 2 | .5 | 25.0 | 25.0 |
| no | 2 | 6 | 1.5 | 75.0 | 100.0 |
| | . | 391 | 98.0 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 8 Missing cases 391

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

DO6.2A4 **Tried train**

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| yes | 1 | 2 | .5 | 12.5 | 12.5 |
| no | 2 | 14 | 3.5 | 87.5 | 100.0 |
| | . | 383 | 96.0 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 16 Missing cases 383

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

DO6.2A5 **Tried walking or biking**

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| yes | 1 | 7 | 1.8 | 38.9 | 38.9 |
| no | 2 | 11 | 2.8 | 61.1 | 100.0 |
| | . | 381 | 95.5 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 18 Missing cases 381

DO6.2B1

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 1 | 6 | 1.5 | 75.0 | 75.0 |
| | 2 | 2 | .5 | 25.0 | 100.0 |
| | . | 391 | 98.0 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 8 Missing cases 391

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

DO6.2B2

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 3 | 1 | .3 | 100.0 | 100.0 |
| | . | 398 | 99.7 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 1 Missing cases 398

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

DO6.2B3

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 1 | 2 | .5 | 100.0 | 100.0 |
| | . | 397 | 99.5 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 2 Missing cases 397

DO6.2B4

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 1 | 1 | .3 | 50.0 | 50.0 |
| | 2 | 1 | .3 | 50.0 | 100.0 |
| | . | 397 | 99.5 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 2 Missing cases 397

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

DO6.2B5

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 1 | 7 | 1.8 | 100.0 | 100.0 |
| | . | 392 | 98.2 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 7 Missing cases 392

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

ES7.0 Did you change you normal route after qu

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| yes | 1 | 96 | 24.1 | 24.4 | 24.4 |
| no | 2 | 296 | 74.2 | 75.1 | 99.5 |
| Wasn't living in are | 4 | 2 | .5 | .5 | 100.0 |
| | . | 5 | 1.3 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 394 Missing cases 5

ES7.1 Changed to or from work trip starting ti

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| yes | 1 | 95 | 23.8 | 24.2 | 24.2 |
| no | 2 | 297 | 74.4 | 75.8 | 100.0 |
| | . | 7 | 1.8 | Missing | |
| | | ------- | ------- | ------- | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 392 Missing cases 7

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

ES7.2 Worked at home, or at a location closer

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| yes | 1 | 27 | 6.8 | 6.9 | 6.9 |
| no | 2 | 363 | 91.0 | 93.1 | 100.0 |
| | . | 9 | 2.3 | Missing | |
| | | w---m-- | ------- | ------- | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 390 Missing cases 9

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

ES7.3 Changed normal means to or form work?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| yes | 1 | 35 | 8.8 | 8.9 | 8.9 |
| no | 2 | 357 | 89.5 | 91.1 | 100.0 |
| | . | 7 | 1.8 | Missing | |
| | | ------- | ------- | ------- | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 392 Missing cases 7

ES7.41 Did you drive alone?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| yes | 1 | 15 | 3.8 | 100.0 | 100.0 |
| | . | 384 | 96.2 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 15 Missing cases 384

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

ES7.42 Did you carpool?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| yes | 2 | 14 | 3.5 | 100.0 | 100.0 |
| | . | 385 | 96.5 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 14 Missing cases 385

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

ES7.43 Did you vanpool?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| yes | 3 | 2 | .5 | 100.0 | 100.0 |
| | . | 397 | 99.5 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 2 Missing cases 397

ES7.44 Did you use bus?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| yes | 4 | 7 | 1.8 | 100.0 | 100.0 |
| | . | 392 | 98.2 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 7 Missing cases 392

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

ES7.45 Did you use train?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| yes | 5 | 2 | .5 | 100.0 | 100.0 |
| | . | 397 | 99.5 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 2 Missing cases 397

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

ES7.46 Did you use motorcycle?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | . | 399 | 100.0 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 0 Missing cases 399

ES7.47 Did you walk or bike?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| yes | 7 | 3 | .8 | 100.0 | 100.0 |
| | . | 396 | 99.2 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 3 Missing cases 396

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

ES7.48

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 8 | 1 | .3 | 100.0 | 100.0 |
| | . | 398 | 99.7 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 1 Missing cases 398

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

ES7.49 Did you use other means?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | . | 399 | 100.0 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 0 Missing cases 399

ES7.51 Did you use TV to get info.?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| yes | 1 | 225 | 56.4 | 100.0 | 100.0 |
| | . | 174 | 43.6 | Missing | |
| | | ------- | ------- | ---a--- | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 225 Missing cases 174

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

ES7.52 Did you use radio to get info.?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| yes | 2 | 235 | 58.9 | 100.0 | 100.0 |
| | . | 164 | 41.1 | Missing | |
| | | ------- | ------- | ------- | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 235 Missing cases 164

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

ES7.53 Did you use newspaper?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| yes | 3 | 127 | 31.8 | 100.0 | 100.0 |
| | . | 272 | 68.2 | Missing | |
| | | ------- | ------- | ------- | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 127 Missing cases 272

ES7.54 Did you call police/CHP?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| yes | 4 | 11 | 2.8 | 100.0 | 100.0 |
| | . | 388 | 97.2 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 11 Missing cases 388

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

ES7.55 Did you use ridesahre agency?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| yes | 5 | 15 | 3.8 | 100.0 | 100.0 |
| | . | 384 | 96.2 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 15 Missing cases 384

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

ES7.56 Did you use 1-800-commute?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| yes | 6 | 13 | 3.3 | 100.0 | 100.0 |
| | . | 386 | 96.7 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 13 Missing cases 386

ES7.57 Did you consult maps?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| yes | 7 | 54 | 13.5 | 100.0 | 100.0 |
| | . | 34s | 86.5 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 54 Missing cases 345

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

ES7.58 Did you ask friends or family?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| yes | 8 | 105 | 26.3 | 100.0 | 100.0 |
| | . | [illegible] | 73.7 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 105 Missing cases 294

- - B - B - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

ES7.59 Did you use other-1

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| yes | 9 | 16 | 4.0 | 100.0 | 100.0 |
| no | . | 383 | 96.0 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 16 Missing cases 383

ES7.510 Did you use other_2?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 0 | 4 | 1.0 | 100.0 | 100.0 |
| | . | 395 | 99.0 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 4 Missing cases 395

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

OK Call you again?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| ok | 1 | 338 | 84.7 | 84.7 | 84.7 |
| refused | 2 | 61 | 15.3 | 15.3 | 100.0 |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 399 Missing cases 0

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

OS4.1AB Tried bus?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 1 | 24 | 6.0 | 47.1 | 47.1 |
| | 2 | 27 | 6.8 | 52.9 | 100.0 |
| | . | 348 | 87.2 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 51 Missing cases 348

OS4.1AC Over time worked, tried cpl?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 1 | 44 | 11.0 | 51.2 | 51.2 |
| | 2 | 42 | 10.5 | 48.8 | 100.0 |
| | . | 313 | 78.4 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 86 Missing cases 313

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

OS4.1AD Over time worked, tried driving alone?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 1 | 67 | 16.8 | 77.9 | 77.9 |
| | 2 | 19 | 4.8 | 22.1 | 100.0 |
| | . | 313 | 78.4 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 86 Missing cases 313

