Title
Evaluation Of The Transit Information System In Southern California

Authors
Le Colletter, Emmanuel
Yim, Youngbin
Hall, Randolph

Publication Date
1993

CALIFORNIA PATH PROGRAM
INSTITUTE OF TRANSPORTATION STUDIES
UNIVERSITY OF CALIFORNIA, BERKELEY

Evaluation of the Transit Information System in Southern California

Emmanuel Le Colletter
Youngbin Yim
Randolph Hall

UCB-ITS-PRR-93-10

This work was performed as part of the California PATH Program of the University of California, in cooperation with the State of California Business, Transportation, and Housing Agency, Department of Transportation; and the United States Department of Transportation, Federal Highway Administration.

AUGUST 1993

ISSN 1055-1425

Acknowledgement

This work was performed as part of the PATH program of the University of California, in cooperation with the State of California, Business and Transportation Agency, Department of Transportation, and FHWA.

The authors wish to acknowledge Mr. Doug Anderson and Ms. Lola Gagnier at MTA who provided data for this study. Special thanks to Mr. Harry Goldsborough of MTA for his assistance in the design of the survey instrument and Mr. Brian Pfeiffle who conducted the experiment with six students from the University of California at Los Angeles. The authors also wish to acknowledge Caltrans for their financial support and Mr. Robert Ratcliff who provided invaluable comments on this study.

Table of Contents

Lii of Figures

List of Tables

Executive Summary

This is an empirical study of current and potential transit users in Southern California. Since the early 1970s, the Metropolitan Transit Authority (MTA), formerly known as Southern California Rapid Transit District, has developed an extensive database with dynamic transit schedule and route guidance information. MTA is the third largest urban transit operator in the U.S. and uses the Computerized Customer Information System (CCIS) which operates on an IBM mainframe. The MTA information system is among the most advanced in the country. To investigate the way in which dynamic transit information was used and perceived by travelers, the MTA telephone information service was evaluated using the survey research method.

The objectives of the experiment were: (1) to assess the perception of dynamic transit information service, (2) to identify the media which can most effectively disseminate transit information, and (3) to compare the information service by human operators with the service by an automated system. In August 1992, an experiment was conducted among 120 shoppers at Broadway Plaza, an indoor shopping mall in downtown Los Angeles. The subjects were asked to call the MTA telephone information service, then to fill out a questionnaire. Pre- and post-call interviews were conducted to determine the extent to which dynamic information services influence travelers perceptions of MTA transit service.

Of the participants, 52.6% were non-transit riders (discretionary riders) and 36.8 % were regular transit riders. When compared with the transit user population in the City of Los Angeles, the sample was over-represented by transit riders. However, the results of the experiment were not weighted because of the experimental nature of the study.

The experiment showed that the perception of transit service improved somewhat after receiving information from the MTA operator. Of the participants who seldom ride transit, 35 % said that the likelihood of taking transit increased after receiving information while 50% of frequent transit riders said the same. The primary reason is that they believed the information received was reliable and accurate.

Currently MTA disseminates information through telephone, fax, PC, and the electronic bulletin board. The overwhelming majority (87.1%) of the subjects interviewed favored telephone information to other forms of media.

To provide readily accessible transit information to travelers, MTA recently extended implementation of an automated system called Regional Transportation Information Network (RTIN) with a 900 number. RTIN provides transit information with a synthesized voice. To access RTIN, a seven-digit number code is used for origin and destination and the cost of a call is 35 cents a minute. Each call takes about two minutes to get the itinerary information.

When the information given by a human operator is compared with a synthesized voice, subjects indicated that the information service provided by the human operators was superior in terms of friendliness, clarity of directions, adequate speed of speech, and confidence in the information received. However, the automated system resulted in improved call response time. The experiment suggests that the ability to interact is valuable to callers in order for them to comprehend information. When subjects were asked to describe in writing the information received, they wrote less information and made on the average more mistakes with the synthesized voice than with the human operators. However, the automated system substantially reduces call-waiting time.

Improvements to be made on the current MTA system are mostly in accessibility to information. Call-waiting time is too long with human operators. For RTIN, improvements are needed in the quality of speech and in its interactive capabilities. Personal computer or videotext services may provide the interactive capability desired by users. In addition to the current service provided by MTA, information that would be helpful to travelers include frequency of bus service, travel time, alternate fare information, real-time transit schedule information, and safety of neighborhoods. In providing itinerary information, description of landmarks would be helpful to travelers.

In general, the study suggests that the MTA telephone information service increased travelers' confidence in transit. This is an important factor which influences travelers' decisions to take transit. With the improved MTA information service, the largest benefit

may be to make transit more accessible to those who are transit dependent than to increase ridership of discretionary users.

1. Introduction

This report presents a study of the effectiveness of the transit telephone information system at Metropolitan Transit Authority (MTA), from both the user's and the operator's perspective. It is the final report of PATH project MOU 69 funded by CalTrans through the California Advanced Public Transportation Systems program (CAPTS).

MTA, formally known as Southern California Rapid Transit District (SCRTD), is one of the largest urban transit operators in the United States. Created in 1964, it provides bus and light rail service in the greater Los Angeles region. Its large 1,442-square mile service area covers Los Angeles County and large parts of Ventura, Orange, and San Bernardino Counties. MTA carries 1.3 million riders in a weekday and 409 million annually (1991). The network comprises more than 200 bus routes and one light rail line stretching 22 miles between Downtown Los Angeles and Long Reach. MTA operates an impressive fleet of 2500 buses and 54 light rail trains.

To help potential transit users find their way on this extended network, MTA provides a telephone information service offering itinerary, schedule and fare information. The system operates from a computerized database including the routes of twenty-four transit operators in the L.A. area. Presently, 105 operators handle 12,000 calls daily, for a total of 4 million calls annually.

The objective of this project is to investigate the effects of transit telephone information on trip behavior. The study looks at both the supply and the demand side of the provision of telephone information. It explores the way transit information is recorded and used by callers, and looks at the potential impact on their mode choice decision. It also gives a clear portrait of the public perception of MTA telephone information service, for both the operators and the synthesized voice system. The supply side is also covered with a review of the costs and the operating characteristics of the telephone information system, as well as with a close look to a sample of phone calls made to the service.

The first part of the report presents a literature review on the subject, The bulk of the

experiment is covered in part 3, where both the results of the survey and the analysis of the phone calls made to the service are presented. Part 4 presents the operating characteristics of the telephone information system and the costs incurred to provide such a service. Finally, the fifth section summarizes the findings and implications of the study.

2. Literature Review

This part of the report presents an overview of the research that has been conducted on the provision of transit information and the way it is perceived by users. A special emphasis is first placed upon work related to the effectiveness of transit telephone information systems, especially at MTA. The two different approaches that have been used to provide telephone information services are reviewed in terms of their objectives. The last part of this literature review summarizes work done on the trip behavior of users provided with transit information.

2.1. Effectiveness of transit telephone information systems

Since the 50s, the transit industry has faced fierce competition from the private automobile, which severely eroded its traditional demand base. Facing constant declines in ridership and ever increasing operating costs, transit operators reacted in several ways. A better marketing of public transportation appeared as one of the solutions able to reverse the downward trend. Transit operators realized they were in a position of selling a service to customers who had more than one alternative for their transportation needs.

Marketing efforts in the transit industry can take several different forms: radio or television ads, maps or timetables, newspaper announcements, and telephone information services.

This latter form of marketing has several distinct advantages over other media. It is easily accessible to a large share of the population; it allows the information to be quickly updated to reflect changes in service; and, more importantly, it permits information to be personalized to the specific needs of individual customers.

Telephone information service is now considered an essential public service and is provided by almost every transit agency in North America. Traditionally, the information has been provided by agents who refer to a hard-copy database consisting of street and route maps, schedule information, and daily bulletins of service modifications. This mode of information retrieval, although still widely in use, is extremely labor-intensive and therefore

costly to operate. Starting in the 70s, various efforts have been undertaken to computerize part of the operations in order to reduce cost and increase call-handling capacity.

In North America, these efforts have taken two general directions: some focused on computerized information storage and retrieval within the traditional telephone information system (TIS) environment while others developed fully automated schedule information to provide callers with stop-specific arrival times, without the need of information agents. The former aimed at improving agent productivity and information consistency, while the latter was aimed at increasing ridership by reducing uncertainty associated with waiting time at bus stops.

2.2. Computerized data retrieval within the existing TIS environment

In the early 70s, results of research concerning automated data retrieval and route finding algorithms were combined to create ***Passenger Routing Information System*** (PARIS), a software package that was successfully implemented at Santa Monica Transit in 1974. Based on that work, the Washington Metropolitan Area Transit Authority (WMATA) and the Southern California Rapid Transit District (MTA) began in the late 70s to develop an automated data storage and retrieval system for telephone information purposes.

2.3. The Los Angeles experience

The population of Los Angeles has been described as "transit ignorant" due to low transit usage. Indeed, in spite of its large size, MTA accounts for only 4% of all trips in the Los Angeles area. Trip patterns in L.A. do not focus on the traditional CBD but are rather diffuse and complex. People have to travel very long distances and thus lack the geographical awareness about their destination point.

In that context, transit telephone information is particularly important although, as Cutler and Putter point out: ***"there is not a long history at Los Angeles of enthusiasm for transit information services. The main emphasis has traditionally been on providing essential information as efficiently as possible."***[1]

1 Cutler, M.R. and Potter, R.F., p. 6.12.

In 1977, approached by the firm that developed PARIS, MTA began developing its ***Computerized Customer Information System*** (CCIS). At its beginnings, CCIS was implemented only for the San Fernando Valley bus network; since 1987, it has been used for the entire Los Angeles area.

The main objective of CCIS was to increase agent's productivity such that more calls could be handled with the same resources. The better accuracy and consistency of the computer's response was considered by Doug Anderson, Los Angeles' Systems Coordinator ***"to be more of a desirable by-product, rather than the central goal of automated data retrieval technology."***[2]

CCIS did allow operators, especially the more experienced ones, to increase their productivity, as was shown in a before-and-after study conducted by Wilson-Hill. The computerized system also allowed MTA to eliminate the hard copy database, partly because the mainframe itself was providing a back-up. This permitted significant savings in printing and updating costs. CCIS further allowed MTA officials to reduce the agent training period from eight to four weeks. This proved to be one of the most positive impacts of CCIS: it improved personnel recruitment and retention, and made it worthwhile to hire part-time employees, which later provided the management with extra flexibility in scheduling personnel. The implementation of CCIS finally had positive impacts on information consistency and reliability, as well as on agents' overall job satisfaction.

CCIS was upgraded in 1992 to include the automatic delivery of itineraries through the use of a synthesized voice. The new feature, known as Regional Transportation Information Network **(RTIN)** allows callers to input a code for their origins and destinations using a touch-tone phone, without having to deal with an operator. Origin and destination codes for all major cross streets are published in a catalogue which is easily available. Landmark information is also provided. Employer members of ***Corporate Transit Partnership also*** have a seven-digit code that is understood by RTIN. In 1992, RTIN was fully implemented using a 900 number. Each call costs 35 cents per minute.

---

2 Ibid, p. 6.13.

2.4. The Washington experience

Because it was one of the first of its kind, the development, implementation, and evaluation of ***the Automated Information Directory System*** (AIDS) at WMATA has been thoroughly documented (see Phillips, 1983; Diewald and al, 1983; Cutler and Potter, 1984; Ross and Soberman, 1987).

The system developed in Washington is comparable to the one used by MTA, although it is installed on microcomputers while CCIS operates on a mainframe. The implementation of AIDS in Washington has brought similar benefits to those in Los Angeles, although the reductions in hardcopy material and training time were not achieved. The difference can be explained by the different philosophies of the two transit authorities. In Washington, agents have a clear marketing role, while in Los Angeles greater emphasis is placed on the number of customers served, and more complex requests are referred to the supervisor.

An evaluation of the cost-effectiveness of transit telephone information systems was performed by the WMATA Office of Marketing in March 1983 (Cutler and Potter, 1984). A phone survey was conducted among 890 callers to the service and 602 valid questionnaires were completed. Eighty-two percent (82%) of the callers indicated that they did take the trip for which they called. Out of these people, 67% stated that they would not have taken the trip by transit without the information they obtained from the telephone service. Using these results and the average fare, WMATA calculated that a thousand calls to the telephone information service would generate $858 in transit revenue. At an estimated cost of $620 / 1000 calls, the telephone information service contributes $238 / 1000 calls in net revenues to WMATA. By extrapolating from the 2,190,000 calls handled by the service in 1982, WMATA estimated that the telephone information service accounts for $520,000 of the authority's revenues. These benefits were calculated assuming that each "effective" call generates only one ride. It might be that people will take more than one trip as a result of a call.. Indeed, respondents indicated in WMATA's survey that, on average, they would take the same trip 12 times/month.

Other interesting findings emerged from the survey. Although 80% of the callers did not have a car available at the moment they called, 56% stated that they have an automobile available at certain times. These callers are not entirely transit dependent, which confirms

the essential marketing role of telephone information systems to attract the so-called "choice" riders.

The survey also revealed that 56% of the trips made by the callers took place during the off-peak period, compared to a 37% average system-wide. This confirms the general belief that telephone information services are most useful to the infrequent, off-peak rider rather than to the daily commuter who obviously knows the information needed to make the trip.

2.5. Other Studies

A survey conducted by the Denver Rapid Transit District in 1986 led to similar results to what was found in Washington (Telephone Information Center, Denver RTD, 1986). The survey showed that RTD telephone information service generates $1.10 per call of trip revenue and around the same amount of sales revenue, for a possible $2.20 of total revenue. These figures take into account all the expected repetitions of the called-about trip during the next seven days, as stated by the respondents themselves. The authors concluded from the research that transit telephone information is ***"a necessary, relatively well-received, and revenue-generating service."*** [1]

2.6. Automated schedule information systems

As stated earlier, a second form of automated transit telephone information systems provides callers with fully automated schedule information (stop-specific arrival times), without the need for a telephone operator. These systems are aimed at increasing ridership by reducing uncertainty associated with waiting time at bus stops, especially at night or during poor weather.

This type of system was first implemented in Canada; it was marketed under the name "Telerider" . The first version was tested in Mississauga, Ontario and included both bus position monitoring and arrival time calculation capabilities to provide callers with real-time information (which is based on the actual position of the bus rather than its scheduled location).

---

1 Telephone Information Center, p. 6.

The version of Telerider which is now sold throughout North America does not include the complex real-time capabilities and gives only scheduled arrival times. The information is transmitted without the need of an agent because bus stop locations are coded in the phone numbers themselves (the first three digits give access to the service, the next two indicate the bus line, and the two last ones identify the precise stop for which the next arrival time is requested).

The impact of this kind of service on ridership has been investigated, but conflicting results were obtained. Ross and Soberman examined route by route transit riderships in four Canadian cities before and after the implementation of Telerider. In Winnipeg, Mississauga, Kitchener, and Guelph, no clear correlation could be established between the deployment of Telerider and ridership (Ross and Soberman, 1987). However, Diewald ***et al*** showed that Telerider in Ottawa had a clear positive impact on ridership in each time period of the day (peak, midday, and evening) and also contributed to improve public perception of the transit authority (Diewald et al, 1983).

Telerider has also been implemented in the United States: the transit authorities of Salt Lake City, Pittsburgh, Colombus and San Diego all have tested the system. It was found to have no significant impact on ridership in Salt Lake City and San Diego, while in Colombus, Telerider bus routes performed 7% better than the control routes. In light of these results, the Central Ohio Transit Authority (COTA) implemented Telerider system-wide in 1983 (Ross and Soberman, 1987).

2.7. Effect of transit information on transit trip behavior

Another way to look at the effectiveness of transit information is to observe the trip behavior of users provided with directions. We summarize here the results of a few studies looking at that aspect.

Geehan and Deslauriers (1978) found that few people correctly interpret transit timetables: only nine percent of their 580 subjects were able to determine from a schedule when the next bus would pass their home. They also reported that "between 23 percent and 69 percent of the respondents were unable to use a transit route guide to plan an actual transit trip."

Bronzaft examined whether the inability to correctly interpret transit information would adversely affect transit trip time (Bronzaft ***et al*** , 1976). Twenty students were provided maps of the New York City subway, and were then asked to visit five stations on a set itinerary. All subjects took longer than necessary because they chose indirect or mistaken routes, or had to backtrack.

Hall also studied the influence of trip information on route choice (Hall, 1983). A set of 50 students were observed as they traveled to a specified location accessible by several bus lines, 1 **1/2** mile away. Twenty students received no information, fifteen received maps only, while another fifteen received both maps and schedules. Subjects supplied with maps reached their destination significantly faster than those without information. However, subjects provided with both maps and schedules took longer than those using maps alone. This result indicates that riders are unable to adjust their route to take advantage of a specific schedule.

A surprisingly wide variety of itineraries was obtained among the students and very few subjects took the shortest route to reach the destination. Subjects were more concerned about finding any route than by minimizing the travel time. Various personality attributes such as skill and attitude toward bus riding proved to be more significant in route choice than the standard criterion of fastest paths. The experiment also showed that route choice was a dynamic process, since subjects constantly reevaluated their decision in light of the last information received

All these studies agree that people's ability to plan a trip from map and schedule information is rather limited. This largely explains the demand for transit telephone information services, where itineraries are provided on a personalized basis. No study has yet looked at the way this information is interpreted and used by the callers; this is the objective of the next section.

3. Experiment

The experiment was designed to investigate the effects of transit telephone information on trip behavior. The study looked at both the supply and the demand side of the provision of telephone information. The objective was to determine how efficiently transit information is provided by operators, and how efficiently it is recorded and used by callers. The analysis of callers' behavior was conducted through a test and a survey (presented in section 3. 1), while the analysis of the directions provided by operators was performed from a transcript of a sample of phone calls (section 3.7).