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

OS4.1AT Tried train?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 1 | 11 | 2.8 | 13.8 | 13.8 |
| | 2 | 69 | 17.3 | 86.3 | 100.0 |
| | . | 319 | 79.9 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 80 Missing cases 319

Q1.2.1 How long in the current job?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 1 | 4 | 1.0 | 1.0 | 1.0 |
| | 2 | 13 | 3.3 | 3.3 | 4.3 |
| | 3 | 55 | 13.8 | 14.0 | 18.3 |
| | 4 | 319 | 79.9 | 81.0 | 99.2 |
| | S | 3 | .8 | .8 | 100.0 |
| | . | 5 | 1.3 | Missing | |
| | | -we---- | ------- | ------- | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 394 Missing cases S

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

41.31 Registered with CTS?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| registered | 1 | 41 | 10.3 | 100.0 | 100.0 |
| | . | 358 | 89.7 | Missing | |
| | | ------- | ------- | ------- | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 41 Missing cases 358

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

Q1.32 Registered with **meployer's** ridematching?

| Value Label | Value | Frequency | Percent | Valid Percent | cum Percent |
|---|---|---|---|---|---|
| registered | 2 | 162 | 40.6 | 100.0 | 100.0 |
| | . | 237 | 59.4 | Missing | |
| | | ------- | ------- | ------- | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 162 Missing cases 237

41.33 Not registered?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| not registered | 3 | 190 | 47.6 | 100.0 | 100.0 |
| | . | 209 | 52.4 | Missing | |
| | | ------- | ------- | ------- | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 190 Missing cases 209

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

41.34 Refused to answer Q1.3?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| refused | 4 | 8 | 2.0 | 100.0 | 100.0 |
| | . | 391 | 98.0 | Missing | |
| | | ------- | ------- | ------- | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 8 Missing cases 391

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

Q1.4 Have vehicle to use for daily trip to wo

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| yes | 1 | 364 | 91.2 | 92.4 | 92.4 |
| sometimes | 2 | 9 | 2.3 | 2.3 | 94.7 |
| no | 3 | 21 | 5.3 | 5.3 | 100.0 |
| | . | 5 | 1.3 | Missing | |
| | | ------- | ------- | ------- | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 394 Missing cases 5

41.6 Minutes usually taken to travel to work

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| 0 - 15 mimutes | 1 | 100 | 25.1 | 25.4 | 25.4 |
| 16 - 30 | 2 | 134 | 33.6 | 34.0 | 59.4 |
| 31 - 4s | 3 | 90 | 22.6 | 22.8 | 82.2 |
| 46 - 60 | 4 | 43 | 10.8 | 10.9 | 93.1 |
| 61 - 90 | 5 | 21 | 5.3 | 5.3 | 98.5 |
| over 90 minutes | 6 | 6 | 1.5 | 1.5 | 100.0 |
| | . | 5 | 1.3 | Missing | |
| | | ---SW-- | ------- | -w--w-- | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 394 Missing cases 5

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

41.8 Usually leave for work at same time

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| yes | 1 | 318 | 79.7 | 80.7 | 80.7 |
| no | 2 | 76 | 19.0 | 19.3 | 100.0 |
| | . | 5 | 1.3 | Missing | |
| | | ------- | ------- | s---m-- | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 394 Missing cases 5

Ql.9 Means travel to & from work

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| drive alone | 1 | 209 | 52.4 | 53.0 | 53.0 |
| carp001 | 2 | 99 | 24.8 | 25.1 | 78.2 |
| vanpool | 3 | 29 | 7.3 | 7.4 | 85.5 |
| take bus | 4 | 35 | 8.8 | 8.9 | 94.4 |
| take train | 5 | 6 | 1.5 | 1.5 | 95.9 |
| walking or biking | 6 | 12 | 3.0 | 3.0 | 99.0 |
| other | 7 | 4 | 1.0 | 1.0 | 100.0 |
| | . | 5 | 1.3 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 394 Missing cases 5

---

ST8.0 Have you heard of Smart traeler?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| yes | 1 | 19 | 4.8 | 4.8 | 4.8 |
| no/refused | 2 | 380 | 95.2 | 95.2 | 100.0 |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 399 Missing cases 0

---

ST8.1 Have you heard of 1800 commute?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| yes | 1 | 184 | 46.1 | 46.1 | 46.1 |
| no/refused | 2 | 215 | 53.9 | 53.9 | 100.0 |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 399 Missing cases 0

ST8.2 Have you ever called 1-800-commute?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| yes | 1 | 21 | 5.3 | 11.5 | 11.5 |
| no | 2 | 162 | 40.6 | 88.5 | 100.0 |
| | . | 216 | 54.1 | Missing | |
| | | ------- | ------- | B-S---- | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 183 Missing cases 216

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

ST8.3 Which kind of service did you request?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| MTA: bus or rail | 1 | 7 | 1.8 | 36.8 | 36.8 |
| Metro link | 2 | 4 | 1.0 | 21.1 | 57.9 |
| Rideshare | 3 | 8 | 2.0 | 42.1 | 100.0 |
| | . | 380 | 95.2 | Missing | |
| | | ------- | ------- | ------- | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 19 Missing cases 380

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

ST8.41 Have own car, no need for transit or cp

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| agree | 1 | 148 | 37.1 | 37.3 | 37.3 |
| disagree | 2 | 249 | 62.4 | 62.7 | 100.0 |
| | . | 2 | .5 | Missing | |
| | | ------- | ------- | -B-S--- | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 397 Missing cases 2

ST8.42 Always listen to radio for traffic info

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| agree | 1 | 339 | 85.0 | 85.8 | 85.8 |
| disagree | 2 | 56 | 14.0 | 14.2 | 100.0 |
| | . | 4 | 1.0 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 39s Missing cases 4

---

ST8.43 Do not like using machine to get info

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| agree | 1 | 98 | 24.6 | 24.9 | 24.9 |
| disagree | 2 | 29s | 73.9 | 75.1 | 100.0 |
| | . | 6 | 1.5 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 393 Missing cases 6

---

ST8.44 Don't give rides to unknown people

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| agree | 1 | 301 | 75.4 | 77.2 | 77.2 |
| disagree | 2 | 89 | 22.3 | 22.8 | 100.0 |
| | . | 9 | 2.3 | Missing | |
| | Total | 399 | 100.0 | 100.0 | |

Valid cases 390 Missing cases 9

# APPENDIX "G"

# QUESTIONNAIRE WITH LOGIC & SKIP PATTERNS

(16:58:14 10 Oct 1994)

QUESTIONNAIRE = USC

```
*****************************
*         CODE BOX :        *
*                           *
* LT = LESS THAN      ( < ) *
* GT = GREATER THAN   ( > ) *
* EQ = EQUALS         ( = ) *
* NE = NOT EQUAL TO   ( # ) *
*****************************
```

HELLO, MY NAME IS ____ WORKING FOR USC.

DO YOU REMEMBER THAT YOU ANSWERED SOME QUESTIONS ABOUT TRANSPORTATION FOR US IN JULY, AND THAT YOU AGREED THAT USC COULD CALL YOU AGAIN TO ASK A FEW MORE QUESTIONS RELATED TO THEIR STUDY ?

*************************************************************************

1. HAVE YOU HEARD OF SMART TRAVELER?

   1. YES
   2. NO
   3. DON'T KNOW/REFUSED

*************************************************************************

2. HAVE YOU HEARD OF 1-800-COMMUTE ?

   1. YES
   2. NO
   3. DON'T KNOW/REFUSED

*************************************************************************

3. THERE IS A NEW AUTOMATED TELEPHONE SERVICE THAT ALLOWS YOU TO FIND CAR-POOL PARTNERS WITHOUT HAVING TO SPEAK TO THE CTS (COMMUTER TRANSPORTATION SERVICES) OPERATOR ? BY USING A TOUCH TONE PHONE YOU CAN AUTOMATICALLY LEARN OF POTENTIAL CARPOOL PARTNERS. YOU CAN THEN EITHER LEAVE VOICE MAIL MESSAGES AUTOMATICALLY, OR RECEIVE A LIST OF NAMES AND TELEPHONE NUMBERS THAT YOU CAN CALL YOURSELF. HAVE YOU HEARD OF THIS SERVICE ?

   1. YES
   2. NO
   3. DON'T KNOW/REFUSED

   SKIP AFTER Q3 IF Q<3> GE "2" THEN GO 21

*************************************************************************

4. HAVE YOU TRIED USING THE SERVICE ?

   1. YES
   2. NO
   3. DON'T KNOW/REFUSED

   SKIP AFTER Q4 IF Q<4> GE "2" THEN GO 17

*************************************************************************

5. DID YOU USE THE SERVICE TO FIND . . .

   1. A NEW CARPOOL PARTNER
   2. A RIDE JUST FOR THE DAY OR A SHORT PERIOD

   SKIP AFTER Q5 IF Q<4> NE "1" THEN GO 17

*************************************************************************

6. WERE YOU SUCCESSFUL IN GETTING A LIST OF PEOPLE TO CONTACT ?

1. YES
2. NO
3. DON'T KNOW/REFUSED

SKIP AFTER Q6 IF Q<6> NE "1" THEN GO 9

**********************************************************************

7. HOW MANY POTENTIAL MATCHES WERE THERE ?

**********************************************************************

8. IF YOU GOT A LIST OF PEOPLE TO CONTACT DID YOU USE THE AUTOMATED SERVICE TO LEAVE A VOICE MAIL MESSAGE AND ASK THEM TO CALL YOU BACK ?

1. YES
2. NO
3. DON'T KNOW/REFUSED

SKIP AFTER Q8 IF Q<8> NE "1" THEN GO 10

**********************************************************************

9. DID YOU CALL ANYONE YOURSELF ?

1. YES
2. NO
3. DON'T KNOW/REFUSED

SKIP AFTER Q9 IF Q<8> NE "1"
AND Q<9> NE "1" THEN GO 11

**********************************************************************

10. DID ANYONE CALL YOU BACK ?

1. YES
2. NO
3. DON'T KNOW/REFUSED

**********************************************************************

11. DID YOU ARRANGE A RIDE WITH ANY OF THE PEOPLE YOU CONTACTED ?

1. YES
2. NO
3. DON'T KNOW/REFUSED

SKIP BEFORE Q11 IF Q<8> NE "1"
AND Q<9> NE "1" THEN GO 12
SKIP AFTER Qll IF Q<11> NE "1" THEN GO 17

**********************************************************************

12. WERE YOU SUCCESSFUL IN GETTING A NEW CARPOOL PARTNER OR IN GETTING A RIDE JUST FOR ONE DAY ON THE DAY YOU NEEDED IT ?

1. YES
2. NO
3. DON'T KNOW/REFUSED

SKIP AFTER Q12 IF Q<12> NE "1" THEN GO 17

**********************************************************************

13. WERE YOU HAPPY WITH THE SERVICE ?

1. YES
2. NO
3. DON'T KNOW/REFUSED

SKIP AFTER Q13 IF Q<13> NE "2" THEN GO 15

**********************************************************************

14. IF NO, WRY NOT ?

**********************************************************************

15. WOULD YOU USE IT AGAIN ?

1. YES
2. NO
3. DON'T KNOW/REFUSED

SKIP AFTER Q15 IF Q<15> NE "2" THEN GO 17

****************************************************************************

16. IF NO, WHY NOT ?

****************************************************************************

17. HAVE YOU EVER BEEN CONTACTED BY OTHERS USING THIS AUTOMATED SERVICE TO FIND A CARPOOL PARTNER OR A RIDE JUST FOR ONE DAY ?

1. YES
2. NO

SKIP AFTER Q17 IF Q<17> EQ "2" THEN GO 21

****************************************************************************

18. HOW MANY PEOPLE HAVE CONTACTED YOU ? . . . (A NUMBER)

1. 1
2. 2
3. 3
4. 4
5. 5+
6. 0
7. DON'T KNOW/REFUSED

****************************************************************************

19. DID YOU JOIN A CARPOOL OR GIVE A RIDE ?

1. YES
2. NO

SKIP AFTER Q19 IF Q<19> EQ "1" THEN GO 21

****************************************************************************

20. IF NO, WHY NOT ?

****************************************************************************

21. ASSUME THAT YOU ARE LOOKING FOR A *LONG TERM* CARPOOL PARTNER, AND THAT YOU ARE USING AN AUTOMATED RIDEMATCHING SYSTEM. WOULD YOU PLEASE TELL ME IF YOU THINK THE FOLLOWING STATEMENTS ARE EXTREMELY IMPORTANT, VERY IMPORTANT, SOMEWHAT IMPORTANT, NOT VERY IMPORTANT, OR NOT AT ALL IMPORTANT.

(Press <return> to continue)

(READ PRE-CODED RESPONSES-EXCEPT FOR 'DON'T KNOW','REFUSED',ETC)

********************************************

QUESTIONS 22-27 ARE RANDOMLY ROTATED

****************************************************************************

22. THE CARPOOL PARTNER IS A GOOD AND SAFE DRIVER :

1. NOT AT ALL IMPORTANT
2. NOT VERY IMPORTANT
3. SOMEWHAT IMPORTANT
4. VERY IMPORTANT
5. EXTREMELY IMPORTANT
6. DON'T KNOW/REFUSED

(READ PRE-CODED RESPONSES-EXCEPT FOR 'DON'T KNOW','REFUSED',ETC)

****************************************************************************

23. THE CAR IS IN GOOD CONDITION AND REPAIR :

1. NOT AT ALL IMPORTANT
2. NOT VERY IMPORTANT
3. SOMEWHAT IMPORTANT
4. VERY IMPORTANT
5. EXTREMELY IMPORTANT
6. DON'T KNOW/REFUSED

(READ PRE-CODED RESPONSES-EXCEPT FOR 'DON'T KNOW','REFUSED',ETC)
*****************************************************************************

24. THE CARPOOL PARTNER DOES/OR DOES NOT SMOKE :

1. NOT AT ALL IMPORTANT
2. NOT VERY IMPORTANT
3. SOMEWHAT IMPORTANT
4. VERY IMPORTANT
5. EXTREMELY IMPORTANT
6. DON'T KNOW/REFUSED

(READ PRE-CODED RESPONSES-EXCEPT FOR 'DON'T KNOW','REFUSED',ETC)
*****************************************************************************