3.1. Test and survey of callers

The analysis of how callers perceive transit telephone informa-tion was conducted through a test and survey administered to a sample of transit and non-transit users. The survey was conducted at Broadway Plaza, an indoor shopping mall in the heart of downtown Los Angeles, during two weeks in August 1992. The survey was conducted by college students, under the banner of MTA and CalTrans. Surveyors worked during lunch hours, from a table set up in a central and busy location of the mall. Passerby's were offered a $5 gift certificate for their collaboration in the experiment. Surveyors first handed in the survey to anyone who approached the table, but later selected the participants to balance the number of transit and non-transit users. Public participation was enthusiastic and resulted in the completion of 120 tests, far more than the initial objective of 50.

The test was composed of five parts. The first portion consis-ted of a survey of participants' travel behavior in general, looking at the mode, purpose, frequency, and length of their most frequent trips. A special emphasis was placed on reasons for use or non-use of public transportation, including a detailed assessment of participants' perception of transit in the Los Angeles area.

The second part of the test was aimed at providing a precise portrait of the effectiveness of the information provided by the MTA telephone information service. Participants were asked to call the information service and to write down the directions they obtained. Participants were divided into two experimental groups. During the first week, participants

asked the MTA operator for directions to their most frequent destination. In the second week of the experiment, all participants were instructed to request directions for a single standardized trip, which was to be taken at a specific time, and included the use of two buses and a transfer. The experiment was expanded during the second week to compare the human operator to RTIN, the new system which permits MTA to deliver the directions through a synthesized voice. The fifty participants obtained information from both a human operator and the synthesized voice, about half of the participants starting with the operator and the other half beginning with RTIN. This design was used to control for any bias in the second call, due to information obtained in the first. During each phone call, surveyors collected information on the quality of service provided: the waiting, holding, and answering time were recorded. Participants were also asked to record independently the perceived service times.

Following each phone call, participants were asked about the quality of the service provided in terms of clarity and usefulness of directions as well as performance of the operator or the synthesized voice system. The participants' perception of transit in the area was assessed once again to determine whether the phone call had any impact.

In order to evaluate whether the sample was representative of the general population, the last part of the survey consisted of questions characterizing socioeconomic profile.

An additional part of the experiment was optional: all participants were offered $10 to complete the trip for which they had requested directions in the experiment. The condition was the completion of a follow-up survey, where participants were asked for details on their trip. They were also questioned once more about their general perception of transit, to see whether it had been affected by their recent experience.

3.2. Socioeconomic profile of participants

This section presents the socioeconomic profile of the respond-ents in the sample, and compares it to the general population of the City of Los Angeles, using data from the 1990 census. This is done to check whether the sampling technique induced significant biases in the results. For further insight, a comparison with MTA riders is also presented for the gender, age, and ethnic origin variables, as provided by the transit authority. Notice that

this last data is given only as an indication, since the sample was not intended to include only transit riders. The detailed results from the entire questionnaire are in Appendix A.

The sample includes a large proportion of males: they represent 60.2 % of the participants while they account for 50.2% of the population of the city and for only 45% of total MTA ridership, as shown in Table 3.1.

Table 3.1. Gender

Gender	Sample	L.A.City(1990)	MTA riders
Male	60.2%	50.2%	45%
Female	39.8%	49.8%	55%

The questionnaires were administered only to people who were more than 18-years old. As can be seen in Table 3.2, the distribution of ages obtained in the sample is very representative of the one observed in the City of Los Angeles (once the percentages for the city are adjusted using the population older than 18 as a basis). It is also worth noticing that there is a larger proportion of both young and elderly (more than 60 years old) among MTA riders than in the city as a whole.

Table 3.2. Age

AGE	Sample	L.A. (1990)*	MTA riders*
From 18 to29	32.8%	31.3%	37%
From 30 to 39	29.9%	24.5 %	22%
From 40 to 49	11.9%	15.9%	10%
From 50 to 59	11.9%	10.5%	6%
60 and older	13.4%	17.9%	25%

* Percentages based on population older than 18.

Looking at the ethnic origin of participants, it can be seen that the sample contains a larger proportion of African Americans and a correspondly smaller share of whites than in the city of Los Angeles. This under representation of whites is however somewhat reflective of the high proportion of transit users in the sample, since whites account for only a small 10% of MTA ridership. People of Hispanic origin account for an impressive 45 % of MTA riders while they form only around 20% of both the sample and the population of Los Angeles. Table 3.3 summarizes these results.

Table 3.3. Race

Race	Sample	L.A.(1990)	M T A riders
White	41.9%	52.8%	10%
African American	27.6%	14.0%	25%
Hispanic/Latino	21.0%	22.9%	45%
Asian/Asian-American	8.6%	9.8%	10%
Native American	1.0%	0.5%	-

The survey also showed that most participants have lived in the Los Angeles area for a long period of time. Only 3.7% of the participants have been in L.A. for less than one year while 78.7% of them have lived there for five years or more. These values are consistent with data from the 1990 census.

The fact that the survey was conducted among adults, during a workday in a downtown area, induced an over representation of people from the working force in the sample. Indeed, employed people account for 79.6 % of the sample, but for only 61.6 % of the population in L. A. On the other hand, only 11.1% of the participants were from the inactive population, which actually represents 32.8% of the total population.

The income distribution of the participants is fairly consistent with what is observed in the general population of Los Angeles; people with lower income being just slightly over represented in the sample. A question about household size further showed that 32.7% of the participants live in l-adult household, 42.6% in 2-adult households, the remaining 24.8% of the sample living in larger households. The number of adults per household is not directly available from the census but data on people per household indicate that the sample seems representative of the general population in terms of household size.

Participants were also inquired about the number of cars in their household. Surprisingly, the number of two-car households is larger in the sample than in the general population of the city. Similarly, there is a smaller proportion of single-car households in the sample, as shown in Table 3.4. This result is probably due to the high percentage of employed people in the sample.

Table 3.4. Automobile Ownership

Number of cars	L.A. City (1990)	MTA riders
None	16.8%	15.3%
One	**29.9%**	**39.3%**
Two	41.1%	31.2%
Three or more	12.1%	14.3%

To summarize the comparison, the sample is relatively representative of the population of the City of Los Angeles, although the site of the experiment induced an over representation of males and employed people. This might be, however, reflective of the population working in the downtown area.

3.3. Trip behavior of participants

This part of the survey was designed to characterize the trip behavior of participants and to determine their motivations to use or not to use transit. Respondents were first asked about their most frequent purpose of traveling. Work trips clearly predominate, being mentioned by three quarters of the participants. School and shopping trips appeared second; both were mentioned by 8% of the people. Participants were then asked for the mode of transportation used for this most frequent trip purpose. The majority of people (52.6%) reported that they drive alone, while 36.8% used transit. These values were compared to the information about the mode used for work trips, which is available from the census. Table 3.5 presents both results. The sampled population contains a larger proportion of transit riders, as expected from the downtown location of the experiment and the efforts of surveyors to balance the number of riders and non riders in their sample.

Table 3.5. Modal Characteristics

Mode	Sample	L.A. (1990)
Drive alone	52.6%	67.3%
Ride transit	36.8%	10.8%
Ride carpool	7.0%	15.9%
Bike	2.6%	0.6%
Walk	0.9%	4.0%
Other	0.0%	1.4%

Participants were further asked about their frequency of transit usage. A third (33.6%) of the respondents did not ride transit in the past week, while 22.5% rode it only once or twice. Frequent transit users (5 times or more in the past week) accounted for 35.4% of the sample. Similar results were obtained regarding the use of transit in the past month. A specific question was asked about the use of the Blue Line, which is the recent light rail line linking downtown Los Angeles to Long Beach. Its usage was limited among the participants: a large majority (85.1%) of the people had not used it in the previous month.

Three quarters (75.7%) of the participants have access to a car whenever they need one, less than the percentage for the City of Los Angeles, where 84.7% of the population have access to an automobile. The smaller proportion for participants is consistent with the high

proportion of transit users in the sample. Notice that the proportion of transit users (36.8 %) is still larger that the percentage of transit captives (24.3 %).

Participants were also asked about the length of their most frequent trip, and the distribution obtained was compared to the work trip length distribution from the census, as shown in Table 3.6. Participants tend to travel longer that the general population of Los Angeles; this might be a reflection of the downtown location of the survey.

Table 3.6. Travel Time

Travel time	Sample	L.A.(1990)
Less than 15 minutes	13.5%	18.9%
From 15 to 29 minutes	19.8%	26.4%
From 30 to 44 minutes	36.0%	30.3%
From 45 to 59 minutes	8.1%	5.6%
One hour or more	22.5%	18.8%

Two fifths (40.0%) of the participants reported that their employer provides free parking; the remaining people pay an average of $85 per month in parking costs. One third (32.4%) of the participants also said that their employer subsidizes transit.

Participants were also asked about their motivation to ride or not to ride transit for their most frequent trip purpose; the results are shown in Figure 1. A third (33.3%) of the transit users stated that they use transit for convenience or preference whereas another quarter (25.0%) invoked economic reasons to justify transit use. Captive riders formed a third (33.3%) of the sampled transit users.

People using a car for their most frequent trips mentioned inconvenience as the main deterrent to public transportation use (Figure 3.2). This perception was mostly due to excessive trip length, but impractical routes and schedules were also mentioned by some car users. A third (36.0%) of them also mentioned that they prefer their car to any form of public transportation.

Figure. 3.1. Reasons Justifying Use of Transit

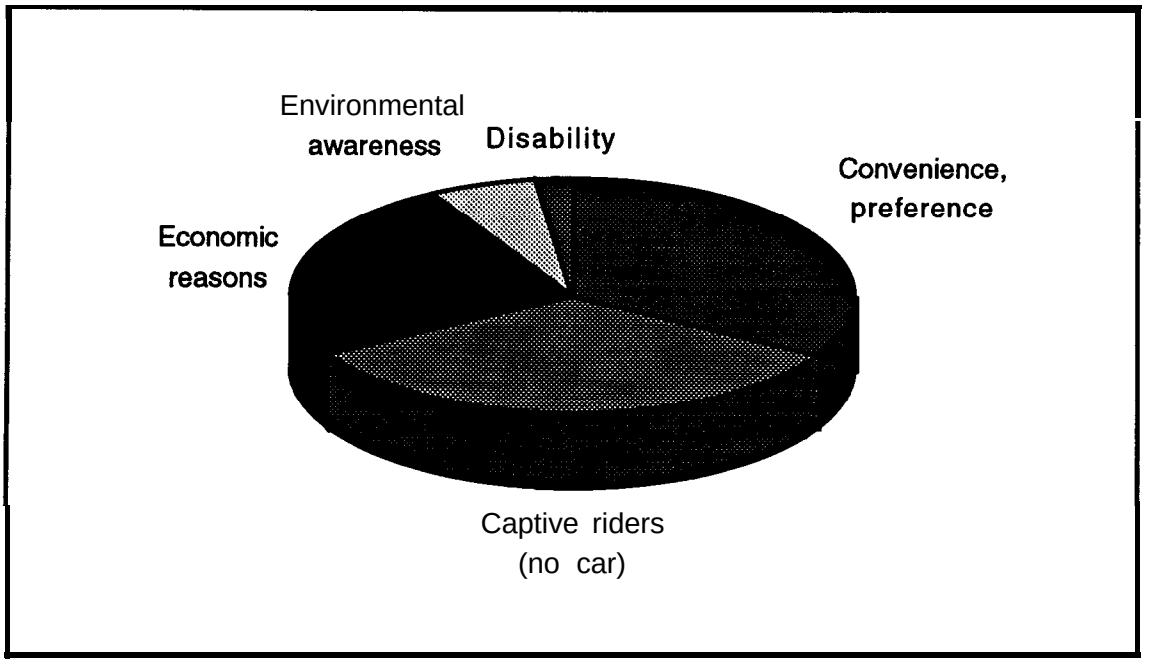
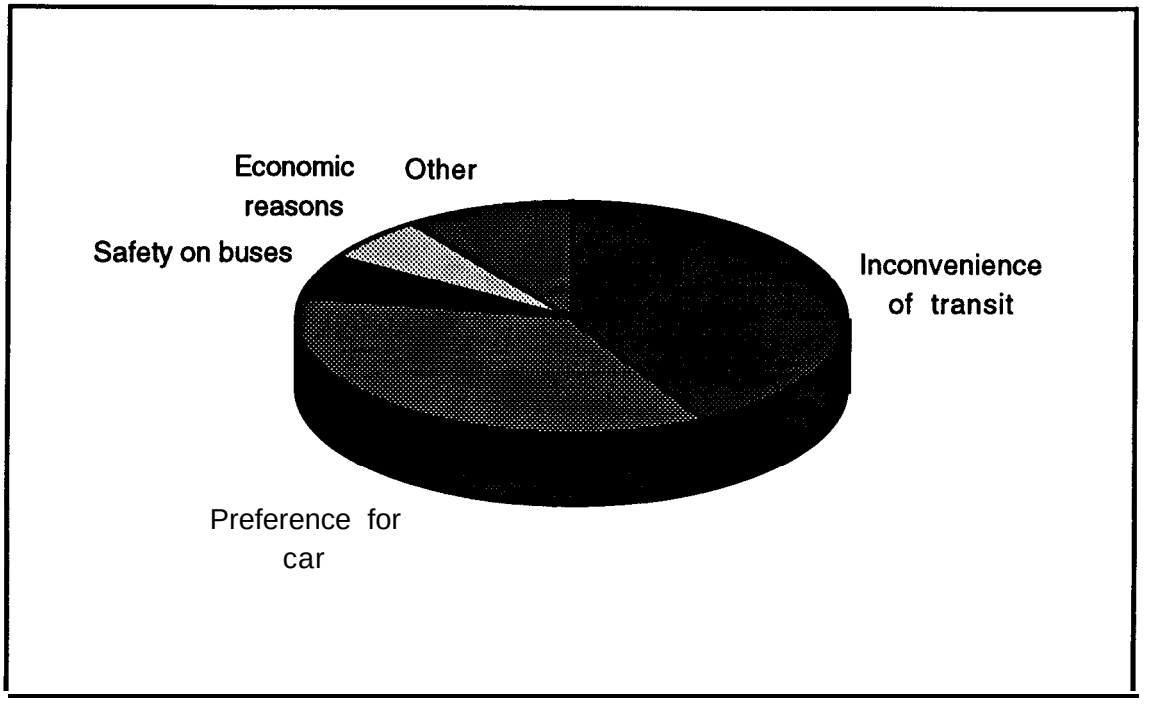


Figure 3.2. Reasons Justifying Use of Car



Another determinant of public transportation use is the ease of access to the closest transit boarding point. A question about the distance between home and the closest bus stop revealed that one fifth (19.8%) of the participants live within a block of a transit boarding point, one third (31.1%) between one and two blocks, while 28.3 % have to walk three blocks or more to access a transit line. Looking at the distance between the workplace and the closest bus stop, 31.5 % of the participants work within one block of a transit boarding point, while 41.4% are between one and two blocks of the next bus stop. As expected, transit appears to be more accessible to the workplace than to the residence. Nine tenths (92.0%) of the participants further mentioned that they access transit by walking. The same proportion stated that no obstacle hinders their access to transit from either home or the workplace. Unsafe neighborhoods was the main problem for the few people who mentioned that transit access was difficult.

Participants were finally asked to rate their overall impression of transit in the Los Angeles area, on a scale from 1 to 5 (5 being excellent and 1 poor). An average satisfaction index was computed, aggregating the answers of the whole sample. The results show that people have a rather good impression of their transit system: it obtained a rating of 3.4 out of 5. Only 6.4% of the people judged the system very poor, while 12.7% judged it excellent. Looking at more specific aspects of the service, people are most satisfied with the punctuality of the system (which was rated 3.68), the availability of transit information (3.67), the availability of connections to destinations (3.65), and the affordability of fares (3.62). The least satisfactory aspects of service were the cleanliness of the buses (2.76), safety at bus stops (3.05), and finally the waiting times at bus stops (3.20).

It was also observed that transit riders clearly have a better perception of public transportation than non-users. In that sense, a certain correlation was found between stated and revealed preferences, Transit users gave an overall rating of 3.62, which is 5 % higher than the rating given by non-transit users. Transit users' perceptions were better on every aspect of service; the largest differences between the two groups concerned the availability of adequate seating on buses (20%), the availability of service to every destination (10%), and personal safety at bus stops.

3.4. Analysis of perceived information

As stated earlier, participants were asked to call **MTA** telephone information service and record the directions provided. This part of the report presents the analysis of the information as perceived by the callers.

The perceived information was analyzed quantitatively only for the standardized trip group. Analysis is made easier in that case, since the directions provided are the same for everyone. Further, this part of the experiment led to interesting conclusions concerning the comparative efficiency of the human operator and the synthesized voice system.

Callers had to request information for a trip from Knott's Perry Farm in Buena Vista to Temple and Grand Streets in Downtown Los Angeles. Two buses had to be taken to complete the trip on the MTA network. The complete directions as provided by the information service are presented in the following table; they include 17 key elements as shown in Table 3.7. (in some cases, the operator may have omitted some of the elements).