25. THE PARTNER IS THE SAME SEX AS YOU :

1. NOT AT ALL IMPORTANT
2. NOT VERY IMPORTANT
3. SOMEWHAT IMPORTANT
4. VERY IMPORTANT
5. EXTREMELY IMPORTANT
6. DON'T KNOW/REFUSED

(READ PRE-CODED RESPONSES-EXCEPT FOR 'DON'T KNOW','REFUSED',ETC)
*****************************************************************************

26. THE CARPOOL PARTNER WORKS AT YOUR COMPANY :

1. NOT AT ALL IMPORTANT
2. NOT VERY IMPORTANT
3. SOMEWHAT IMPORTANT
4. VERY IMPORTANT
5. EXTREMELY IMPORTANT
6. DON'T KNOW/REFUSED

(READ PRE-CODED RESPONSES-EXCEPT FOR 'DON'T KNOW','REFUSED',ETC)
*****************************************************************************

27. THE CARPOOL PARTNER LIVES IN YOUR NEIGHBORHOOD :
(ONLY IF ASKED: NEIGHBORHOOD = 1-2 MILE RADIUS)

1. NOT AT ALL IMPORTANT
2. NOT VERY IMPORTANT
3. SOMEWHAT IMPORTANT
4. VERY IMPORTANT
5. EXTREMELY IMPORTANT
6. DON'T KNOW/REFUSED

(READ PRE-CODED RESPONSES-EXCEPT FOR 'DON'T KNOW','REFUSED',ETC)
*****************************************************************************

28. NOW ASSUME THAT YOU ARE LOOKING FOR A RIDE FOR *JUST ONE DAY* AND YOU WOULD BE USING THE AUTOMATED RIDEMATCHING SYSTEM. WOULD YOU PLEASE TELL ME IF YOU THINK THE FOLLOWING STATEMENTS ARE EXTREMELY IMPORTANT, VERY IMPORTANT, SOMEWHAT IMPORTANT, NOT VERY IMPORTANT, OR NOT AT ALL IMPORTANT.

(Press <return> to continue)

*******************************************
QUESTIONS 29-34 ARE RANDOMLY ROTATED
*******************************************************************************
29. THE CARPOOL PARTNER IS A GOOD AND SAFE DRIVER :

1. NOT AT ALL IMPORTANT
2. NOT VERY IMPORTANT
3. SOMEWHAT IMPORTANT
4. VERY IMPORTANT
5. EXTREMELY IMPORTANT
6. DON'T KNOW/REFUSED

(READ PRE-CODED RESPONSES-EXCEPT FOR 'DON'T KNOW','REFUSED',ETC)
*******************************************************************************
30. THE CAR IS IN GOOD CONDITION AND REPAIR :

1. NOT AT ALL IMPORTANT
2. NOT VERY IMPORTANT
3. SOMEWHAT IMPORTANT
4. VERY IMPORTANT
5. EXTREMELY IMPORTANT
6. DON'T KNOW/REFUSED

(READ PRE-CODED RESPONSES-EXCEPT FOR 'DON'T KNOW','REFUSED',ETC)
*******************************************************************************
31. THE CARPOOL PARTNER DOES/OR DOES NOT SMOKE :

1. NOT AT ALL IMPORTANT
2. NOT VERY IMPORTANT
3. SOMEWHAT IMPORTANT
4. VERY IMPORTANT
5. EXTREMELY IMPORTANT
6. DON'T KNOW/REFUSED

(READ PRE-CODED RESPONSES-EXCEPT FOR 'DON'T KNOW','REFUSED',ETC)
*******************************************************************************
32. THE PARTNER IS THE SAME SEX AS YOU :

1. NOT AT ALL IMPORTANT
2. NOT VERY IMPORTANT
3. SOMEWHAT IMPORTANT
4. VERY IMPORTANT
5. EXTREMELY IMPORTANT
6. DON'T KNOW/REFUSED

(READ PRE-CODED RESPONSES-EXCEPT FOR 'DON'T KNOW','REFUSED',ETC)
*******************************************************************************
33. THE CARPOOL PARTNER WORKS AT YOUR COMPANY :

1. NOT AT ALL IMPORTANT
2. NOT VERY IMPORTANT
3. SOMEWHAT IMPORTANT
4. VERY IMPORTANT
5. EXTREMELY IMPORTANT
6. DON'T KNOW/REFUSED

(READ PRE-CODED RESPONSES-EXCEPT FOR 'DON'T KNOW','REFUSED',ETC)
*******************************************************************************
34. THE CARPOOL PARTNER LIVES IN YOUR NEIGHBORHOOD :
(ONLY IF ASKED: NEIGHBORHOOD = l-2 MILE RADIUS)

1. NOT AT ALL IMPORTANT
2. NOT VERY IMPORTANT

3. SOMEWHAT IMPORTANT
4. VERY IMPORTANT
5. EXTREMELY IMPORTANT
6. DON'T KNOW/REFUSED

(READ PRE-CODED RESPONSES-EXCEPT FOR 'DON'T KNOW','REFUSED',ETC)
******************************************************************************

35. WE ARE INTERESTED IN KNOWING HOW OFTEN THE FOLLOWING CIRCUMSTANCES MIGHT APPLY TO YOU. FOR EACH OF THE FOLLOWING WOULD YOU TELL ME WHETHER THEY OCCUR:
1. FREQUENTLY 2. SOMETIMES 3. SELDOM 4. NEVER

MY REGULAR MEANS OF TRAVELING TO WORK IS NOT AVAILABLE, E.G. CAR IS IN THE SHOP, CARPOOL PARTNER IS ON VACATION, TRANSIT STRIKE, ETC. :

1. FREQUENTLY
2. SOMETIMES
3. SELDOM
4. NEVER
5. DON'T KNOW/REFUSED

(READ PRE-CODED RESPONSES-EXCEPT FOR 'DON'T KNOW','REFUSED',ETC)
******************************************************************************

36. I HAVE TO WORE AT A DIFFERENT LOCATION :

1. FREQUENTLY
2. SOMETIMES
3. SELDOM
4. NEVER
5. DON'T KNOW/REFUSED

(READ PRE-CODED RESPONSES-EXCEPT FOR 'DON'T KNOW','REFUSED',ETC)
******************************************************************************

37. MY WORE HOURS ARE DIFFERENT FROM USUAL :

1. FREQUENTLY
2. SOMETIMES
3. SELDOM
4. NEVER
5. DON'T KNOW/REFUSED

(READ PRE-CODED RESPONSES-EXCEPT FOR 'DON'T KNOW','REFUSED',ETC)
******************************************************************************

38. I HAVE TO LEAVE WORK EARLY BECAUSE OF A MEDICAL APPOINTMENT OR OTHER REASONS :

1. FREQUENTLY
2. SOMETIMES
3. SELDOM
4. NEVER
5. DON'T KNOW/REFUSED

(READ PRE-CODED RESPONSES-EXCEPT FOR 'DON'T KNOW','REFUSED',ETC)
******************************************************************************

39. I HAVE TO START WORK LATE BECAUSE OF MEDICAL APPOINTMENTS OR OTHER REASONS :

1. FREQUENTLY
2. SOMETIMES
3. SELDOM
4. NEVER
5. DON'T KNOW/REFUSED

# APPENDIX H

## DESCRIPTIVE STATISTICS AUTOMATED RIDEMATCHING SURVEY 2

V1 Have you heard of smart traveler?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
| --- | --- | --- | --- | --- | --- |
| yes | 1.00 | 58 | 19.0 | 19.2 | 19.2 |
| no | 2.00 | 244 | 79.7 | 80.8 | 100.0 |
| | . | 4 | 1.3 | Missing | |
| | Total | 306 | 100.0 | 100.0 | |