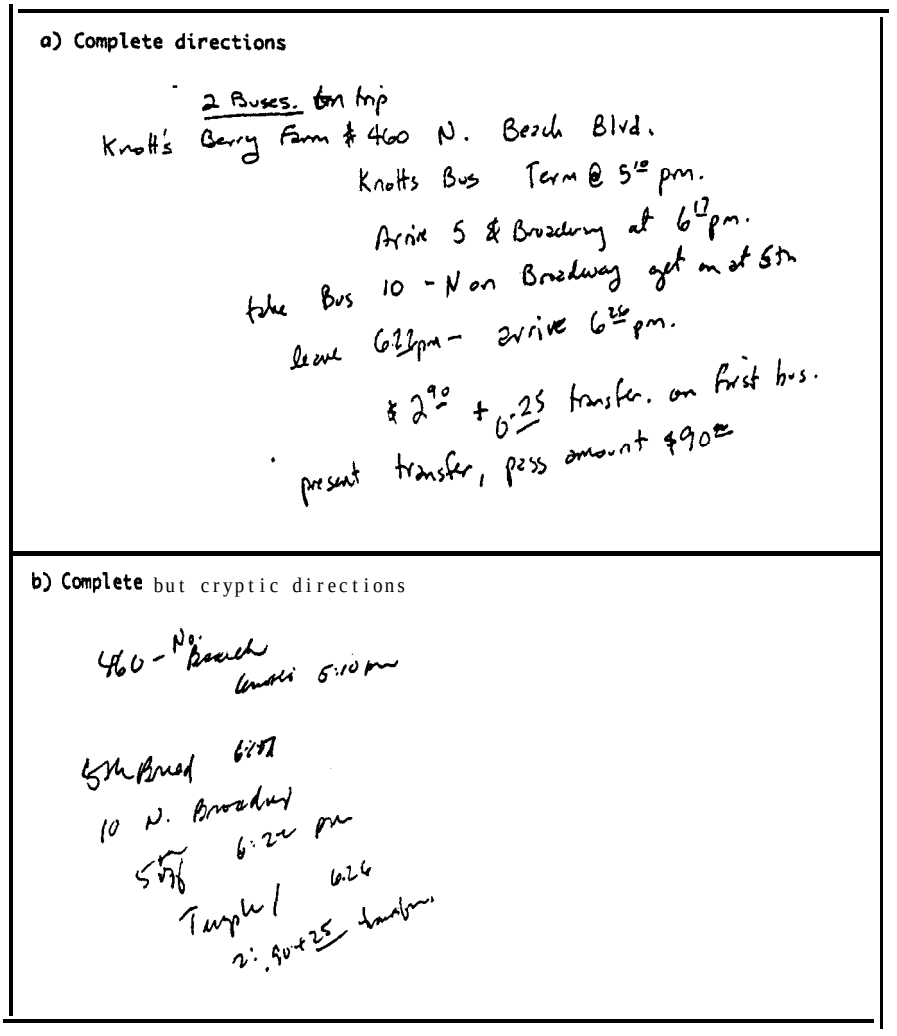
Table 3.7. Key Elements Presented by Operator

First bus	
Bus number	*#460*
Direction	*North*
Bus line	*Beach Blvd.*
Departure point	*Knott's Bus Terminal*
Departure time	*5:10 PM*
Arrival point	*5th Street*
	Broadway
Arrival time	*6:17 PM*
Second bus	
Bus number	*#10 or #11*
Direction	*North*
Bus line	*Broadway*
Departure time	*6:22 PM*
Arrival point	*Temple*
	Grand
Arrival time	*6:26 PM*
Fare	*$2.90*
Transfer	*$0.25*

Participants were asked to write down the given directions on the questionnaire as clearly

as possible. They were allowed to draw maps or whatever figure they might find helpful. However, not one participant drew a map which seems to indicate that information provided in an oral form is not perceived or stored under a visual format. Instead, all participants wrote down the directions in a sequential fashion, noting the bus lines and the boarding and arrival points with their corresponding departure and arrival times. Figure 3.3 presents two examples of the way information was collected by participants. Although there are wide variations in the clarity and completeness of the recorded directions, the information is basically presented under the same format in both cases.

Figure 3.3. Typical information collected by participants



To analyze the information quantitatively, the number of correct, wrong, or missing elements was computed for each of the categories in Table 3.7. The total number of correct elements recorded was used as a measure of the caller's performance to handle the given information.

As mentioned earlier, every caller got the information from both a human operator and RTIN, the synthesized voice, with half the callers reaching the operator first and the other half starting with RTIN.

It was postulated that the information recorded would be more precise for the second call, once the callers became familiar with the trip to be made. This proved to be true only for the participants who reached the voice first and then the operator. They were able to improve their performance on the second phone call, while people who started with the operator did not record more information when they later listened to RTIN. The inherent characteristics of the two modes of information dissemination prove to be more significant than the order in which the phone calls were made.

Indeed, participants clearly recorded more information when the directions were provided by a human operator rather than by the synthesized voice. They were able to record on average 12.5 elements out of 17 with the operator, while only 10.5 with RTIN. The following table shows the distribution of the number of elements recorded by the participants for the two modes.

Table 3.8. Comprehension of Information

Number of correct elements	**Human operator (44 cases)**	**Synthesized voice (40 cases)**
Less than 5:	**2%**	**15%**
Between 5 and 9:	**7%**	**17%**
Between 10 and 12:	**25%**	**28%**
Between 13 and 16:	**66%**	**40%**
All (17):	**0%**	**0%**
Average:	**12.5**	**10.5**

The directions provided by the synthesized voice were also more often incorrectly interpreted than the ones provided by the operator. The proportion of people who made zero, one, or two recording errors is presented for each mode in Table 3.9.

Table 3.9. Number of Errors

Number of errors	Human operator	Synthesized voice
None:	71%	60%
One:	29%	35%
Two:	0%	5%

Although the number of missing elements was relatively large, the most important directions were written down by the majority of participants. Bus numbers, the directions of the buses, the scheduled departure and arrival times, and the location of the transfer point were all recorded by more than 80% of the participants talking to the operator and by more than 65% of those dealing with the voice. The detailed information recorded for each category can be found in Appendix C. The less crucial information, such as the fare and the exact starting point (Knott's Bus Terminal), was often overlooked with the human operator but less often with the synthesized voice. This can be explained by the fact that human operators often skip over these details (as will be seen later in the analysis of transcripts), while RTIN is programmed to meticulously deliver everything.

It was further found that transit users tend to record less information than others. This result was observed with both the human operator, where transit users recorded on average only 11.6 elements compared to 13.0 for others, and the synthesized voice (9.3 for transit users against 11.3 for others). The proportion of information recorded by transit users is consistently less for all the elements. The difference between the two groups is more marked in two cases: the fare, as would be expected, and the bus line, which indicates the street on which the bus is running. Indeed, transit riders seem satisfied with just a bus line number, while car users typically recorded the street as well.

Finally, further analysis also showed that women record more information than men when talking to a human operator, while men seem to record more than women when dealing with RTIN.

3.5. Post-call questionnaire

After the phone call, participants were asked to assess the quality and usefulness of the service provided. Their evaluation is reported here; results are mostly concerned with participants who dealt with both the human operator and the synthesized voice.

The waiting, holding and answering times were recorded by the surveyors during the phone calls. The waiting time is the time needed to first get an answer to the call and reach the service. The holding time is the delay between this point and the moment callers can place their request for information. Finally, the answer time is the time taken by the operator or RTIN to transmit the directions. The values obtained for these three service times ranged between 0 and 10 minutes; Table 3.10 presents the average values for both the human operator and RTIN.

Table 3.10 Human Operator vs Synthesized Voice

Tie taken	Human operator	Synthesized voice
Waiting time	2.5 min.	2.6 min.
Holding time	1.3 min.	2.3 min.
Answer time	1.1 min.	1.4 min.

As can be seen, the human operator performed better in every category. The waiting time is similar for both modes in our case because even the participants who listened to RTIN reached an operator first and then specifically asked for the synthesized voice to deliver the directions (a phone number was also available to reach RTIN directly but surveyors soon discovered that it provided excessive and irregular waiting times).

Table 3.10 shows that the holding time is significantly longer for the synthesized voice. This is because the RTIN system tested were not fully automated. The operator had to transfer the call to RTIN for the synthesized voice. The answering time is also slightly longer for RTIN because users asked for more repetitions of the directions. Indeed, RTIN repeated the directions to the callers 1.83 times, while the operator repeated only 1.18 times. These are average values for the first phone call. On the second call, once the participants were familiar with the directions from their previous call, the average number of repetitions went down to 1.30 for RTIN but remained the same for the operator.

Participants were also asked to record the waiting, holding, and answering time according to their own perception. Surprisingly, a very small correlation was observed between the actual and the perceived time, which means that the participants were not able to correctly estimate the duration of their waiting period.

Results further showed that the instructions given by the human operator were more easier to follow than the ones provided by the synthesized voice. Indeed, 87% of the participants rated the instructions given by the operator "easy to follow" compared to only 24% for RTIN. On the other hand, only 2 % stated that the operator was "difficult to follow" while 24% said so for RTIN. Similarly, when prompted about the clarity of the speech when the directions were given, 91% of the participants said the operator pronounced words very clearly while only 24% said the same for RTIN.

Three quarters (76%) of the participants were satisfied with the speed of the operator when giving directions while the rest judged that it was somewhat too fast. However, only a third (33 %) of the participants were satisfied with RTIN's speech speed. Over 22% thought it was too slow while 45% thought it was too fast.

The operators were perceived to be friendly by 82% of the participants. On the other hand, the synthesized voice was rated as neutral by three quarters of the callers.

The large majority of participants (89%) were also very satisfied with the operator's promptness to answer their questions (since RTIN does not allow people to interact in a direct way, this question was not asked for the synthesized voice).

Participants further expressed confidence in the accuracy of information provided by the service. Almost everyone (96%) trusted the directions given by the operator while RTIN's credibility was almost as high at 89%. However, just two thirds of the participants (67%) also judged that the information was sufficiently complete to complete their trip successfully.

Notice also that transit users gave higher ratings to the telephone information service than non-users. They consistently were more satisfied with the clarity of information, the speed of the speech, the friendliness of the operator, and its promptness to answer questions, They were also more confident in the accuracy and completeness of the provided information than non-transit users. This result might be explained by a better ability to handle transit related information as well as a more positive attitude towards MTA in general.

One of the objectives of the experiment was to see how the availability of precise and personalized transit information would affect people's propensity to use public transportation. A question on the post-call questionnaire therefore asked participants how the directions they received would affect their chances of using transit. A majority (56%) mentioned that the information would have no effect. The remaining people stated that information would somewhat (16%) or definitely (26%) increase their likelihood to take transit, while the number of people who were less likely to use transit after the call was marginal. People were further asked to explain their answers. Figure 3.3 on the next page shows the reasons why the information received acted as an incentive to take transit while figure 3.4 depicts the reasons why the information did not influence participants' behavior. These figures concern the callers who requested information for their most frequent trip. In the second figure, it can be seen that more than half of the participants are either already transit users or prefer their car anyway: the provision of transit information is a marginal concern in their mode choice decision.

It was also found that the perception that telephone informa-tion would increase transit use was greatest for people who are already frequent transit riders. Indeed, 55% of transit users stated that the received information encouraged them to take transit compared to 35% of the non-transit users. Further, the manner by which the information is provided also influences the attitude toward greater transit use. Fifty-six percent (56%) of the participants affirmed that the information provided by the human operator encouraged them to ride transit while only 36% of the same people said so when the same information was transmitted by RTIN.

When asked directly about their favorite mode of receiving transit telephone information, participants overwhelmingly (95%) selected the human operator. The main reasons given are the possibility of interaction (mentioned by 91% of the participants), the clarity of directions (83%), the clearer pronunciation of names (79%) and the better speech speed of the operator (76%).

Participants were also asked about the most appropriate media to transmit transit information. Telephone clearly appeared as the preferred form, being supported by three quarters of the participants. Written information was second while other sources, such as

employer, personal computer, and fax, only obtained marginal results.

Another question concerned the price that should be charged for telephone information services. The majority (58%) of the participants judged that the current price of 35 cents was rather unreasonable, while only a quarter (26%) thought the service was reasonably priced. A substantial proportion of the people mentioned that the service should simply be free.

Finally, participant's perception of the transit system in Los Angeles was assessed once again after the call. No major differences were found on most of the points. However, a decrease in the satisfaction level was observed concerning bus travel time, once participants were given an example of a typically long (1 hour 16 minutes) bus commute. Satisfaction toward MTA employees was rated higher after the call, probably because participants appreciated the telephone operators. Notice that similar results did not appear in the case of the callers asking for their most frequent trip.

Figure 3.4
Reasons why the information received increased the chances of taking transit

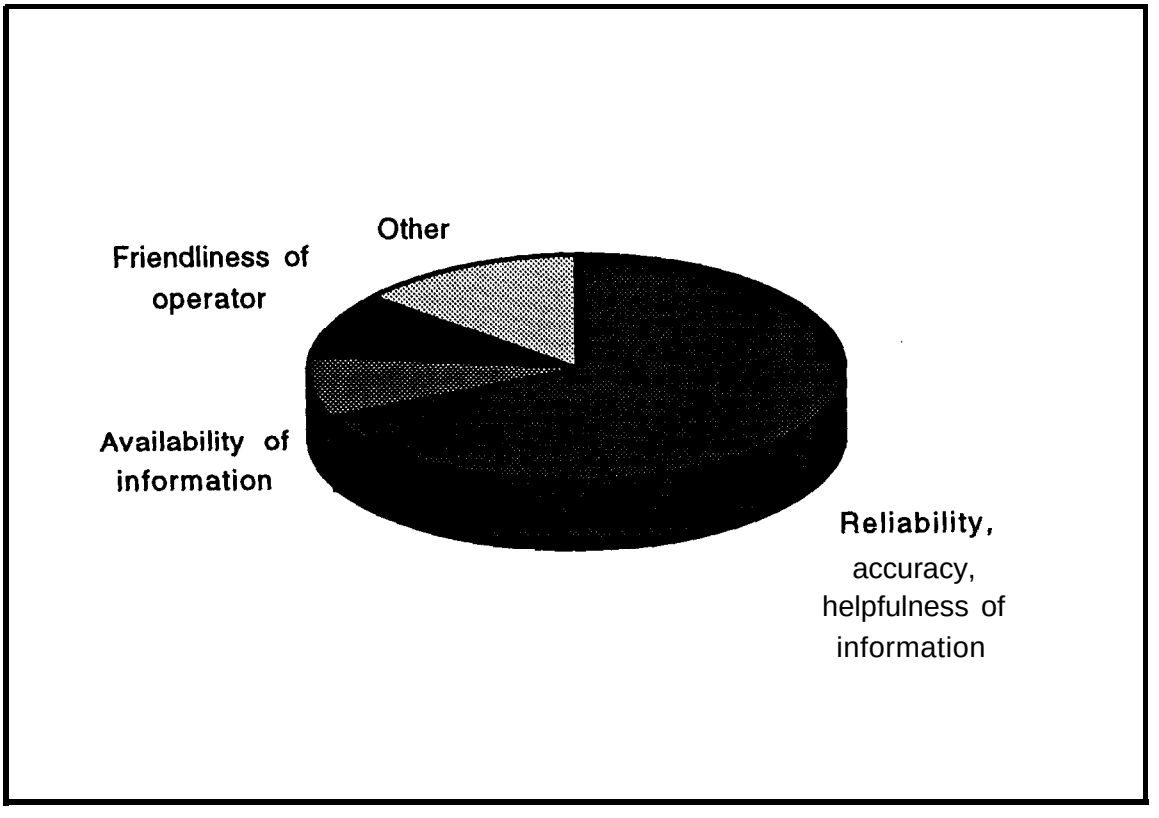
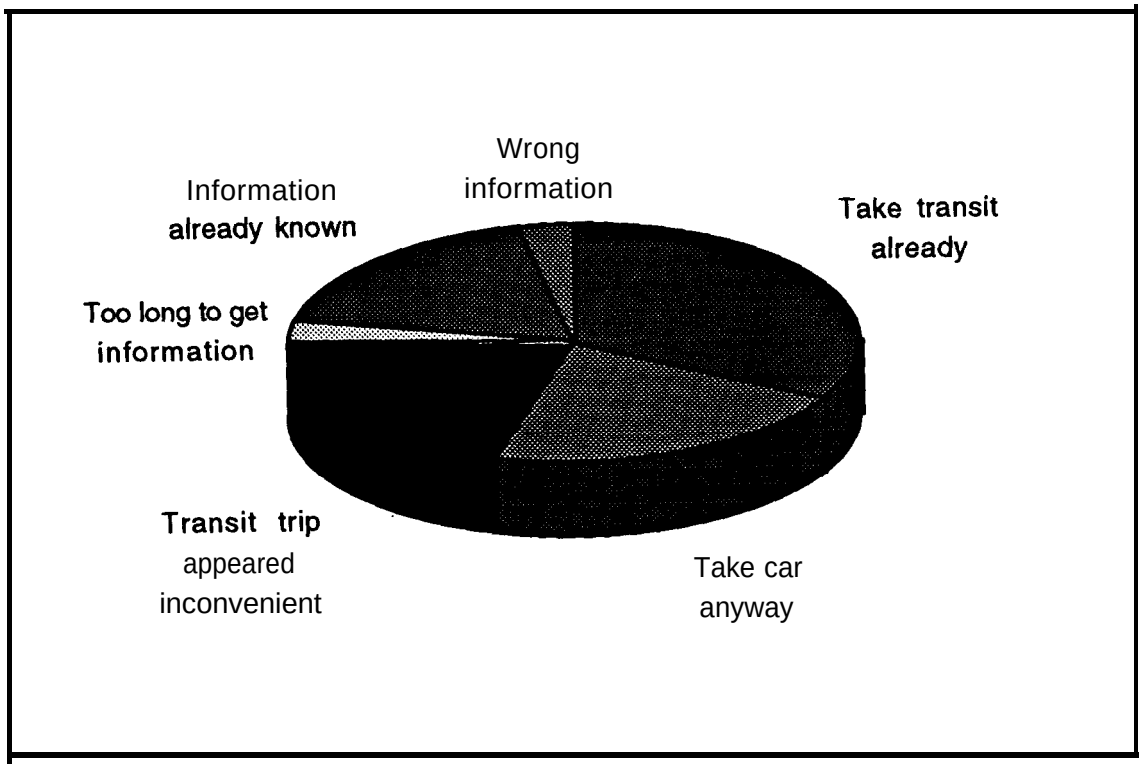


Figure 3.5.
Reasons why the information received had no effect on the chances of taking transit



3.6. Post-trip questionnaire

The last part of the questionnaire was optional: participants were offered $10 to complete the trip from the experiment. Surprisingly few people volunteered and only thirteen participants did return a valid questionnaire. Seven of these were already daily transit riders; the other six were car users. Half of the trips reported were daily school or work commutes while the other half were occasional or recreational trips.

The small sample size and inconsistencies in filling the trip diary did not permit any conclusions regarding the punctuality of the buses and the accuracy of the information provided. Every participant did however complete his or her trip in a reasonable time.

Participants were asked to evaluate the clarity and usefulness of the information provided

once the trip was completed. This evaluation was compared to what the same thirteen people stated before they took the trip.

It is interesting to see that the directions given by the telephone information service were judged to be much clearer after the completion of the trip. This is especially true for the non-transit users, who rated the clarity of directions at 2.3 before the trip and 4.3 after (using again our scale from 1 to 5). Transit users also increased their rating of the clarity of directions from 3.3 to 4.0. Therefore, directions that might first have appeared vague and complex were later judged clear, once callers had successfully used them to complete their ride.

Ambiguous results were obtained, however, regarding the completeness and the reliability of the information. This can be explained by the small sample size and the fact that some people rated the information as unreliable because the given schedule was not adhered to. A few people actually missed their connections.

Participant's overall perception of transit in the Los Angeles area was not affected by the trip. This was observed for both transit users and others. Satisfaction was, however, improved for some aspects of service, such as the availability of information about transit service, the cleanliness of the buses, and the availability of service to various destinations. Surprisingly, transit users were responsible for most of the increase.

Finally, participants were asked if the ride they just took would affect their likelihood to take transit in the future. All transit users answered no but half of the car users reported that indeed their chances of using transit had improved.

3.7. Analysis of phone calls made to MTA

In addition to the survey, a sample of phone calls made to the information service was recorded and transcripted. Thanks to the collaboration of MTA, three hours of conversation were recorded while the survey was underway in August 1992. Three operators collaborated in the recording, which contained a total of ninety-two phone calls. The purpose of the operation was to get further insight about the flow of information between callers and operators as well as about the nature of the phone calls made to the telephone information service. Three examples of typical phone calls are presented in Appendix B.

As depicted in Figure 3.6, a typical phone call starts with a request for a specific type of information from the caller. Next, the operator usually helps the caller to clarify his request. The operator then inputs the details of the request in the computer and waits for possible solutions to be generated, while the caller stays on hold. The operator then chooses the most appropriate solution out of the ones proposed by the computer and details it to the caller.

Generally, the caller accepts the given solution and completes the call after confirming the information. In some cases callers tell the operator they are not satisfied with an aspect of the proposed solution, such as the route or the schedule. When this happens, the process starts again and the operator tries to find a new solution that better fits the needs of the caller.

Eighty percent of the 92 calls are requests for an itinerary, as can be seen in Table 3.11. Itinerary calls are those where callers provide the operator with an origin and destination and ask for the most convenient way to complete the trip on the MTA network. As can be seen in the table, most itinerary calls concern a single trip with a specific time constraint specified. Schedule information accounts for one tenth of the calls while requests about fare only are marginal. The high proportion of itinerary calls in Los Angeles compared to other American cities[4] reflects the large size and complexity of MTA network. Notice further that since the phone number for the information service is widely available, many people use it as a first trial to reach any MTA service. This explains the large proportion of transfers to other services among the requests for information.

* In Washington, for example, only two thirds of the calls are itinerary requests.

Figure. 3.6. Structure of a phone call for transit information

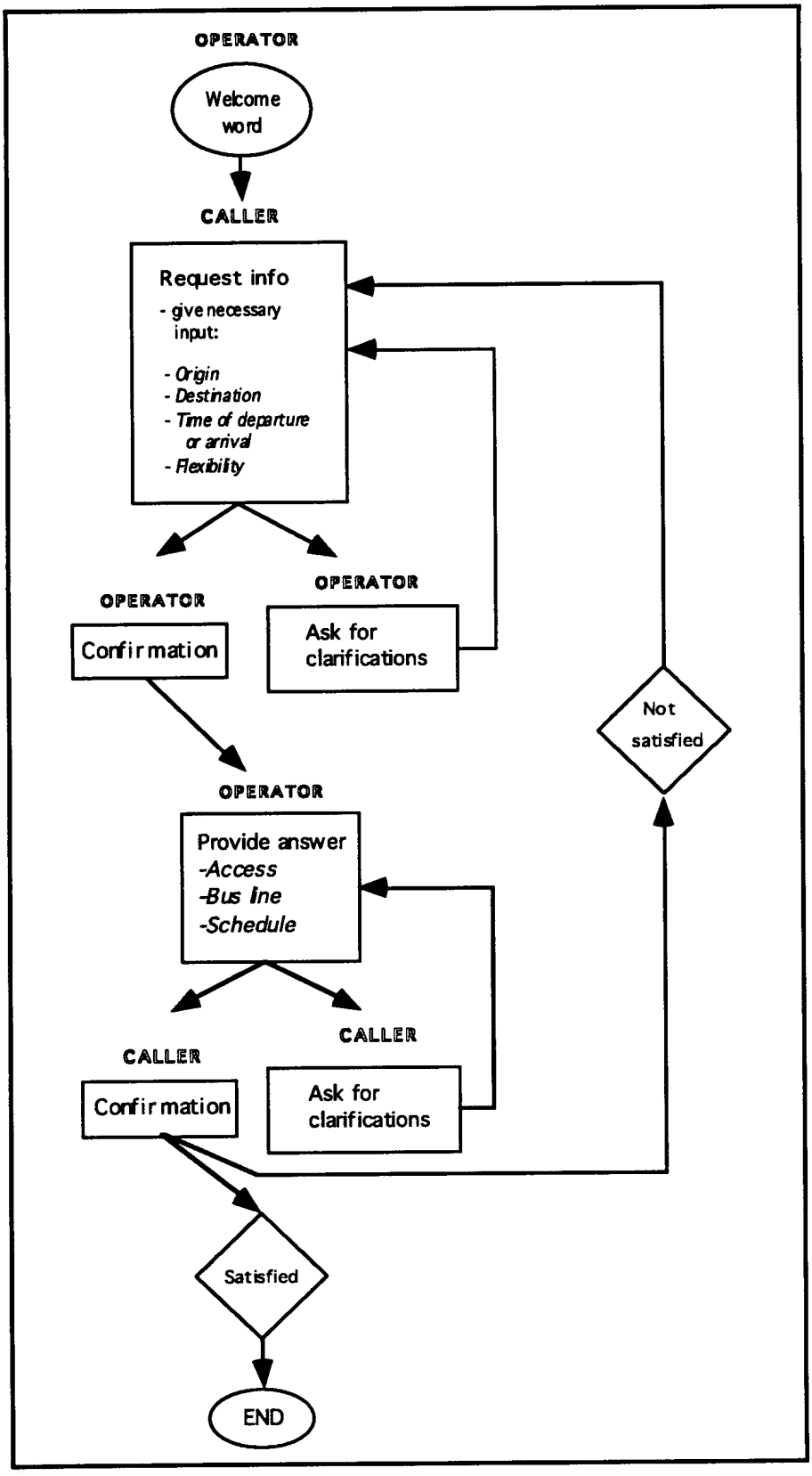
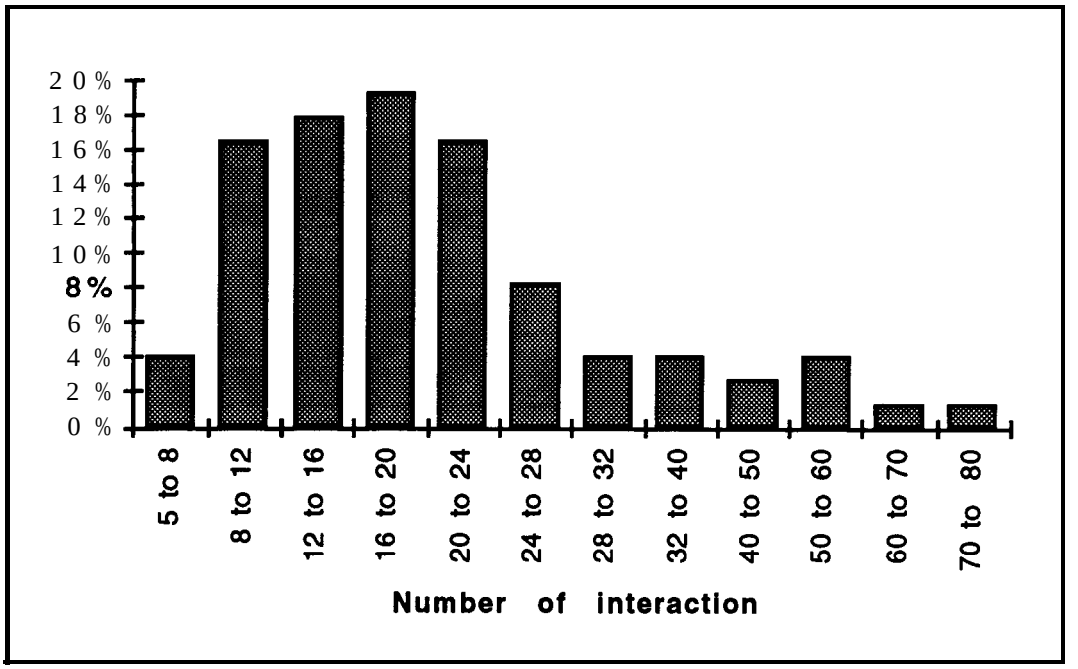


Table 3.11. Type of Information

Itinerary		**80%**
- single trip, no time specified	4%	
- single trip, with time specified	62%	
- round-trip, with time specified	14%	
Schedule information		**10%**
Fare and other transportation related information		3%
Transfer to other services		7%

To examine the duration of itinerary phone calls, the total number of interactions was used as an approximation of the exact length in minutes. An interaction represents here any statement or question made by one of the interlocutor; interactions are not of equal length, but, in average, the measure is a reasonable approximation for the call length. The average phone in the sample is composed of 21.5 interactions, although some phone calls contains as few as five and one as much as 73. Figure 3.7 on the next page shows the distribution of phone call lengths. One of the recorded calls was part of the call-in experiment. It is interesting to note that this call was completed with only seven interactions, much less than the average phone call. This seems to indicate that the experiment did not portray entirely the complex interactions usually occurring between the caller and the operator. The fact that the trip was not intended to be taken also explains the haste with which the sample call was handled by both the caller and the operator. When the caller is really planning to undertake the trip, he or she usually asks for more details and for a repetition of the directions, which makes phone calls significantly longer. The call given as the third example in Appendix B was made by one of the participants in the survey; it can be compared to more typical calls such as the two first examples.

Figure 3.7. Number of interactions between caller and operator during a phone call



The calls requiring a longer treatment were classified under several categories of "problems", as presented in Table 4.2 (notice that the percentages do not sum up to 100% because some calls fit into more than one category). As the table shows, only 62 % of the calls were a direct and straightforward request for information from the caller followed by a direct answer from the operator. These calls are significantly shorter than the others: they are completed on average in 15 interactions. For 11% of the calls, the operator had to force the caller to formulate his or her request in a precise way, such that it could be input into the computer. This percentage does not include the numerous calls where the operator asked the caller about small details, such as the departure or arrival time of the trip. Notice also that in one call out of ten the caller is not satisfied with the first solution proposed by the operator. These calls are on average twice as long as the straightforward ones. Cases where the caller is not familiar with the locations described by the operator also make for a fair percentage (8%) of the total calls. These calls too are twice as long as the direct ones, since

the operator then has to provide detailed access and egress indications. In these cases, the operator's knowledge of the exact bus stop location proved to be important. Finally, some of the problem calls are significantly longer than the average requests; fortunately they account for a small proportion of the total.

Table 3.12. Type of Problems

Type of problem	Proportion	Average length
Calls without problems	62%	15
Operator asks for precision about request	11%	25
Caller does not accept the solution proposed by the operator	9%	32
Caller unfamiliar with locations	8%	32
Caller has wrong or incomplete information about his/her request	6%	21
Caller repeats given information	6%	52
Operator has to repeat information	5%	40
Caller does not understand	3%	43
Caller keeps changing request	1%	59

The type of reference points used by callers when specifying their origins and destinations was also investigated. As Table 4.3 shows, most locations are specified with two cross streets (60%) or with a specific address (14%). The CCIS system also accepts specific origins and destinations such as shopping centers and universities; this feature proved to be helpful since it is used in a fair percentage of the calls.

Table 3.13. Type of Reference Points

Type of reference point	Proportion
Two cross streets	**60%**
Address	14%
Shopping center	7%
City or neighborhood	4%
University or college	3%
Downtown L.A.	2%
Point related to a transit line	2%
LAX Airport	2%
Others	7%

To conclude the study of the transcripts, all of the specific elements of information that were transmitted by the operator during the itinerary calls in the sample were extracted. Table 4.4 summarizes the results and compares it to what was recorded by experiment participants (standardized trip, human operator). The last column indeed presents the percentage of participants who correctly recorded each element of information.

Detailed access information was provided in one quarter (24%) of the phone calls sampled. Two cross streets were provided or simply repeated from the caller's request in another 23% of the calls, whereas no single access information was given in the remaining half of the calls. Similarly, precise egress information was provided in only 31% of the calls, including all those where the destination points was referred to by an address.

Only one scheduled departure time was provided in most of the cases (73%); two departure times were provided for 11% of the calls, and three or more in only 3% of the calls. Thirteen percent of the itineraries did not include any schedule information.

The comparison presented in Table 4.4 indicates that there is a good consistency between the information provided and what is recorded by the callers. Notice that the numbers are not directly comparable since they come from two different samples.

Table 3.14. Elements of Information

Element of information	provided by the operator	recorded by the caller
Access	24%	11%
Departure point	91%	80%
Bus line	100%	98%
Direction	88%	91%
Departure time	87%	90%
Arrival point	96%	83%
Arrival time	80%	86%
Fare	8%	21%
Egress	31%	
Other	21%	-

4. Telephone Information Service at MTA

This part of the report briefly presents statistics about the costs of providing telephone information service, as well as some data on the general performance of the MTA system.

Table 4.1 presents the costs associated with different marketing activities at MTA and the percentage of the total operating budget they account for. The most recent data made available by the authority dates back from 1983; it is taken from a study conducted by Cutler and Potter.

Table 4.1. Annual Budget (1983)

	Annual budget	Percent
Media	$1,188,000	0.3%
Schedule	1,950,000	0.5%
Community relations	336,000	0.1%
Telephone information	2,416,574	0.6%
TOTAL FOR MARKETING	6,028,969	1.5%
TOTAL ANNUAL BUDGET	410,610,000	

As can be seen in the table, the provision of personalized telephone information service is the largest marketing expenditure at MTA, closely followed by the publication of schedules. It accounts for 1.5 % of the total operating budget, a figure very similar to what is found in other transit authorities.

The capital and R&D (Research and Development) costs of the Computerized Customer Information System (CCIS) in 1980 was $3.5 million. A comparable system would cost approximately $1 million in 1990. It was expected at that time that annual savings of $417,000 could be achieved through CCIS. The precise savings MTA was able to achieve with the introduction of the synthesized voice system (RTIN) have not been disclosed yet.

MTA employs 90 telephone information agents; forty of them are on duty during peak hours. All agents are unionized; their salary when starting is $7.66/hour or about

$16,000 a year. The training period for new agents is four weeks.

The following statistics summarize the performance of the telephone information system. Thirteen percent (13%) of the calls to the service received a busy signal. Three quarters (75%) of the callers who reach MTA are put on hold before they can place their request for transit information. The average holding time is 1.44 minutes, a figure comparable to what was found during the experiment (1.3 minutes) for the callers reaching a human operator. About one call out of ten (11%) is lost because of excessive holding time. The average transaction time is 2.12 minutes (it is not directly comparable with the value obtained from the transcripts since it was measured in number of interactions). MTA agents are able to handle 30 calls per hour, a productivity comparable to what is found in most transit authorities. Finally, to give an idea of the intensity of use of the telephone information service, one call is made for every 130 passenger trips.

5. Conclusions

This report presented a study of the effectiveness of the transit telephone information system at MTA. To evaluate the system, an experiment with 120 subjects was conducted among shoppers at Broadway Plaza in downtown Los Angeles. The research issues were how transit information is provided by MTA and how it is perceived and used by subjects. The chief findings of the experiment are:

1) The MTA telephone information service is in general favorably perceived by the participants and to a greater extent by those who use MTA on a regular basis. As many as 35% of the participants who do not ride MTA indicated that the likelihood of taking transit increased after receiving on-site transit information while 50% of the transit riders said the same.

2) The participants also indicated that the telephone is the most favored method of receiving transit information.

3) The participants gave higher ratings to the information received from the human operators than from RTIN, in terms of friendliness, clarity of directions, adequacy in the speed of speech, and confidence in the directions provided. The rating on the information given by the automated voice was extremely low, especially on the clarity of directions and the quality of speech. The primary reason for preferring human operators to synthesized voice was the ability to interact with the operator when obtaining itinerary directions. The tape-recorded transcripts revealed that much of the information is exchanged through multiple interactions between the caller and the operator. According to the study, the automated system appears less effective in comprehension of the callers when compared with human operators. Subjects recorded less information and made more mistakes when the same information was received from RTIN than from the human operators.

Based on the results of the experiment, the functional requirements of the information service are summarized from the user perspective for an ideal traveler information system:

A) Call handling

(1) immediate call response

(2) short call-waiting time

(3) adequate call-answering time

B) Information

In addition to the current MTA service, the information desired most in descending order of *importance are:*

(1) reliable transit schedule information within 5 minutes of arrival and departure

(2) frequency of bus service

(3) travel time

(4) fare information

(5) up to the minute transit schedule information

(6) safety of neighborhoods while transferring

(7) personal safety on bus

(8) landmarks for directions

C) Oneration

For RTIN, improve the quality of speech and interactive capabilities through personal computer or videotext.

The study suggests that the telephone is an effective way to provide reliable transit information service. The primary beneficiaries of the improved transit information service will likely be those who are transit dependent travelers. The study also showed evidence that reliable information service would to some extent encourage travelers to take public transit.