Valid cases 302 Missing cases 4

---

v2 Have you heard of 1-800-commute?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
| --- | --- | --- | --- | --- | --- |
| yes | 1.00 | 236 | 77.1 | 78.4 | 78.4 |
| no | 2.00 | 65 | 21.2 | 21.6 | 100.0 |
| | . | 5 | 1.6 | Missing | |
| | Total | 306 | 100.0 | 100.0 | |

Valid cases 301 Missing cases S

---

v3 Have you heard of flexpool ridematch?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
| --- | --- | --- | --- | --- | --- |
| yes | 1.00 | 57 | 18.6 | 18.8 | 18.8 |
| no | 2.00 | 246 | 80.4 | 81.2 | 100.0 |
| | . | 3 | 1.0 | Missing | |
| | Total | 306 | 100.0 | 100.0 | |

Valid cases 303 Missing cases 3

---

v4 Have you tried using flexpool?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| yes | 1.00 | 4 | 1.3 | 7.0 | 7.0 |
| no | 2.00 | 53 | 17.3 | 93.0 | 100.0 |
| | . | 249 | 81.4 | Missing | |
| | Total | 306 | 100.0 | 100.0 | |

Valid cases 57 Missing cases 249

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

v5 Did you use the service to find...

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| A new parpool partne | 1.00 | 3 | 1.0 | 75.0 | 75.0 |
| A ride just for the | 2.00 | 1 | .3 | 25.0 | 100.0 |
| | . | 302 | 98.7 | Missing | |
| | Total | 306 | 100.0 | 100.0 | |

Valid cases 4 Missing cases 302

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

V6 Were you successful in getting a list to

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| yes | 1.00 | 4 | 1.3 | 100.0 | 100.0 |
| | . | 302 | 98.7 | Missing | |
| | Total | 306 | 100.0 | 100.0 | |

Valid cases 4 Missing cases 302

v7 How many potential matches were there?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 2.00 | 1 | .3 | 25.0 | 25.0 |
| | 5.00 | 1 | .3 | 25.0 | 50.0 |
| | 7.00 | 1 | .3 | 25.0 | 75.0 |
| | 10.00 | 1 | .3 | 25.0 | 100.0 |
| | . | 302 | 98.7 | Missing | |
| | Total | 306 | 100.0 | 100.0 | |

Valid cases 4 Missing cases 302

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

V8 Did you leave a message on flexpool?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| yes | 1.00 | 2 | .7 | 50.0 | 50.0 |
| no | 2.00 | 2 | .7 | 50.0 | 100.0 |
| | . | 302 | 98.7 | Missing | |
| | Total | 306 | 100.0 | 100.0 | |

Valid cases 4 Missing cases 302

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

V9 Did you call anyone youself?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| no | 2.00 | 2 | .7 | 100.0 | 100.0 |
| | . | 304 | 99.3 | Missing | |
| | Total | 306 | 100.0 | 100.0 | |

Valid cases 2 Missing cases 304

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

V10 Did anyone call you back?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| yes | 1.00 | 1 | .3 | 25.0 | 25.0 |
| no | 2.00 | 3 | 1.0 | 75.0 | 100.0 |
| | . | 302 | 98.7 | Missing | |
| | Total | 306 | 100.0 | 100.0 | |

Valid cases 4 Missing cases 302

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

V11 Did you arrange a ride with those people

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| yes | 2.00 | 2 | .7 | 100.0 | 100.0 |
| no | . | 304 | 99.3 | Missing | |
| | Total | 306 | 100.0 | 100.0 | |

Valid cases 2 Missing cases 304

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

V12 Successful in getting either a partner?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| yes | 1.00 | 2 | .7 | 100.0 | 100.0 |
| no | . | 304 | 99.3 | Missing | |
| | Total | 306 | 100.0 | 100.0 | |

Valid cases 2 Missing cases 304

v13 Were you happy with the service?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| yes | 1.00 | 2 | .7 | 100.0 | 100.0 |
| no | . | 304 | 99.3 | Missing | |
| | | ------- | ------- | -s--m-- | |
| | Total | 306 | 100.0 | 100.0 | |

Valid cases 2 Missing cases 304

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

v15 Would you use it again?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| yes | 1.00 | 2 | .7 | 100.0 | 100.0 |
| no | . | 304 | 99.3 | Missing | |
| | | ------- | ------- | ------- | |
| | Total | 306 | 100.0 | 100.0 | |

Valid cases 2 Missing cases 304

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

v17 Have you been contacted by others using

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| yes | 1.00 | 6 | 2.0 | 10.5 | 10.5 |
| no | 2.00 | 51 | 16.7 | 89.5 | 100.0 |
| | . | 249 | 81.4 | Missing | |
| | | ------- | ------- | ------- | |
| | Total | 306 | 100.0 | 100.0 | |

Valid cases 57 Missing cases 249

V18 How many peopl have contacted you?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
| --- | --- | --- | --- | --- | --- |
| | 1.00 | 2 | .7 | 33.3 | 33.3 |
| | 2.00 | 1 | .3 | 16.7 | 50.0 |
| | 3.00 | 2 | .7 | 33.3 | 83.3 |
| | 4.00 | 1 | .3 | 16.7 | 100.0 |
| | . | 300 | 98.0 | Missing | |
| | Total | 306 | 100.0 | 100.0 | |

Valid cases 6 Missing cases 300

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

V19 Did you join a carpool or give a ride?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
| --- | --- | --- | --- | --- | --- |
| yes | 1.00 | 1 | .3 | 16.7 | 16.7 |
| no | 2.00 | 5 | 1.6 | 83.3 | 100.0 |
| | . | 300 | 98.0 | Missing | |
| | Total | 306 | 100.0 | 100.0 | |

Valid cases 6 Missing cases 300

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

v21

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
| --- | --- | --- | --- | --- | --- |
| | . | 306 | 100.0 | Missing | |
| | Total | 306 | 100.0 | 100.0 | |

Valid cases 0 Missing cases 306

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

v22 Is the carpool partner a good &safe dir

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| Not at all important | 1.00 | 2 | .7 | .7 | .7 |
| Not very | 2.00 | 1 | .3 | .3 | 1.0 |
| Somewhat important | 3.00 | 14 | 4.6 | 4.6 | 5.6 |
| Very important | 4.00 | 127 | 41.5 | 41.5 | 47.1 |
| extremely important | 5.00 | 162 | 52.9 | 52.9 | 100.0 |
| | Total | 306 | 100.0 | 100.0 | |

Valid cases 306 Missing cases 0

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

V23 Is the car in good condition and & repai

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| Not at all important | 1.00 | 1 | .3 | .3 | .3 |
| Not very important | 2.00 | 3 | 1.0 | 1.0 | 1.3 |
| Somewhat important | 3.00 | 37 | 12.1 | 12.1 | 13.4 |
| Very important | 4.00 | 152 | 49.7 | 49.7 | 63.1 |
| Extremely important | 5.00 | 113 | 36.9 | 36.9 | 100.0 |
| | Total | 306 | 100.0 | 100.0 | |