References

Bronzaft, A. L., Dobrow, S.B., O'Hanlon, T.J. **Spatial Orientation in a Subway *System, Environment and Behavior*,** Vol. 8, pp. 575-594, 1976

Cutler, M.R., Potter, R.F. **The, Effectiveness of Telephone Information in Transit,** UMTA, Washington, D.C., February 1984

Diewald, W.J., Frost, W.H., Bamberg, W. **Assessment of Transit Passenger Information System,** UMTA, Washington, D.C., June 1983

Geehan, T., Deslauriers, **Transit Route Guide -- An Investigation and Analysis, *Bus Ride,*** Vol. 14, no. 4, pp.56-58, 1978

Hall, Randolph W. **Traveler Performance and Information Availability: An Experiment in Route Choice,** in ***Transportation Planning and Technology,*** Vol.8, pp. 177-189, 1983

Phillips, R.O. **A socioeconomic Impact Assessment of the Automated Information Directory System (AIDS) at the Washington Metropolitan Area Transit Authority (WMATA),** UMTA, Washington, D.C., April 1983

Phillips, R.O. **The CCIS Experiment: Comparing Transit Information Retrieval Modes at the Southern California Rapid Transit District (MTA),** UMTA, Washington, D.C., March 1984

Ross, D.R., Soberman, R.M. **Evaluation of Public Transit Automated Telephone Information Systems,** Transportation Development Center, Montreal, Quebec, Canada, May 1987

Telephone Information Center, Benchmark Survey, Denver Rapid Transit District, Spring 1986

APPENDICES

APPENDIX A

Results of the survey

1. Are you 18 or older?

   YES 100%

2. a) About how many times last week did you ride the bus?

Never:	33.6%
Once:	11.5%
Twice:	11.5%
3 times:	4.4%
4 times:	3.5%
5 times:	17.7%
6 times:	2.7%
7 times or more:	15.0%

   b) About how many times last week did you ride the Blue Line?

Never:	88.6%
Once or twice:	4.4%
3 times or more:	7.0%

   c) About how many times ***in the*** last ***month*** did you ride the bus?

Never:	22.1%
Between 1 and 4 times:	24.8%
Between 5 and 9 times:	13.3%
Between 10 and 19 times:	7.1%
Between 20 and 29 times:	15.0%
30 times or more:	17.7%

   d) About how many times ***in the*** last ***month*** did you ride the Blue Line ?

Never:	85.1%
Between 1 and 4 times:	8.8%
Between 5 and 9 times:	0.9%
Between 10 and 19 times:	1.8%
Between 20 and 29 times:	0.9%
30 times or more:	2.6%

3. Do you own or have use of an automobile that you can drive whenever you need to?

	Sample	L.A. City (1990)
YES	75.7%	84.7%
NO	24.3%	15.3%

4. On an average weekday, what is your most frequent purpose for traveling?

Work:	76.1%
School:	8.0%
Shopping:	8.0%
Recreation:	3.5%
Other:	4.4%

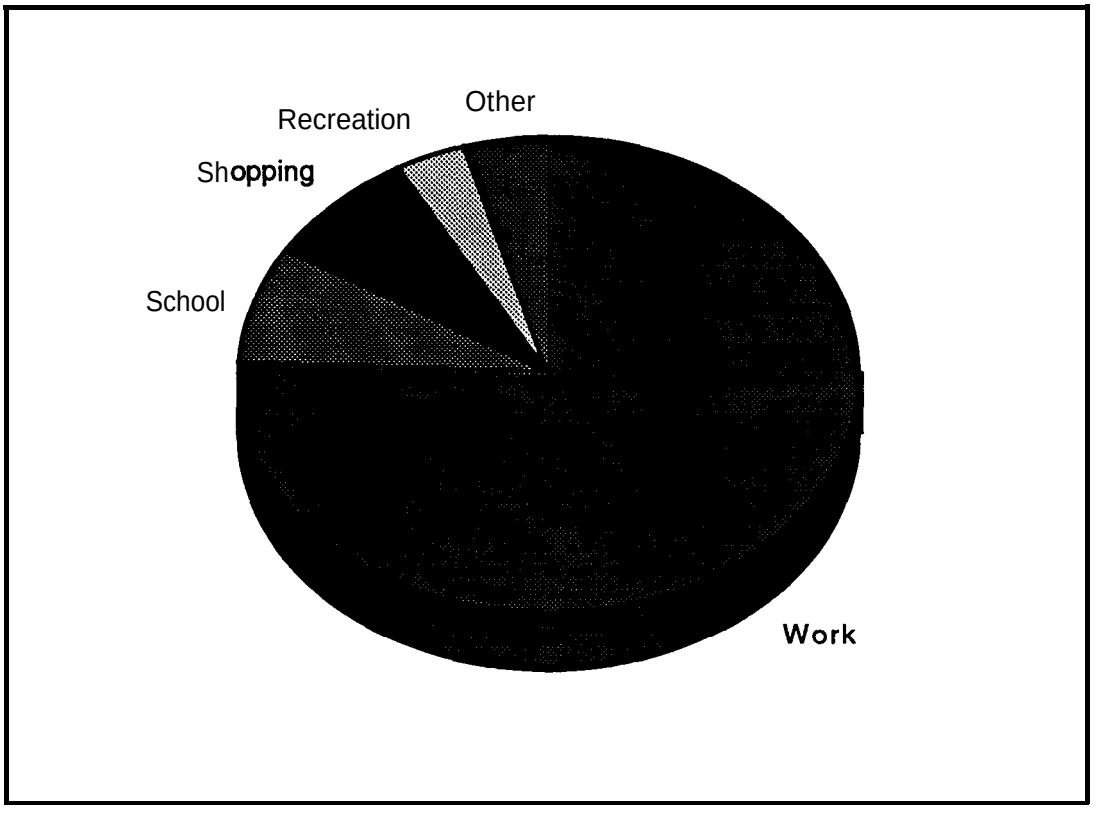


Fig. 1 Trip purpose

5. What is your usual means of transportation for this travel purpose?

MODE	Sample	L.A. City (1990)
Drive alone	52.6%	67.3%
Ride transit	36.8%	10.8%
Ride carpool	7.0%	15.9%
Bike	2.6%	0.6%
Walk	0.9%	4.0%
Other	0.0%	1.4%

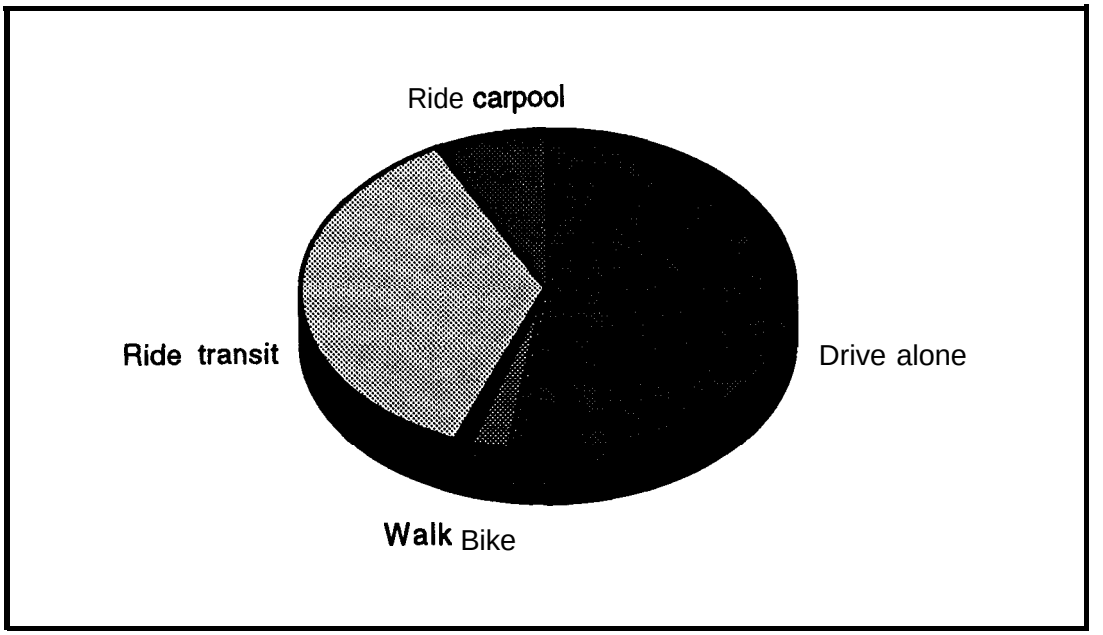


Fig. 2 Modal share (sample)

6. On an average weekday how long does it take you to get to the place where you most frequently travel?

TRAVEL TIME	Sample	L.A. City (1990)
Less than 15 minutes	13.5%	18.9%
From 15 to 29 minutes	19.8%	26.4%
From 30 to 44 minutes	36.0%	30.3%
From 45 to 59 minutes	8.1%	5.6%
One hour or more	22.5%	18.8%

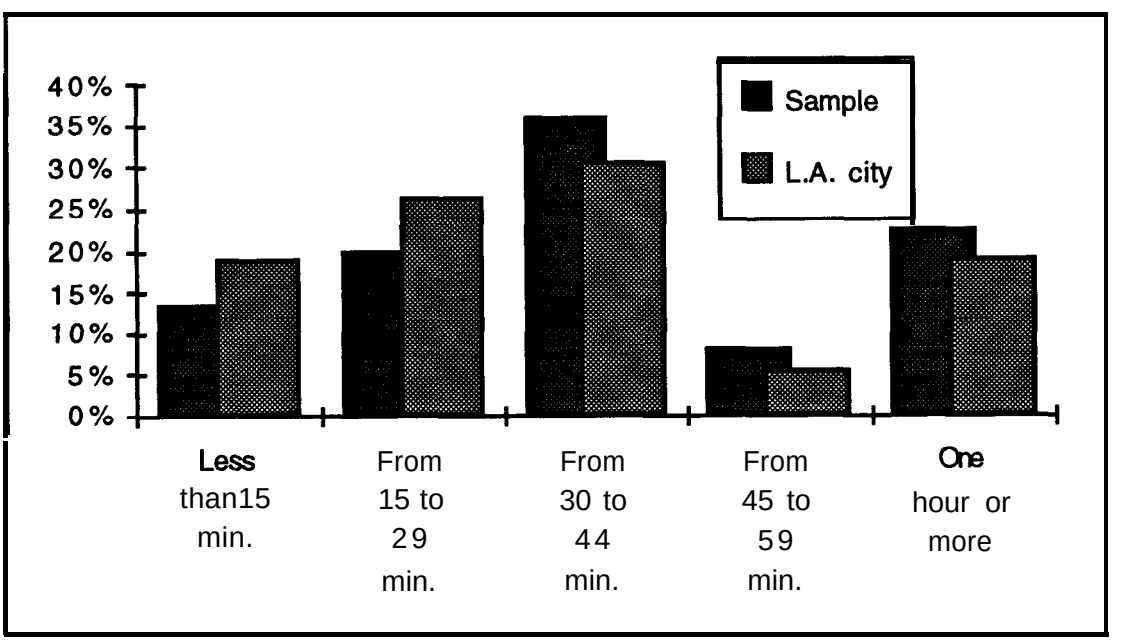


Fig. 3 Trip length distribution for most frequent trips

7. On an average weekday how long does it usually take you to go home?

Less than 15 minutes:	11.1%
From 15 to 29 minutes:	21.3%
From 30 to 44 minutes:	31.5%
From 45 to 59 minutes:	9.3%
One hour or more:	26.9%

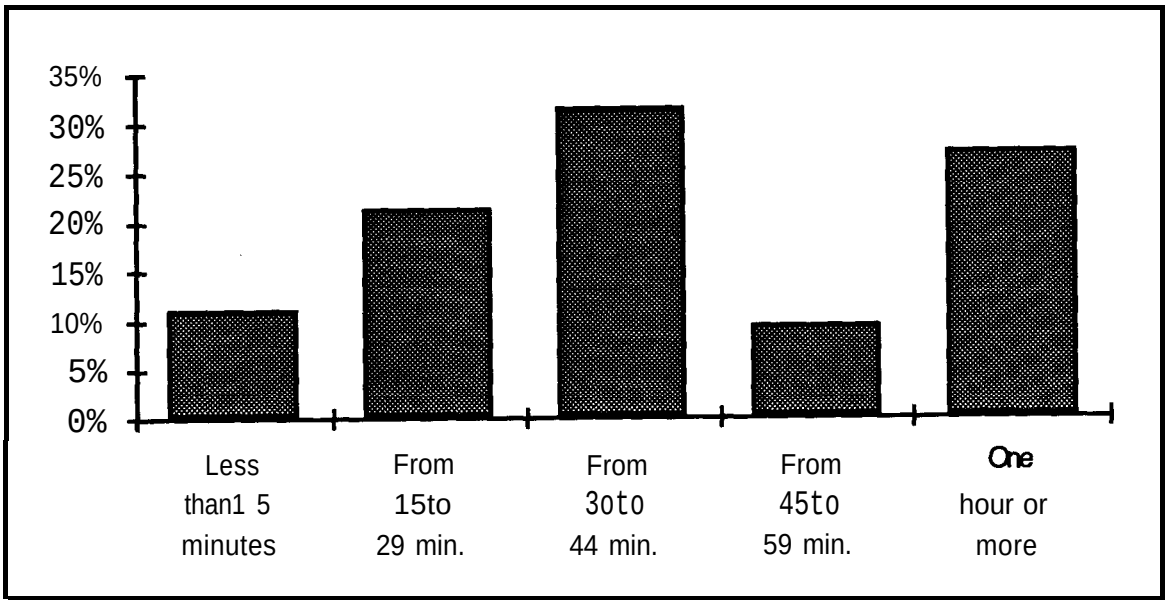


Fig. 4 Trip length distribution for return to home trips

8. a) Does your employer provide free parking?

YES 40.0%
NO 60.0%

b) If no, how much do you pay for your parking per month?

Less than $50:	17.9%
From $50 to $74:	25.6%
From $75 to $99:	15.4%
From $100 to $125:	28.2%
$125 and more:	12.8%

9. Why do you or do you not usually ride public transit for your most frequent travel purpose?

a) Reasons invoked to ride transit (48 answers):

Convenience, preference:	33.3%
Captive riders (no car):	33.3%
Economical reasons:	25.0%
Environmental awareness:	6.3%
Disability:	2.1%

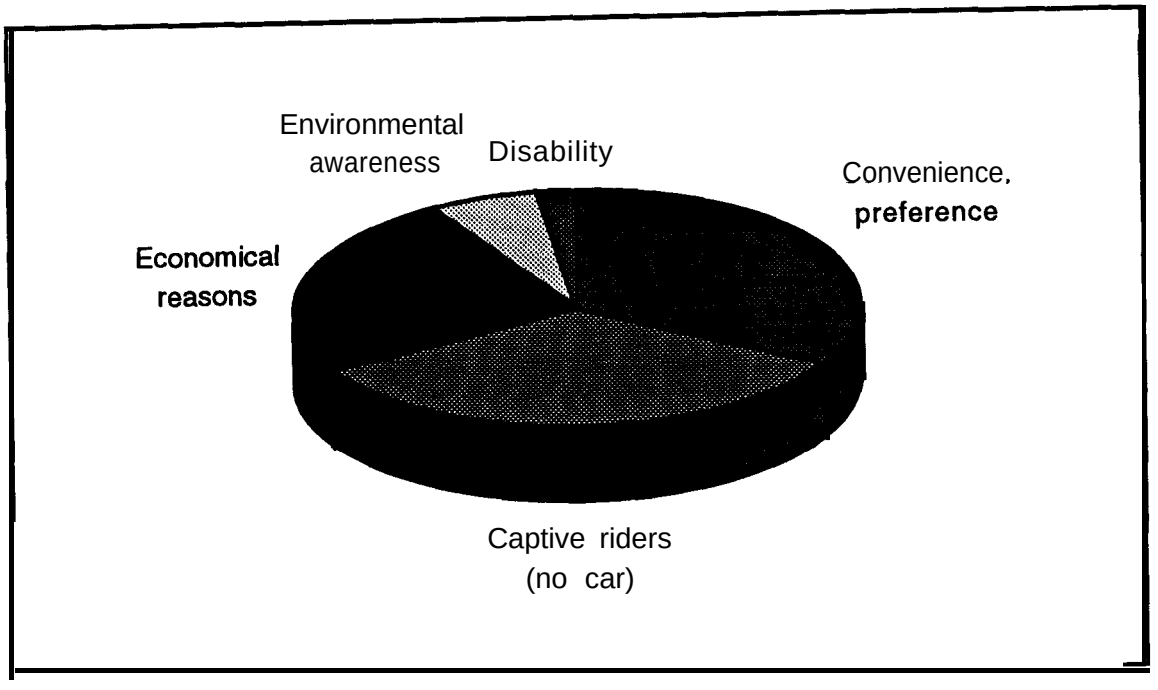


Fig. 5 Reasons justifying use of transit

b) Reasons invoked to use car (50 answers):

Inconvenience of transit: (in terms of routes, schedules or travel time)	42.0%
Preference for car:	36.0%
Economical reasons:	6.0%
No safety on buses:	6.0%
Other:	10.0%

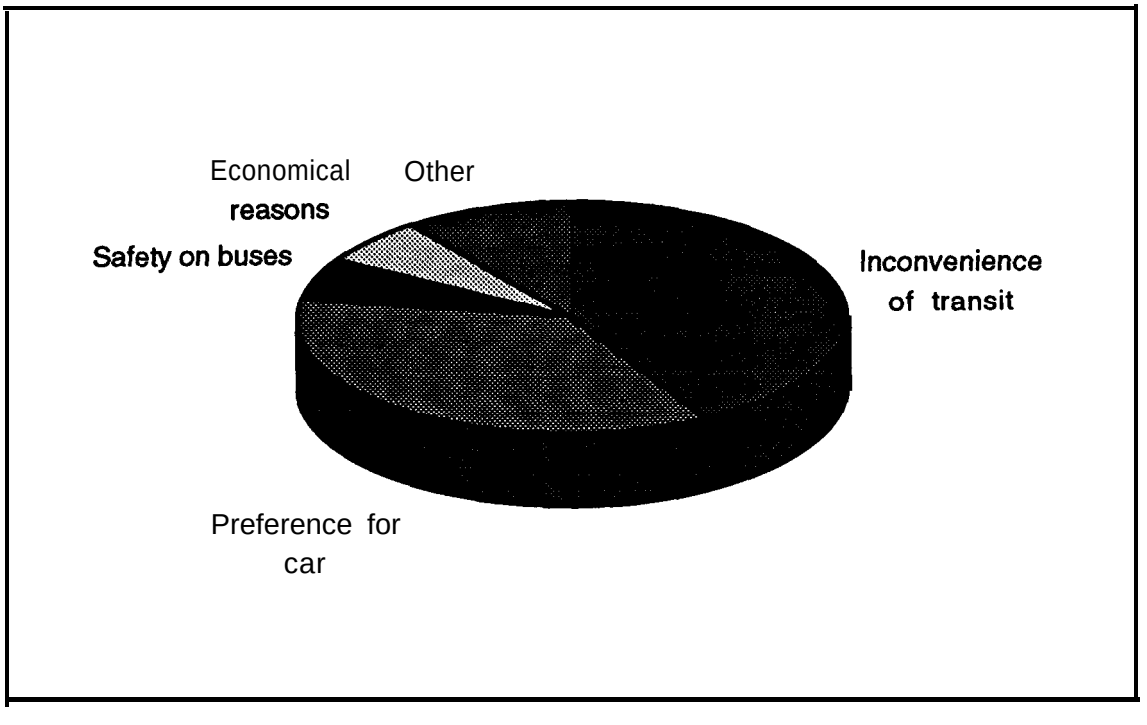


Fig. 6 Reasons justifying use of car

10. a) How far is the nearest bus stop or transit station from your home?

Less than one block:	19.8%
Between 1 and 2- blocks:	31.1%
Between 2 and 3- blocks:	20.8%
Between 3 and 5- blocks:	18.9%
5 blocks and more:	9.4%

b) How far is the nearest bus stop or transit station from your work place or from the place where you travel most?

Less than one block:	31.5%
Between 1 and 2- blocks:	41.4%
Between 2 and 3- blocks:	10.8%
Between 3 and 5- blocks:	9.9%
5 blocks and more:	6.3%

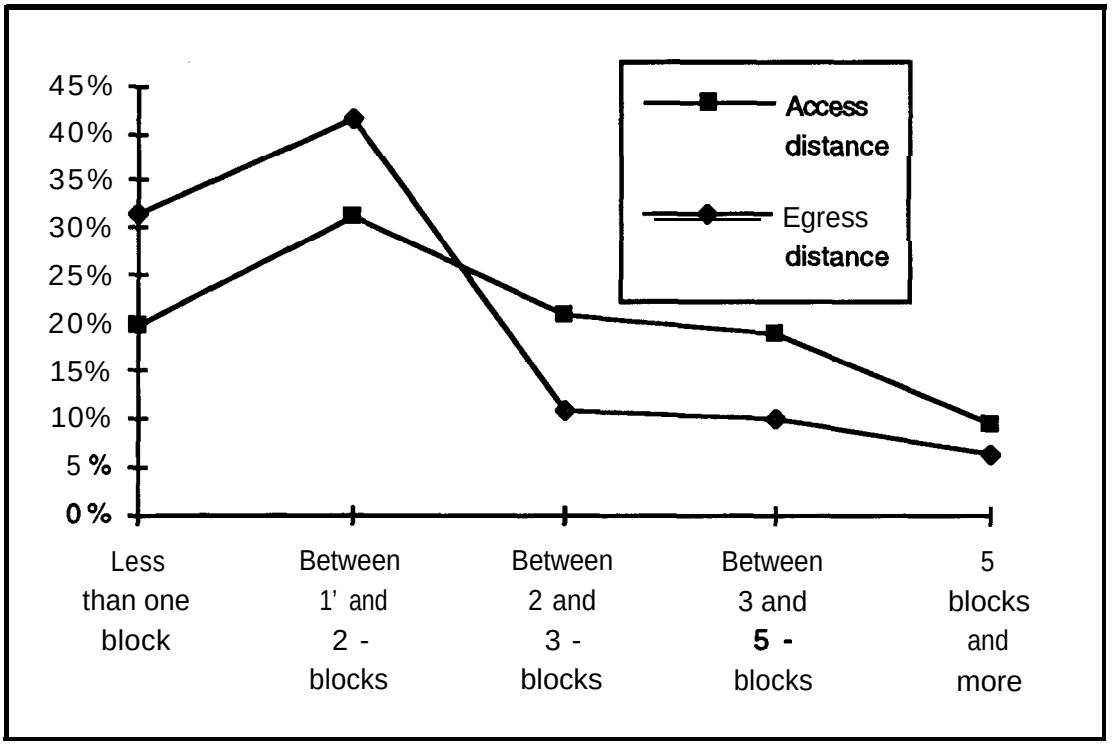


Fig. 7 Distribution of access and egress distances

11. If you take transit on a regular basis, how do you get to the bus stop or transit stations?

By walking:	92.0%
Other modes:	8.0%

12. a) How easy is it to get to the nearest transit stop from your ***home ?***

Very ***easy:***	85.5%
Somewhat easy:	7.3%
Neutral:	1.8%
Somewhat difficult:	3.6%
Very difficult:	1.8%

b) How easy is it to get to the nearest transit stop from your ***workplace*** or from your ***most frequently traveled location ?***

Very easy:	87.6%
Somewhat easy:	3.8%
Neutral:	1.9%
Somewhat difficult:	5.7%
Very difficult:	1.0%

13. a) Do you have any physical barriers such as highway crossings or safety barriers such as high crime neighborhoods that make access to transit difficult from your ***home ?***

NO	87.7%
YES	**12.3%**

b) How about from your ***work*** to the nearest bus stop or transit point?

NO	87.6%
YES	12.4%

14. Based on your experience, what is your overall impression of transit service in your area? On a scale of 1 to 5, with 5 being excellent service and 1 being extremely poor, how would you rate the service?

1:	6.4%	
2:	10.9%	
3:	32.7%	
4:	37.3%	
5:	12.7%	Average satisfaction index: 3.39

15. Using the scale from 1 to 5, please give the number that best describes your impression of transit in the Los Angeles area on the following aspects of service.

a) Availability of information about transit service

1:	7.0%	
2:	11.4%	
3:	17.5%	
4:	36.0%	
51	28.1%	Average satisfaction index: 3.67

b) Personal safety on buses

1:	14.0%	
2:	12.3%	
3:	22.8%	
41	28.9%	
5:	21.9%	Average satisfaction index: 3.33

c) Personal safety at bus stops

1:	13.2%	
2:	20.2%	
31	26.3%	
4:	28.9%	
5:	11.4%	Average satisfaction index: 3.05

d) Amount of time a bus trip takes

1:	14.3%	
2:	13.4%	
3:	19.6%	
4:	33.9%	
5:	18.8%	Average satisfaction index: 3.30

e) Cleanliness of the bus

1:	25.7%	
2:	13.3%	
31	31.0%	
4:	19.5%	
5:	10.6%	Average satisfaction index: 2.76

f) Service to places you wish to go

1::	5.4%	
2:	10.7%	
3:	22.3%	
4:	42.0%	
51	19.6%	Average satisfaction index: 3.60

g) On-time service

1:	6.2%	
2:	5.3%	
3:	23.9%	
41	43.4%	
5:	21.2%	Average satisfaction index: 3.68

h) Hours of service

1:	9.8%	
2:	8.9%	
3:	21.4%	
41	34.8%	
5:	25.0%	Average satisfaction index: 3.56

i) Reasonable fares

1:	10.6%	
2:	8.8%	
3:	21.2%	
4:	26.5%	
51	32.7%	Average satisfaction index: 3.62

j) Adequate seating

1::	9.8%	
2:	17.0%	
3:	26.8%	
4:	30.4%	
51	16.1%	Average satisfaction index: 3.26

k) Frequency of service

1:	9.7%	
2:	9.7%	
3:	28.3%	
41	36.3%	
5:	15.9%	Average satisfaction index: 3.40

1) Friendly, knowledgeable employees

1:	13.3%	
2:	10.6%	
3:	20.4%	
4:	30.1%	
5:	25.7%	Average satisfaction index: 3.44

Connections between buses

m) Waiting time

1:	13.5%	
2:	13.5%	
3:	26.9%	
41	31.7%	
5:	14.4%	Average satisfaction index: 3.20

n) Number of connections

1:	8.7%	
2:	7.7%	
3:	22.1%	
41	43.3%	
5:	18.3%	Average satisfaction index: 3.55

o) Availability of connections to destinations

1:	6.9%	
2:	8.8%	
3:	20.6%	
41	40.2%	
5:	23.5%	Average satisfaction index: 3.65

SOCIOECONOMIC PROFILE QUESTIONS

34. How long have you lived in the Los Angeles region?

TIME	Sample	L.A. City (1990)
Less than one year	3.7%	18.1%
Between 1 and 5 years	17.6%	
Between 5 and 10 years	16.7%	81.9%
Between 10 and 15 years	10.2%	
Between 15 and 20 years	10.2%	
Between 20 and 30 years	25.9%	
Between 30 and 40 years	5.6%	
40 years and more	10.2%	

35. What is your employment status?

EMPLOYMENT STATUS	Sample	L.A. City (1990)
Employed full-time	63.9%	61.6%
Employed part-time	15.7%	
Not employed	9.3%	5.6%
Retired	6.5%	32.8%
Other	4.6%	

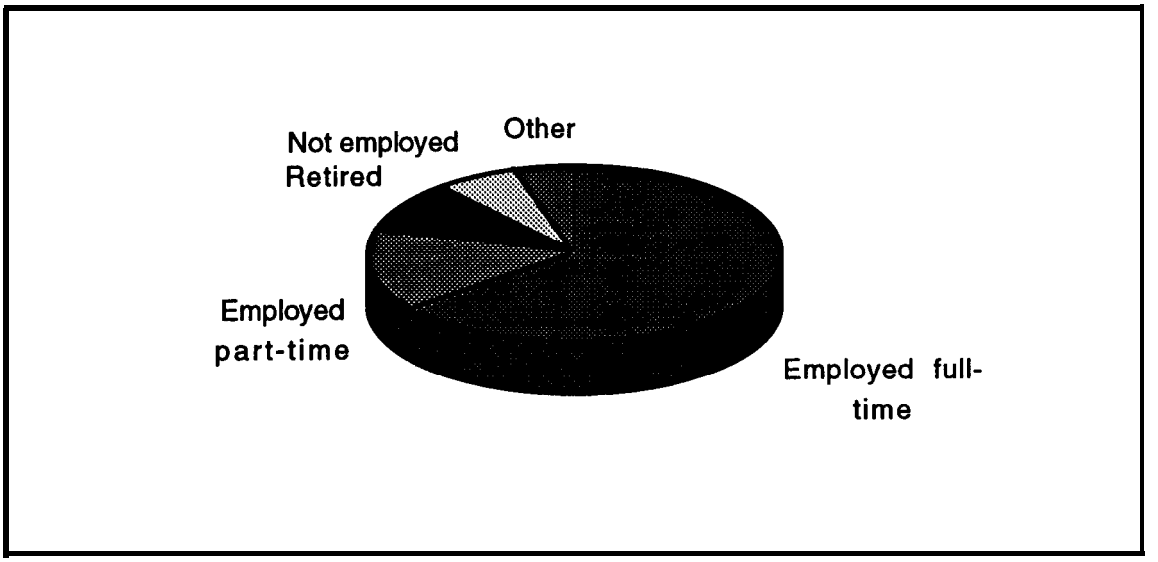


Fig. 8 Employment Status (sample)

36. Into which category does your total household annual income fall?

INCOME	Sample	L.A. City (1989)
Under $10,000:	9.5%	15.6%
$10,000 to $14,999:	20.0%	8.7%
$15,000 to $24,999:	16.8%	16.7%
$25,000 to $34,999:	18.9%	14.5%
$35,000 to $49,999:	9.5%	15.7%
$50,000 to $74,999:	11.6%	14.6%
$75,000 to $99,999:	5.3%	6.3%
$100,000 or over:	8.4%	7.9%

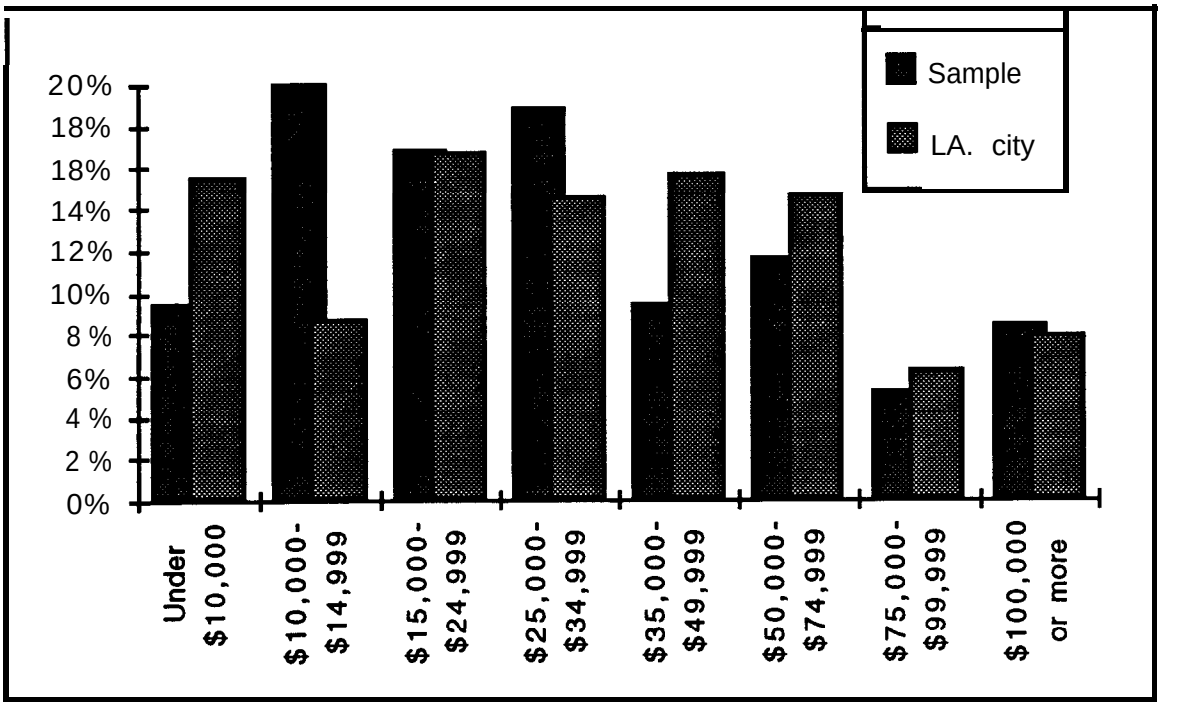


Fig. 9 Distribution of household annual income

37. How many people in your household are 18 or over?

NUMBER OF PEOPLE	Adults/hh Sample	People/hh L.A. city (1990)
One	32.7%	28.4%
Two	42.6%	27.7%
Three	11.9%	14.9%
Four	5.0%	12.5%
Five or more	7.9%	16.6%

38. How many adults are employed in your household?

NUMBERS OF EMPLOYED PEOPLE	Sample
None	12.6%
One	37.8%
Two	36.0%
Three	8.1%
Four	3.6%
Five	1.8%

39. How many cars do you have in your household?

NUMBER OF CARS	Sample	L.A. City (1990)
None	16.8%	15.3%
One	29.9%	39.3%
Two	41.1%	31.2%
Three or more	12.1%	14.3%

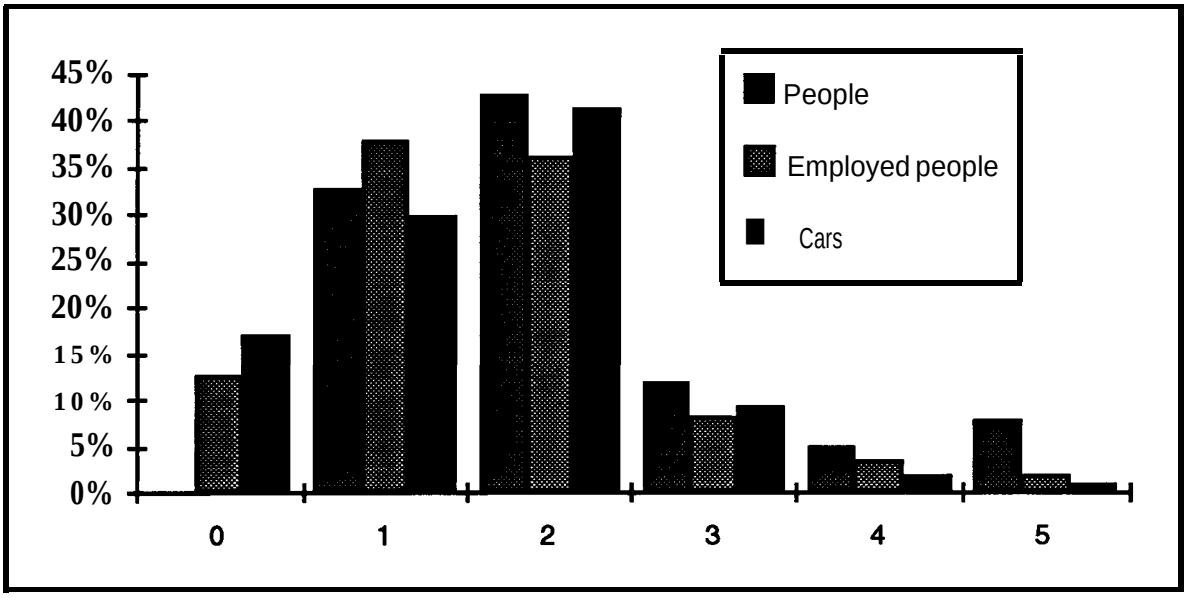


Fig. 10 Distribution of persons, workers and cars per household (sample)