Valid cases 306 Missing cases 0

- - - - - - - - - - - - - - W - - - W - - - - - - - - - - - - - - - - -

V24 The partner does or does not smoke

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| Not at all important | 1.00 | 32 | 10.5 | 10.5 | 10.5 |
| Not very important | 2.00 | 22 | 7.2 | 7.2 | 17.6 |
| somewhat important | 3.00 | 30 | 9.8 | 9.8 | 27.5 |
| very important | 4.00 | 100 | 32.7 | 32.7 | 60.1 |
| extremely important | 5.00 | 122 | 39.9 | 39.9 | 100.0 |
| | Total | 306 | 100.0 | 100.0 | |

Valid cases 306 Missing cases 0

V25 The partner is the same sex as you?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| Not at all important | 1.00 | 211 | 69.0 | 69.0 | 69.0 |
| not very important | 2.00 | 57 | 18.6 | 18.6 | 87.6 |
| somewhat important | 3.00 | 21 | 6.9 | 6.9 | 94.4 |
| very important | 4.00 | 15 | 4.9 | 4.9 | 99.3 |
| extremely important | 5.00 | 2 | .7 | .7 | 100.0 |
| | Total | 306 | 100.0 | 100.0 | |

Valid cases 306 Missing cases 0

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

V26 The carpool partner works at your compan

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| not at all important | 1.00 | 51 | 16.7 | 16.7 | 16.7 |
| not very important | 2.00 | 33 | 10.8 | 10.8 | 27.5 |
| somewhat important | 3.00 | 118 | 38.6 | 38.6 | 66.0 |
| very important | 4.00 | 77 | 25.2 | 25.2 | 91.2 |
| extremely important | 5.00 | 27 | 8.8 | a.8 | 100.0 |
| | Total | 306 | 100.0 | 100.0 | |

Valid cases 306 Missing cases 0

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

V27 The partner lives in your neighborhood

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| not at all important | 1.00 | 20 | 6.5 | 6.5 | 6.5 |
| not very important | 2.00 | 33 | 10.8 | 10.8 | 17.3 |
| somewhat important | 3.00 | 123 | 40.2 | 40.2 | 57.5 |
| very important | 4.00 | 98 | 32.0 | 32.0 | 89.5 |
| extremely important | 5.00 | 32 | 10.5 | 10.5 | 100.0 |
| | Total | 306 | 100.0 | 100.0 | |

Valid cases 306 Missing cases 0

V28

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | . | 306 | 100.0 | Missing | |
| | Total | 306 | 100.0 | 100.0 | |

Valid cases 0 Missing cases 306

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

v29 The carpool partner is a good & safe dri

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| Not at all important | 1.00 | 1 | .3 | .3 | .3 |
| not very important | 2.00 | 3 | 1.0 | 1.0 | 1.3 |
| somewhat important | 3.00 | 33 | 10.8 | 10.8 | 12.1 |
| very important | 4.00 | 142 | 46.4 | 46.4 | 58.5 |
| extremely important | 5.00 | 127 | 41.5 | 41.5 | 100.0 |
| | Total | 306 | 100.0 | 100.0 | |

Valid cases 306 Missing cases 0

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

V30 The car is in good condition and repair

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| not at all important | 1.00 | 8 | 2.6 | 2.6 | 2.6 |
| not very important | 2.00 | 7 | 2.3 | 2.3 | 4.9 |
| somewhat important | 3.00 | 60 | 19.6 | 19.6 | 24.5 |
| very important | 4.00 | 145 | 47.4 | 47.4 | 71.9 |
| extremely important | 5.00 | 86 | 28.1 | 28.1 | 100.0 |
| | Total | 306 | 100.0 | 100.0 | |

Valid cases 306 Missing cases 0

v31 The partner does or does not smoke

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| not at all important | 1.00 | 65 | 21.2 | 21.2 | 21.2 |
| not very important | 2.00 | 46 | 15.0 | 15.0 | 36.3 |
| somewhat important | 3.00 | 42 | 13.7 | 13.7 | 50.0 |
| very important | 4.00 | 73 | 23.9 | 23.9 | 73.9 |
| extremely important | 5.00 | 80 | 26.1 | 26.1 | 100.0 |
| | Total | 306 | 100.0 | 100.0 | |

Valid cases 306 Missing cases 0

---

V32 The partner is the same sex as you

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 1.00 | 235 | 76.8 | 76.8 | 76.8 |
| | 2.00 | 35 | 11.4 | 11.4 | 88.2 |
| | 3.00 | 22 | 7.2 | 7.2 | 95.4 |
| | 4.00 | 13 | 4.2 | 4.2 | 99.7 |
| | 5.00 | 1 | .3 | .3 | 100.0 |
| | Total | 306 | 100.0 | 100.0 | |

Valid cases 306 Missing cases 0

---

v33 The partner works at your company.

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 1.00 | 105 | 34.3 | 34.3 | 34.3 |
| | 2.00 | 62 | 20.3 | 20.3 | 54.6 |
| | 3.00 | 73 | 23.9 | 23.9 | 78.4 |
| | 4.00 | 52 | 17.0 | 17.0 | 95.4 |
| | 5.00 | 14 | 4.6 | 4.6 | 100.0 |
| | Total | 306 | 100.0 | 100.0 | |

Valid cases 306 Missing cases 0

v34 The carpool partner lives in your neighb

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | 1.00 | 80 | 26.1 | 26.1 | 26.1 |
| | 2.00 | 49 | 16.0 | 16.0 | 42.2 |
| | 3.00 | 110 | 35.9 | 35.9 | 78.1 |
| | 4.00 | 53 | 17.3 | 17.3 | 95.4 |
| | 5.00 | 14 | 4.6 | 4.6 | 100.0 |
| | Total | 306 | 100.0 | 100.0 | |

Valid cases 306 Missing cases 0

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

v35 Regular means of traveling to work not a

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| Frequently | 1.00 | 3 | 1.0 | 1.0 | 1.0 |
| Sometimes | 2.00 | 36 | 11.8 | 11.8 | 12.8 |
| Seldom | 3.00 | 147 | 48.0 | 48.4 | 61.2 |
| Never | 4.00 | 118 | 38.6 | 38.8 | 100.0 |
| | . | 2 | .7 | Missing | |
| | Total | 306 | 100.0 | 100.0 | |

Valid cases 304 Missing cases 2

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

V36 I have worked at a different location

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| frequently | 1.00 | 19 | 6.2 | 6.2 | 6.2 |
| sometimes | 2.00 | 4s | 14.7 | 14.7 | 20.9 |
| seldom | 3.00 | 72 | 23.5 | 23.5 | 44.4 |
| never | 4.00 | 170 | 55.6 | 55.6 | 100.0 |
| | Total | 306 | 100.0 | 100.0 | |

Valid cases 306 Missing cases 0

v37 My work hours are different from usual

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| frequently | 1.00 | 93 | 30.4 | 30.4 | 30.4 |
| sometimes | 2.00 | 67 | 21.9 | 21.9 | 52.3 |
| seldom | 3.00 | 73 | 23.9 | 23.9 | 76.1 |
| never | 4.00 | 73 | 23.9 | 23.9 | 100.0 |
| | Total | 306 | 100.0 | 100.0 | |