40. Which of the following ethnic backgrounds do you consider yourself?

RACE	Sample	L.A. City (1990)	SCRTD riders
White	41.9%	52.8%	10%
African American	27.6%	14.0%	25%
Hispanic/Latino	21.0%	22.9%	45%
Asian/Asian-American	8.6%	9.8%	10%
Native American	1.0%	0.5%	

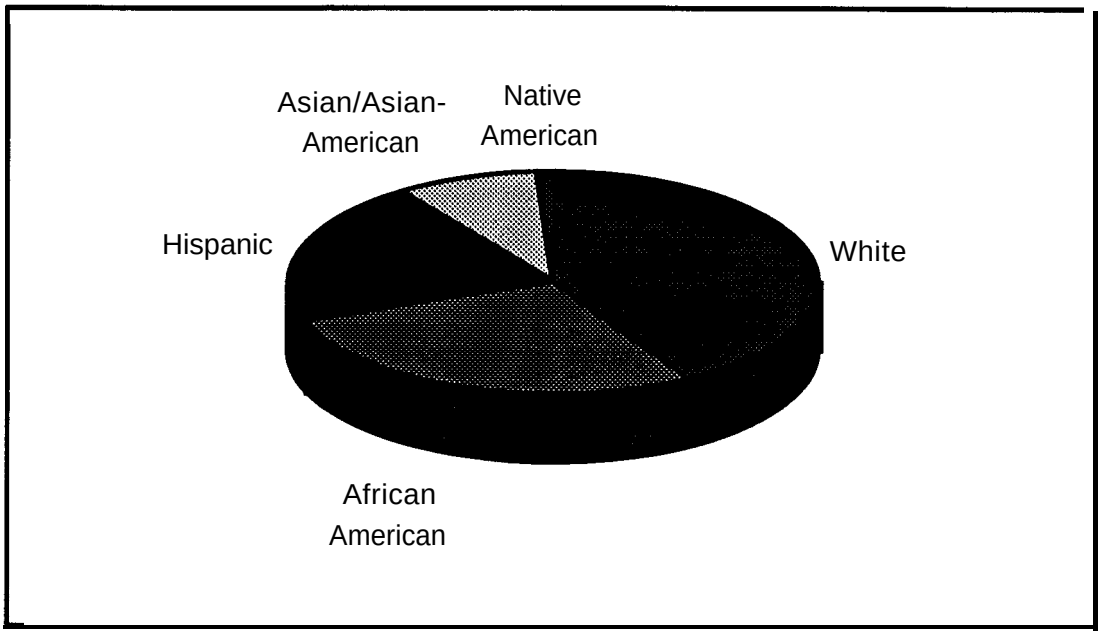


Fig. 11 Ethnic origin (sample)

41. What is your gender?

SEX	Sample	L.A. City (1990)	SCRTD riders
Male	60.2%	50.2%	45%
Female	39.8%	49.8%	55%

42. What is your age?

AGE	Sample	L.A. City (1990)*	SCRTD riders*
From 18 to 29	32.8%	31.3%	37%
From 30 to 39	29.9%	24.5%	22%
From 40 to 49	11.9%	15.9%	10%
From 50 to 59	11.9%	10.5%	6%
60 and older	13.4%	17.9%	25%

*** Percentages based on population older than 18.**

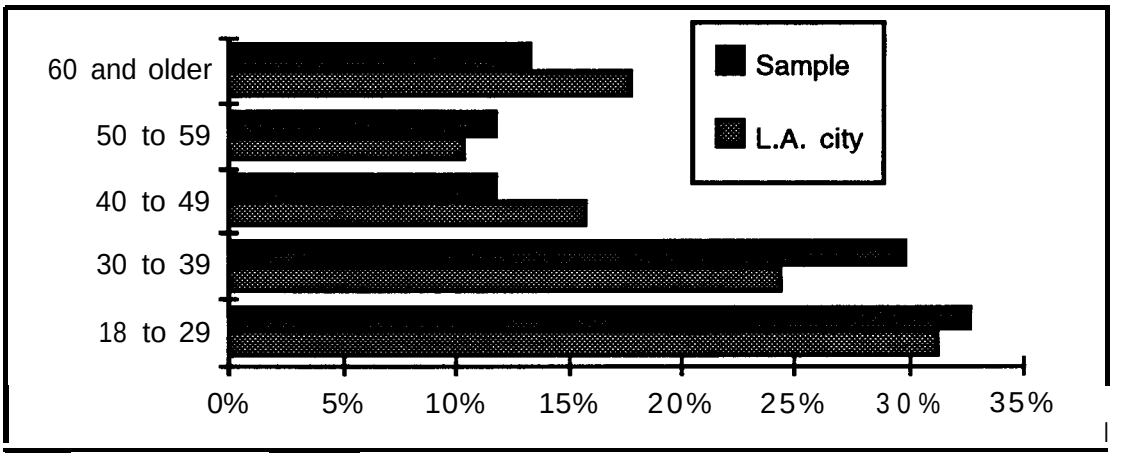


Fig. 12 Age distribution

3) POST-CALL INTERVIEW (most frequent trip)

16. How many times did the operator repeat the directions to the user?

None:	10.7%
Once:	51.8%
Twice:	33.9%
3 times or more:	3.6%

17. How long did take the operator to pick up the phone?

No waiting time:	5.1%
Less than one minute:	3.4%
Between 1 and 2- minutes:	18.6%
Between 2 and 3- minutes:	28.8%
Between 3 and 4- minutes:	27.1%
Between 4 and 5- minutes:	6.8%
Between 5 and 7.5- minutes:	6.8%
7.5 minutes or more:	3.4%

18. How long did the operator keep the user on hold?

No holding time:	3.4%
Less than one minute:	29.3%
Between 1 and 2- minutes:	39.6%
Between 2 and 3- minutes:	12.1%
Between 3 and 4- minutes:	6.9%
Between 4 and 5- minutes:	1.7%
Between 5 and 7.5- minutes:	5.1%
7.5 minutes or more:	1.7%

19. How long did it take the operator to give the information?

Less than one minute:	23.2%
Between 1 and 2- minutes:	30.4%
Between 2 and 3- minutes:	17.9%
Between 3 and 4- minutes:	16.1%
Between 4 and 5- minutes:	5.4%
Between 5 and 7.5- minutes:	7.1%
7.5 minutes or more:	0.0%

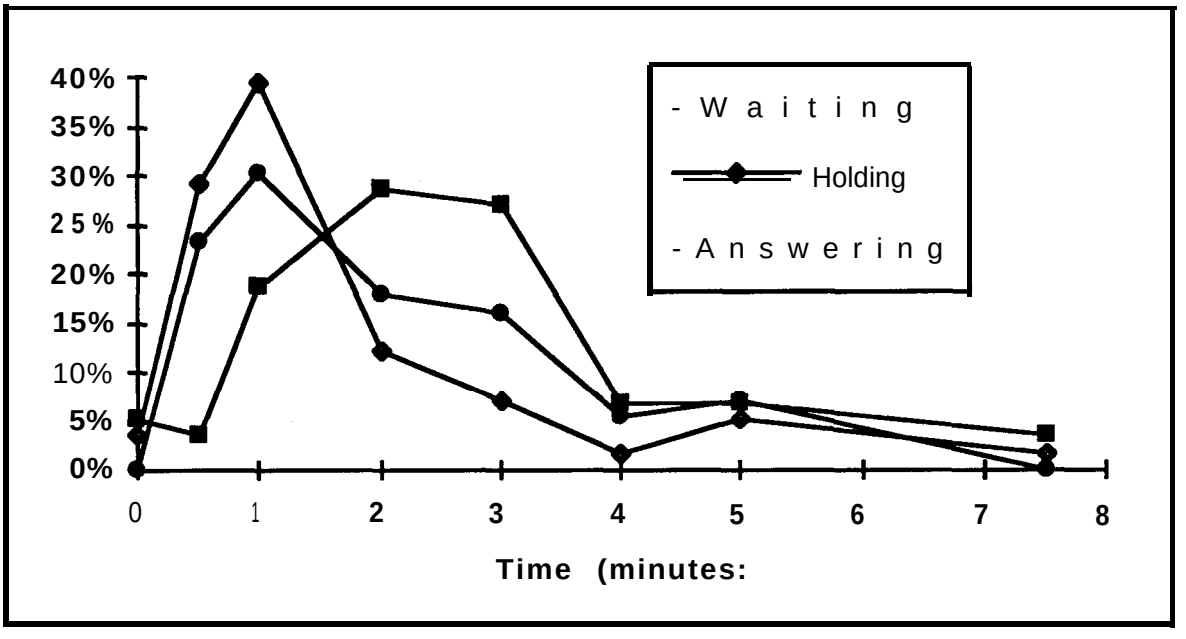


Fig. 13 Distribution of waiting, holding and answering times

20. (Clarity of directions)
How would you rate the clarity of directions given to you?

Easy to follow:	77.4%
Somewhat easy to follow:	9.7%
Neutral:	6.5%
Somewhat difficult to follow:	3.2%
Difficult to follow:	3.2%

21. (The manner by which information is given)
Did the operator clearly pronounce street names and directions?

Very clearly:	80.3%
Somewhat clearly:	8.2%
Somewhat unclearly:	9.8%
Very unclearly:	1.6%

22. (Speed of giving directions)
How would you rate the speed at which the operator talked?

Too slow:	0.0%
Somewhat slow:	1.6%
Just right:	83.9%
Somewhat fast:	9.7%
Too fast:	4.8%

23. (Speed of answering questions)
How would you rate the operator's promptness of answering your questions?

Too slow to respond:	4.9%
Somewhat slow to respond:	3.3%
Neutral:	19.7%
Somewhat prompt:	18.0%
Very prompt:	54.1%

24. (Friendliness)
How would you rate the friendliness of the operator?

Very friendly:	54.1%
Somewhat friendly:	24.6%
Neutral:	18.0%
Somewhat unfriendly and intimidating:	1.6%
Very unfriendly and intimidating:	1.6%

25. (Confidence in the accuracy of the information)
Do you believe the information you received from the operator is reliable?

Very confident that the information is accurate:	84.1%
Somewhat confident of the information's accuracy:	7.9%
Neutral:	1.6%
Somewhat incomplete:	0.0%
Very incomplete:	6.3%

26. (Completeness of information, security, reliability, fare, etc.)
Was the operator able to provide you with all information that you needed to make your trip?

Very complete:	76.2%
Somewhat complete:	7.9%
Neutral:	3.2%
Somewhat incomplete:	4.8%
Very incomplete:	7.9%

What additional information would be most helpful?
On a scale of 1 to 5, with 5 being most important.

a) Landmarks for directions

1:	14.8%	
2:	11.5%	
3:	13.1%	
4:	26.2%	
5:	34.4%	Average importance index: 3.54

b) Safety of neighborhoods while transferring bus

1:	6.7%	
2:	10.0%	
31	16.7%	
4:	20.0%	
5:	46.7%	Average importance index: 3.90

c) Personal safety on bus

1:	6.8%	
2:	11.9%	
31	15.3%	
4:	22.0%	
5:	44.1%	Average importance index: 3.85

d) Fare information

1:	11.3%	
2:	1.6%	
3:	11.3%	
4:	22.6%	
51	53.2%	Average importance index: 4.05

e) Length of trip time

1:	11.5%	
2:	0.0%	
3:	8.2%	
41	23.0%	
5:	57.4%	Average importance index: 4.15

f) Reliability of transit schedule information (within 5 min. of arrival and departure)

1:	1.7%	
2:	5.0%	
31	11.7%	
4:	15.0%	
5:	66.7%	Average importance index: 4.39

g) Up to the minute transit schedule information

1:	8.3%	
2:	6.7%	
3:	13.3%	
4:	21.7%	
5:	50.0%	Average importance index: 3.98

h) Frequency of service

1:	1.7%	
2:	1.7%	
3:	13.8%	
4:	24.1%	
5:	58.6%	Average importance index: 4.36

28. (Effect on use of transit)
The information received today would:

definitely increase the chances that I take transit:	26.2%
somewhat increase the chances that I take transit:	16.4%
have no effect:	55.7%
somewhat decrease the chances that I take transit:	1.6%
definitely decrease the chances that I take transit:	0.0%

29. What are the reasons?

a) Reasons why the information received increased the chances of taking transit (22 answers)

Reliability, accuracy or helpfulness of information:	68.2%
Direct availability of information:	9.1%
Friendliness, helpfulness of operator:	9.1%
Other reasons*:	13.6%

* Other reasons include:
- *"I feel now more secure to arrive on time at destination."*
- *"It is cheaper than what I thought."*
- *"I can transfer in safer neighborhoods than what I thought."*

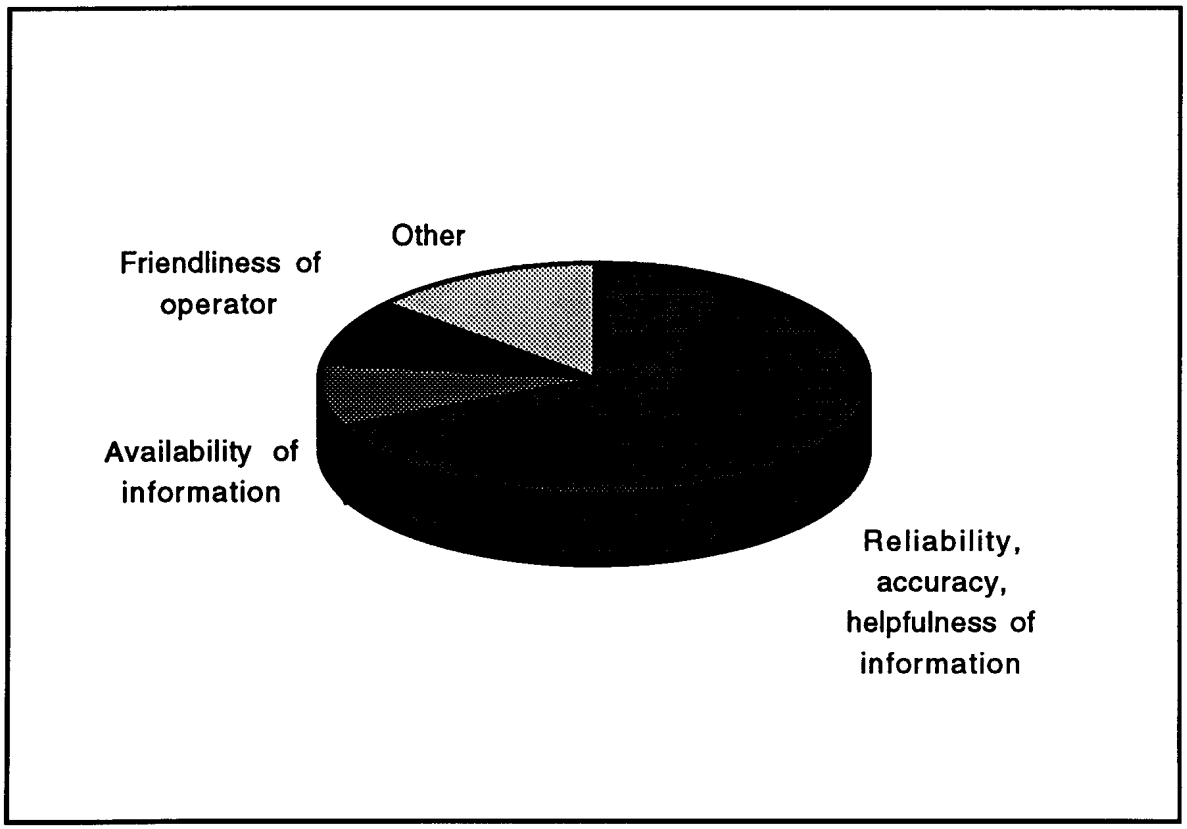


Fig. 14 Reasons why the information received increased the chances of taking transit

b) Reasons why the information received had no effect on the chances of taking transit (33 answers)

Subjects already taking transit:	33.3%
Subjects needing or preferring car anyway:	21.2%
Transit trip appeared too inconvenient from the information received (in terms of travel time, frequency or schedule):	21.2%
Subjects already knowing the information:	18.2%
Wrong information received:	3.0%
Excessive time to get information:	3.0%

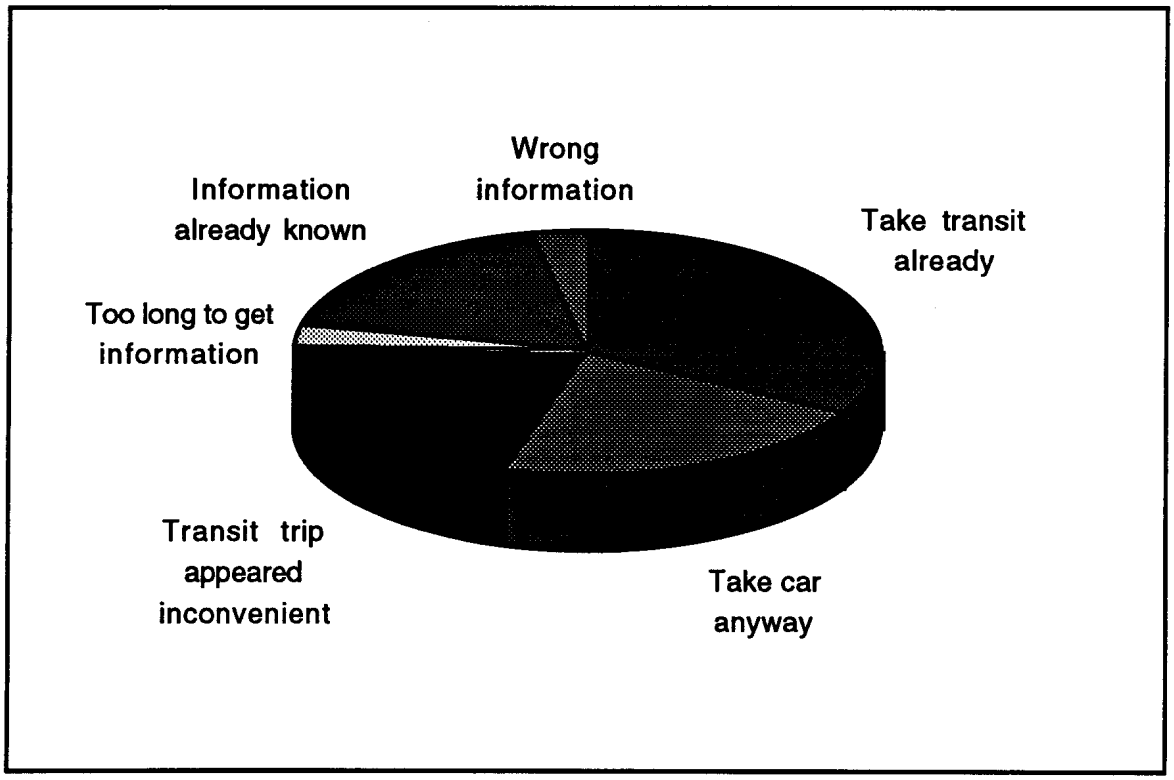


Fig. 15 Reasons why the information received had no effect on the chances of taking transit

30. (Cost of a phone call)
Answer the following statement: 35 cents is a reasonable cost to me for this call.

very reasonable:	23.0%
somewhat reasonable:	16.4%
neutral:	3.3%
somewhat unreasonable:	19.7%
very unreasonable:	37.7%

31. How would you prefer to get transit information?

Telephone:	87.1%
Written down:	9.7%
Personal computer:	3.2%

32. Using the scale from 1 to 5, please give the number that best describes your impression of transit in the L.A. area on the following aspects of service.

Aspect of service	**Average satisfaction index**	
	Before the call (question 15)	After the call (question 32)
Availability of information about transit service	3.75	3.87
Amount of time a bus trip takes	3.48	3.51
Service to places you want to go	3.71	3.82
Frequency of service	3.57	3.49
Friendly, knowledgeable drivers and employees	3.49	3.30

33. Does your employer subsidize transit?

NO	67.9%
YES	32.1%

4) POST-CALL INTERVIEW (Standardized trip)

Part a: Synthesized Voice

16. How many times were the directions repeated to you?

If the voice was heard first

None:	0.0%	
Once:	33.3%	
Twice:	50.0%	
3 times:	16.7%	Average: 1.83 time

If the voice was heard after the operator had already given the information

None:	8.7%	
Once:	56.5%	
Twice:	30.4%	
3 times:	4.3%	Average: 1.30 time

Combining both

None:	4.9%	
Once:	46.3%	
Twice:	39.0%	
3 times:	9.8%	Average: 1.54 time

17. How long did it take at first to get an answer to the call?

Average	2.6 minutes
Minimum	30 sec.
Maximum	10 minutes

18. How long was the user kept on hold?

Average	2.3 minutes
Minimum	0 sec.
Maximum	10 minutes

19. How long did it take to get the information?

Average	1.4 minute
Minimum	30 sec.
Maximum	5 minutes

20. (Clarity of directions) How would you rate the clarity of directions given to you?

If the voice was heard first

Easy to follow:	33.3%
Somewhat easy to follow:	16.7%
Neutral:	22.2%
Somewhat difficult to follow:	0.0%
Difficult to follow:	27.8%

If the voice was heard after the operator had already given the information

Easy to follow:	18.5%
Somewhat easy to follow:	11.1%
Neutral:	11.1%
Somewhat difficult to follow:	37.0%
Difficult to follow:	22.2%

Combining both

Easy to follow:	24.4%
Somewhat easy to follow:	13.3%
Neutral:	15.6%
Somewhat difficult to follow:	22.2%
Difficult to follow:	24.4%

21. (The manner by which information is given)
Were the street names and directions clearly pronounced?

If the voice was heard first

Very clearly:	22.2%
Somewhat clearly:	22.2%
Neutral:	0.0%
Somewhat unclearly:	11.1%
Very unclearly:	44.4%

If the voice was heard after the operator had already given the information

Very clearly:	25.9%
Somewhat clearly:	11.1%
Neutral:	0.0%
Somewhat unclearly:	37.0%
Very unclearly:	25.9%

Combining both

Very clearly:	24.4%
Somewhat clearly:	15.6%
Neutral:	0.0%
Somewhat unclearly:	26.7%
Very unclearly:	33.3%

22. (Speed of giving directions)
How would you rate the speed of the voice?

Too slow:	11.1%
Somewhat slow:	11.1%
Just right:	33.3%
Somewhat fast:	26.7%
Too fast:	17.8%

23. (Friendliness)
How would you rate the friendliness of the voice?

Very friendly:	6.8%
Somewhat friendly:	6.8%
Neutral:	75.0%
Somewhat unfriendly and intimidating:	6.8%
Very unfriendly and intimidating:	4.5%

24. (Confidence in the accuracy of the information)
Do you believe the information you received from the system is reliable?

Very confident of the information's accuracy:	48.9%
Somewhat confident of the information's accuracy:	40.0%
Neutral:	4.4%
Somewhat unconfident:	2.2%
Very unconfident:	4.4%

25. (Completeness of information, security, reliability, fare, etc.)
Was the system able to provide you with all information that you needed to make your trip?

Very complete:	66.7%
Somewhat complete:	11.1%
Neutral:	11.1%
Somewhat incomplete:	5.6%
Very incomplete:	5.6%

26. (Effect on use of transit)
The information you received today would

definitely increase the chances that I take transit:	6.7%
somewhat increase the chances that I take transit:	28.9%
have no effect:	46.7%
somewhat decrease the chances that I take transit:	11.1%
definitely decrease the chances that I take transit:	6.7%

27. What are the reasons?

a) Reasons why the information received increased the chances of taking transit (13 answers)

Reliability, accuracy or helpfulness of information:	76.9%
Importance of schedule information:	7.7%
Other reasons*:	15.4%

* Other reasons include:
- ***"The bus gets there faster than what I thought."***
- ***"Information is easier to understand than written schedules."***

b) Reasons why the information received had no effect on the chances of taking transit (19 answers)

Subjects needing or preferring car anyway:	36.8%
Subjects already taking transit:	26.3%
Information not perceived as the decision factor:	15.8%
Computer voice is unpleasant:	10.5%
Excessive time to get information:	5.3%
Transit trip appeared too inconvenient from the information received **(in terms of travel time, frequency or schedule):**	5.3%

c) Reasons why the information received decreased the chances of taking transit (9 answers)

Lack of clarity of the computer voice:	88.9%
Excessive time to get information:	11.1%

28. Using the scale from 1 to 5, please give the number that best describes your impression of transit in the L.A. area on the following aspects of service. (5 is excellent and 1 is very poor)

a) Availability of information about transit service

1:	8.7%		
2:	10.9%		
3:	23.9%		
41	30.4%		
5:	26.1%	Average satisfaction index:	3.54

b) Amount of time a bus trip takes

1:	13.0%		
2:	13.0%		
3:	28.3%		
4:	39.1%		
5:	6.5%	Average satisfaction index:	3.13

c) Service to places you wish to go

1:	6.7%		
2:	13.3%		
3:	17.8%		
41	42.2%		
5:	20.0%	Average satisfaction index:	3.56

d) Frequency of service

1:	6.7%		
2:	20.0%		
3:	24.4%		
41	35.6%		
5:	13.3%	Average satisfaction index:	3.29

e) Friendly, knowledgeable employees

1:	17.4%		
2:	15.2%		
3:	13.0%		
41	39.1%		
5:	15.2%	Average satisfaction index:	3.20

Part b : Human Operator

29. How many times did the operator repeat the directions to the subject?

If the operator was heard first

None:	4.2%	
Once:	75.0%	
Twice:	20.8%	Average: 1.18 time

If the operator was reached after the synthesized voice had already told the information

None:	0.0%	
Once:	81.3%	
Twice:	18.7%	Average: 1.17 time

Combining both:

None:	2.4%	
Once:	75.6%	
Twice:	21.9%	Average: 1.18 time

30. How long did take the operator to pick up the phone?

Average	2.5 minutes
Minimum	20 sec.
Maximum	8 minutes

31. How long did the operator keep the subject on hold?

Average	1.3 minutes
Minimum	0 sec.
Maximum	10 minutes

32. How long did take the operator to give the information?

Average	1.1 minutes
Minimum	30 sec.
Maximum	5 minutes

33. (Clarity of directions)
How would you rate the clarity of directions given to you?

Easy to follow:	87.0%
Somewhat easy to follow:	4.3%
Neutral:	0.0%
Somewhat difficult to follow:	6.5%
Difficult to follow:	2.2%

34. (The manner by which information is given)
Did the operator pronounce street names and directions clearly?

Very clearly:	91.3%
Somewhat clearly:	4.3%
Neutral:	0.0%
Somewhat unclearly:	2.2%
Very unclearly:	2.2%

35. (Speed of the directions)
How would you rate the speed at which the operator talked?

Too slow:	0.0%
Somewhat slow:	0.0%
Just right:	76.1%
Somewhat fast:	19.6%
Too fast:	4.3%

36. (Speed of answering questions)
How would you rate the speed of the response to your questions?

Too slow to respond:	0.0%
Somewhat slow to respond:	0.0%
Neutral:	11.1%
Somewhat prompt:	33.3%
Very prompt:	55.6%

37. (Friendliness)
How would you rate the friendliness of the operator?

Very friendly:	52.2%
Somewhat friendly:	30.4%
Neutral:	13.0%
Somewhat unfriendly and intimidating:	4.3%
Very unfriendly and intimidating:	0.0%

38. (Confidence in the accuracy of the information)
Do you believe the information you received is reliable?

Very confident of the information's accuracy:	78.3%
Somewhat confident of the information's accuracy:	17.4%
Neutral:	4.3%

39. What additional information would be most helpful? Rank from most to least important on a scale of 1 to **5, 5** being most important.

Additional information	**Average importance index**
Landmarks for directions	3.47
Safety of neighborhoods while transferring buses	3.96
Personal safety of bus	3.98
Fare information	4.29
Travel time	**4.30**
Reliability of transit schedule information (within 5 minutes of arrival and departure)	4.04

40. (Effect on use of transit)
The information you received from this call would:

definitely increase the chances that I take transit:	21.7%
somewhat increase the chances that I take transit:	34.8%
have no effect:	41.3%
somewhat decrease the chances that I take transit:	2.2%
definitely decrease the chances that I take transit:	0.0%

41. What are the reasons?

a) Reasons why the information received increased the chances of taking transit (24 answers)

Reliability, accuracy or helpfulness of information:	75.0%
Importance of schedule information:	8.4%
Direct availability of information:	4.2%
Friendliness, helpfulness of operator:	4.2%
Other reasons*:	8.4%

* Other reasons include:
- ***"The bus gets there faster than what I thought."***
- ***"Information is easier to understand than written schedules."***

b) Reasons why the information received had no effect on the chances of taking transit (18 answers)

Subjects needing or preferring car anyway:	50.0%
Subjects already taking transit:	33.3%
Information not perceived as the decision factor:	11.1%
Subjects already knowing the information:	5.6%

42. (Cost of phone call)
Answer the following statement: 35 cents is a reasonable cost to me for this call.

Very reasonable:	13.3%
Somewhat reasonable:	22.2%
Neutral:	6.7%
Somewhat unreasonable:	13.3%
Very unreasonable:	44.4%

43. Which method do you prefer over ah?

Human operator:	95.2%
Voice synthesizer:	4.8%

44. Reasons are: (mark all that apply)

91% Ability to interact with the operator
83% Clarity of directions
79% Clear pronunciation of street names and directions
76% Speed of the operator answering questions
7 1% Completeness of information
68% Speed of giving directions
68% Friendliness of the operator
68% Confidence in the accuracy of the information

45. Using the scale from 1 to 5, please give the number that best describes your impression of local transit on the following aspects of service.

Aspect of service	Average satisfaction index	
	Before the call (question 28)	After the call (question 45)
Availability of information about transit service	3.54	3.54
Amount of time a bus trip takes	3.22	3.13
Service to places you want to go	3.53	3.56
Frequency of service	3.24	3.29
Friendly, knowledgeable drivers and employees	3.05	3.20

46. Does your employer subsidize transit?

NO	67.6%
YES	32.4%

47. How would you prefer to get transit information?

Telephone:	74.4%
Written form:	9.3%
Employer:	9.3%
FAX:	4.7%
Personal Computer:	2.3%

APPENDIX B

Example of 3 phone calls made at SCRTD

Example 1

Operator: Transit information. This is Frank.

Caller: Hi. I have a friend who is coming in from Salinas on Greyhound. I presume he's coming into the main Greyhound station in Los Angeles. And he needs to get to the airport--LAX.

Operator: Any idea when he's arriving?

Caller: He's arriving approximately 5:00 tomorrow morning--an early morning hour.

Operator: Oh, okay. Okay, the Greyhound station is on Seventh Street, near Alameda Avenue. And he should start out at Seventh and Alameda with a bus number 60, going west on Seventh Street at 5:22 in the morning. That bus will bring him right over to Seventh and Broadway, downtowm, at 5:26. Then he would cross both streets--Seventh and Broadway--and transfer to bus 42, going south on Broadway at 5:37.

Caller: Is he going to make that?

Operator: Well, it should be about eleven minutes from getting off...

Caller: Twenty-six and 37. Okay.

Operator: That bus will end at the LAX Transit Center, right outside the airport, at 6:24. Now, the transit center is next to parking lot C, where he can get a free shuttle bus that goes to the different airline terminals.

Caller: Does he need to get himself over to the parking lot C?

Operator: Yes, but that's right next to the transit center.

Caller: So he should be able to get reasonably . . . I mean, to his airlines by . . .

Operator: Well, sometime between 6:30 and quarter of seven. Do you know what time his flight is leaving?

Caller: No. I think he told me that he had two hours, so I'm thinking this is going to be kind of close. But I'll let him know.

Operator: Yes, do get the details of his arrival downtown and his departure from LAX, because two hours is just barely enough to allow for this, and we want to make sure that we've got the timing right. We have lots of 60s and a fair number of 42s, and we can adjust the time as needed, probably. But it would be better to get a real clear idea of the arrival of the bus and the departure of the plane, and make sure that we can get him from one to the other.

Caller: If I get times, can I call back? Is there any way for you to make sure, or anything like that, or... ?

Operator: We all know these buses. Anyone you reach here will be able to give you the same information.

Caller: Okay. Alright. So . . . two hours is a little bit risky. You know, it sounds like that to me, too.

Operator: It's a little tight. I mean, if his plane actually takes off at seven, he should be there in time for it. Even if it takes off at, like, 7:30, he'll be there amply ahead of time. But you do want to get . . . It's a little bit . . . That two hour window is just barely enough, and it would be better to get a real clear idea of the exact times for this, and then check back with us to get the exact times for our buses to connect him.

Caller: Okay. But what you've given me now are exact, as far as you know.

Operator: Well, these are exact times if his bus is arriving at five and if his plane is leaving at seven.

Caller: Okay. Got it. You've been very helpful and patient with me. Thank you.

Operator: Good. You're welcome. Bye.

Example 2

Operator: Transit information. This is Frank.

Caller: I want to go to Beverly Blvd. and Wilcox.

Operator: Beverly and Wilcox, in Montebello.

Caller: In Montebello, yes.

Operator: Okay.

Caller: Leaving from Paxton and Laurel Canyon.

Operator: Paxton and Laurel Canyon. When do you want to do this, please?

Caller: As soon as possible.

Operator: Okay. [Pause.] Okay. Can you leave in ten minutes?

Caller: Yes.

Operator: Very good. Start with bus 230, going south on Laurel Canyon...

Caller: 230 south?

Operator: Right. From Paxton.

Caller: Okay.

Operator: At 6:39.

Caller: 6:39?

Operator: Yes. That bus will bring you to Laurel Canyon and Ventura Blvd., arriving there at 7:13. Then you can transfer to bus number 424, going east on Ventura Blvd., at 7:29. And that bus will bring you downtown to Hill Street and Third Street, arriving there at 7:54. Then you would walk one block further south on Hill to Fourth Street--just follow the bus--and then you would walk one block east on Fourth Street to Broadway. Now, Fourth is a one-way street going east. So you walk in that direction and then transfer to the Montebello number 40, going east on Fourth Street, at 7:58. And that bus will let you off at Beverly Blvd. and Wilcox at 8:27.

Caller: Okay. Beverly Blvd. and Wilcox--I was just told that there was some construction going on. Do you happen to know which street is before that, that I can get off on? I don't think they're letting people off on that street.

Operator: Okay. 1'11 see what the stop is before Wilcox, as you go along Beverly. [Pause.] The computer is taking a few seconds, but we will have this. Okay, the stop prior to Wilcox is at Beverly and Via Valverde.

Caller: Via Valverde.

Operator: Yes.

Caller: Okay. Well, thank you.

Operator: You're welcome. Bye.

Example 3 (real from a participant in the survey)

Operator: Transit information. This is Christal. May I help you ?

Caller: Yeah. I'm trying to get directions from Knott's Berry Farm to Temple and Grand Streets in L.A.

Operator: Okay. And when do you think you'd be travelling ?

Caller: I'11 be departing at 5:00 pm.

Operator: One moment. [Pause.] Okay, you have a 460 going north on Beach Blvd. at 5:10 p.m., you'll get off at Fifth and Broadway at 6:17, and transfer to the number 10 or the number 11 going north on Broadway at 6:22, and you'll be at Temple and Grand at 6:26.

Caller: Alright. That should do it. Thank you very much.

Operator: And thank you, sir. Goodbye.