Valid cases 306 Missing cases 0

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

V38 I have to leave work early for some reas

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| frequently | 1.00 | 15 | 4.9 | 4.9 | 4.9 |
| sometimes | 2.00 | 123 | 40.2 | 40.2 | 45.1 |
| seldom | 3.00 | 136 | 44.4 | 44.4 | 89.5 |
| never | 4.00 | 32 | 10.5 | 10.5 | 100.0 |
| | Total | 306 | 100.0 | 100.0 | |

Valid cases 306 Missing cases 0

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

V39 I have to start work late for some reaso

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| frequently | 1.00 | 14 | 4.6 | 4.6 | 4.6 |
| sometimes | 2.00 | 89 | 29.1 | 29.1 | 33.7 |
| seldom | 3.00 | 142 | 46.4 | 46.4 | 80.1 |
| never | 4.00 | 61 | 19.9 | 19.9 | 100.0 |
| | Total | 306 | 100.0 | 100.0 | |

Valid cases 306 Missing cases 0

V40

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | . | 306 | 100.0 | Missing | |
| | Total | 306 | 100.0 | 100.0 | |

Valid cases 0 Missing cases 306

v41 Have proof that the rideshare partner ha

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| not at all likely | 1.00 | 16 | 5.2 | 5.2 | 5.2 |
| not very likely | 2.00 | 35 | 11.4 | 11.4 | 16.7 |
| somewhat likely | 3.00 | 72 | 23.5 | 23.5 | 40.2 |
| very likely | 4.00 | 12s | 40.8 | 40.8 | 81.0 |
| extermely likely | 5.00 | 58 | 19.0 | 19.0 | 100.0 |
| | Total | 306 | 100.0 | 100.0 | |

Valid cases 306 Missing cases 0

V42 Have proof that the partner has auto ins

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| not at all likely | 1.00 | 19 | 6.2 | 6.2 | 6.2 |
| not very liekly | 2.00 | 16 | 5.2 | 5.2 | 11.4 |
| soemwhat liekly | 3.00 | 50 | 16.3 | 16.3 | 27.8 |
| very likely | 4.00 | 129 | 42.2 | 42.2 | 69.9 |
| extermely likely | 5.00 | 92 | 30.1 | 30.1 | 100.0 |
| | Total | 306 | 100.0 | 100.0 | |

Valid cases 306 Missing cases 0

V43 Have proof that the auto is in good repair.

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| not at all likely | 1.00 | 23 | 7.5 | 7.5 | 7.5 |
| not very likely | 2.00 | 20 | 6.5 | 6.5 | 14.1 |
| somewhat likely | 3.00 | 74 | 24.2 | 24.2 | 38.2 |
| very likely | 4.00 | 133 | 43.5 | 43.5 | 81.7 |
| extremely likely | 5.00 | 56 | 18.3 | 18.3 | 100.0 |
| | Total | 306 | 100.0 | 100.0 | |

Valid cases 306 Missing cases 0

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

V44 Would always find a ride when you use th

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| not at all liekly | 1.00 | 13 | 4.2 | 4.2 | 4.2 |
| not very likely | 2.00 | 13 | 4.2 | 4.2 | 8.5 |
| somewhat likely | 3.00 | 75 | 24.5 | 24.5 | 33.0 |
| very likely | 4.00 | 131 | 42.8 | 42.8 | 75.8 |
| extremely likely | 5.00 | 74 | 24.2 | 24.2 | 100.0 |
| | Total | 306 | 100.0 | 100.0 | |

Valid cases 306 Missing cases 0

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

V45 Someone of your own sex would always be

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| not at all likely | 1.00 | 186 | 60.8 | 61.0 | 61.0 |
| not very likely | 2.00 | 49 | 16.0 | 16.1 | 77.0 |
| somewhat likely | 3.00 | 48 | 15.7 | 15.7 | 92.8 |
| very likely | 4.00 | 19 | 6.2 | 6.2 | 99.0 |
| extremely likely | 5.00 | 3 | 1.0 | 1.0 | 100.0 |
| | . | 1 | .3 | Missing | |
| | Total | 306 | 100.0 | 100.0 | |

Valid cases 305 Missing cases 1

V46 You have no other obvious transportation

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| not at all important | 1.00 | 34 | 11.1 | 11.1 | 11.1 |
| not very important | 2.00 | 21 | 6.9 | 6.9 | 18.0 |
| somewhat important | 3.00 | 53 | 17.3 | 17.3 | 35.3 |
| very important | 4.00 | 105 | 34.3 | 34.3 | 69.6 |
| extremely important | 5.00 | 93 | 30.4 | 30.4 | 100.0 |
| | Total | 306 | 100.0 | 100.0 | |

Valid cases 306 Missing cases 0

---

v47 It would take a few minutes to arrange a

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| not at all important | 1.00 | 24 | 7.8 | 7.9 | 7.9 |
| not very important | 2.00 | 19 | 6.2 | 6.2 | 14.1 |
| somewhat important | 3.00 | 73 | 23.9 | 23.9 | 38.0 |
| very important | 4.00 | 122 | 39.9 | 40.0 | 78.0 |
| extremely important | 5.00 | 67 | 21.9 | 22.0 | 100.0 |
| | . | 1 | .3 | Missing | |
| | Total | 306 | 100.0 | 100.0 | |

Valid cases 305 Missing cases 1

---

V48 Would use the service if your requirement?

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| yes | 1.00 | 244 | 79.7 | 79.7 | 79.7 |
| no | 2.00 | 62 | 20.3 | 20.3 | 100.0 |
| | Total | 306 | 100.0 | 100.0 | |

Valid cases 306 Missing cases 0

# APPENDIX I

# AUTOMATED RIDEMATCHING SURVEY 3

1. YES
2. NO
3. DON'T KNOW/REFUSED

(PROMPT ONLY IF NO ANSWER)

SKIP AFTER Q5 IF Q<5> NE "1" THEN GO 14

*************************************************************************

6. CAN YOU TELL ME HOW MANY PEOPLE WERE ON YOUR LIST ?

*************************************************************************

7. DID YOU ATTEMPT TO CONTACT ANY OF THOSE PEOPLE ?

1. YES, I USED THE AUTOMATED MESSAGE SYSTEM TO LEAVE A VOICE MAIL MESSAGE
2. YES, I PHONED THE PEOPLE ON THE LIST
3. TRIED BOTH OF THE ABOVE
4. NO

(READ PRE-CODED RESPONSES-EXCEPT FOR 'DON'T KNOW','REFUSED',ETC)

SKIP AFTER Q7 IF Q<7> EQ "4" THEN GO 9

*************************************************************************

8. DID YOU ARRANGE A RIDE OR NEW CARPOOL WITH ANY OF THE PEOPLE YOU CONTACTED ?

1. YES
2. NO
3. DON'T KNOW/REFUSED

(PROMPT ONLY IF NO ANSWER)

*************************************************************************

9. WERE YOU HAPPY WITH THE SERVICE ?

1. YES
2. NO
3. DON'T KNOW/REFUSED

(PROMPT ONLY IF NO ANSWER)

SKIP AFTER Q9 IF Q<9> NE "2" THEN GO 11

*************************************************************************

10. WHY NOT ?

*************************************************************************

11. WOULD YOU TRY USING THE SERVICE AGAIN ?

1. YES
2. NO
3. DON'T KNOW/REFUSED

(PROMPT ONLY IF NO ANSWER)

SKIP AFTER Q11 IF Q<11> EQ "2" THEN GO 13
SKIP AFTER Q11 IF Q<11> EQ "3" THEN GO 14

*************************************************************************

12. WOULD YOU USE IT ?

1. FREQUENTLY
2. OCCASIONALLY
3. VERY INFREQUENTLY

(READ PRE-CODED RESPONSES-EXCEPT FOR 'DON'T KNOW','REFUSED',ETC)

SKIP AFTER Q12 IF Q<12> GT "0" THEN GO 14

******************************************************************************
13. WHY NOT ?
******************************************************************************
14. HAVE YOU EVER BEEN CONTACTED BY OTHERS USING THIS AUTOMATED PHONE SERVICE TO FIND A CARPOOL PARTNER OR RIDE JUST FOR ONE DAY ?

1. YES
2. NO

(PROMPT ONLY IF NO ANSWER)

SXIP AFTER Q14 IF Q<14> EQ "2" THEN GO 18
******************************************************************************
15. HOW MANY PEOPLE HAVE CONTACTED YOU ?
******************************************************************************
16. DID YOU JOIN A CARPOOL OR GIVE A RIDE ?

1. YES
2. NO

(PROMPT ONLY IF NO ANSWER)

SKIP AFTER Q16 IF Q<16> EQ "1" THEN GO 18
******************************************************************************
17. WHY NOT ?
******************************************************************************
18. BY WHAT MEANS DO YOU USUALLY TRAVEL TO AND FROM WORK ?

1. DRIVE ALONE
2. CARPOOL
3. VANPOOL
4. TAKE THE BUS
5. TAKE THE TRAIN
6. WALKING OR BIKING
7. OTHER (SPECIFY) (OTHER LINE = 42)

(READ PRE-CODED RESPONSES-EXCEPT FOR 'DON'T KNOW','REFUSED',ETC)
******************************************************************************
19. GENDER ?

1. MALE
2. FEMALE

(PROMPT ONLY IF NO ANSWER)
******************************************************************************
20. PLEASE RECORD RESPONDENT'S NAME
******************************************************************************
21. PLEASE RECORD RESPONDENT'S PHONE NUMBER
******************************************************************************
57. ENTER SURVEYOR FIRST & LAST NAME, SPELLED CORRECTLY !!
******************************************************************************

# APPENDIX J

# EXPERIMENTAL DESIGN

ARMS Experiment

## Experimental Desian

| Date | Location | Zip code | Ride type | Time | Call type |
|---|---|---|---|---|---|
| | | | | 4pm | |
| 2/22/95 | Burbank | 91564 | Manual | 5pm | Round-trlp |
| | | | | 6pm | |
| 2/23/95 | Arleta | 91331 | Manual | 4pm | One-way |
| 2/23/95 | Westwood | 90049 | Manual | 5pm | Round-trip |
| | | | | 6pm | |
| | | | | 4pm | |
| | | | | 5pm | |
| 2/27/95 | Sherman Oaks | 91403 | Manual | 6pm | Round-trip |
| 2/28/95 | Valencia | 91355 | Manual | 4pm | One-way |
| 2/28/95 | Arleta | 91331 | Manual | 5pm | Round-trip |
| | | | | 6pm | |
| 3/1/95 | Altadena | 91001 | Manual | 4pm | One-way |
| | | | | 5pm | |
| | | | | 6pm | |
| 3/6/95 | Los Angeles | 90026 | Manual | 4pm | One-way |
| | | | | 5pm | |
| | | | | 6pm | |
| | | | | 4pm | |
| 3/7/95 | Glendale | 91203 | Manual | 5pm | Round-trip |
| 3/7/95 | La Crescenta | 91214 | Manual | 6pm | One-way |
| | | | | 4pm | |
| 3/8/95 | Chatsworth | 91311 | Manual | 5pm | Round-trip |
| | | | | 6pm | |
| | | | | 4pm | |
| 3/9/95 | Sylmar | 91342 | Manual | 5pm | Round-trip |
| 3/9/95 | Saugus | 91350 | Manual | 6pm | One-way |
| | | | | 4pm | |
| 3/13/95 | Mission Hills | 91344 | Manual | 5pm | One-way |
| | | | | 6pm | |
| 3/14/95 | Saugus | 91350 | Manual | 4pm | Round-trip |
| | | | | 5pm | |
| 3/14/95 | Northridge | 91324 | Manual | 6pm | One-way |
| 3/16/95 | Woodland Hills | 91367 | Manual | 4pm | One-way |
| | | | | 5pm | |
| 3/16/95 | Valencia | 91355 | Manual | 6pm | Round-trip |

| bate | Location | Zip code | Ride type | T i m e | Call type |
|---|---|---|---|---|---|
| 3/20/95 | La Crescenta | 91214 | Automatic | 4pm | Round-trip |
| 3/20/95 | Westwood | 90949 | Automatic | 5pm | Round-trip |
| | | | | 6pm | |
| 3/21/95 | Sylmar | 191342 | Automatic | 4pm | Round-trip |
| | | | | 5pm | |
| 3/21/95 | Altadena | 91001 | Automatic | 6pm | Round-trip |
| | | | | 4pm | |
| 3/22/95 | Saugus | 91350 | Automatic | 5pm | One-way |
| 3/22/95 | Mission Hills | 91344 | Automatic | 6pm | One-way |
| 3/23/95 | Chatsworth | 91311 | Automatic | 4pm | Round-trip |
| | | | | 5pm | |
| 3/23/95 | Arleta | 91331 | Automatk | 6pm | Round-trip |
| 3/27/95 | Woodland Hills | 91367 | Automatic | 4pm | One-way |
| | | | | 5pm | |
| 3/27/95 | Northridge | 91324 | Automatk | 6pm | One-wry |
| 3/28/95 | Mission Hills | 91344 | Automatic | 4pm | Round-trip |
| 3/28/95 | Sherman Oaks | 91403 | Automatic | 5pm | Round-trip |
| | | | | 6pm | |
| | | | | 4pm | |
| 3/29/95 | Valencia | 91355 | Automatk | 5pm | One-way |
| 3/29/95 | Chatsworth | 91311 | Automatic | 6pm | One-way |
| | | | | 4pm | |
| 3/30/95 | Northridge | 91324 | Automatic | 5pm | Round-trip |
| 3/30/95 | Woodland Hills | 91367 | Automatic | 6pm | Round-trip |
| | | | | 4pm | |
| 4/3/95 | Sherman Oaks | 91403 | Automatic | 5pm | One-way |
| 4/3/95 | Sylmar | 91342 | Automatic | 6pm | One-way |
| | | | | 4pm | |
| 4/4/95 | Westwood | 90049 | Automatic | 5pm | One-way |
| 4/4/95 | Burbank | 91594 | Automatic | 6pm | One-way |
| 4/5/95 | Burbank | 91504 | Automatic | 4pm | Round-trip |
| | | | | 5pm | |
| 4/5/95 | Los Angeles | 90026 | Automatic | 6pm | Round-trip |
| 4/6/95 | Glendale | 91203 | Automatic | 4pm | One-way |
| 4/6/95 | La Crescenta | 91214 | Automatic | 5pm | One-way |
| | | | | 6pm | |

# Kiosk Location by Zip Code

**Smart Traveler Project**