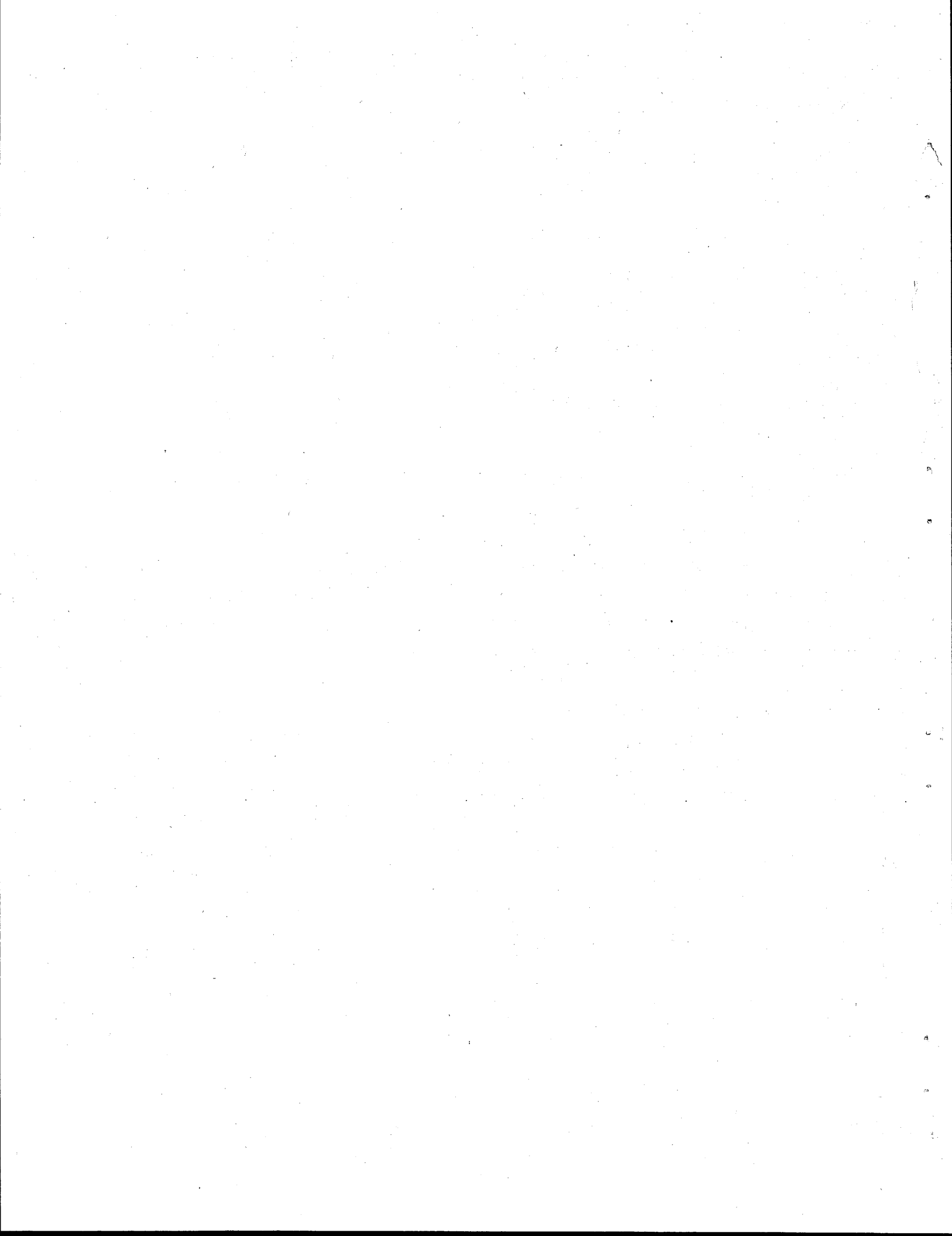


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16. Abstract <p>The area of transit market research began receiving a great deal of attention as systems came to recognize the importance of a consumer-orientation within the transit industry. Responsiveness to the public's needs and preferences necessitates the identification of these and other factors, thereby requiring sound market research efforts by each system.</p> <p>With a knowledge of basic research principles and procedures, in-house personnel can establish market research as an integral part of their marketing program. Therefore, this report provides guidelines on designing and administering questionnaires, sampling techniques to be used with public surveys, attitudinal scaling devices, field observation techniques, and the use of secondary data analysis. The discussions are general in nature to facilitate understanding, particularly for those individuals who have not had previous experience in the area. The report is a unique contribution, however, in that it is geared specifically to the area of public transportation.</p>					
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BASIC MARKET RESEARCH TECHNIQUES FOR TRANSIT SYSTEMS

by

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The contents of this report reflect the views of the authors who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the Urban Mass Transportation Administration or the State Department of Highways and Public Transportation. The report does not constitute a standard, a specification, or a regulation.



## IMPLEMENTATION STATEMENT

To be most effective, decisions regarding the provision of transit service must be based on an objective assessment of the needs and preferences of the system's target markets. Hence, there is a critical dependence upon sound market research efforts to secure this essential information.

The material presented in this report is designed to facilitate in-house transit market research activities by providing transit personnel with some basic methodological guidelines and considerations. Knowledge gained from this information will enable those in the transit industry to conceptualize and conduct the market research needed to fulfill their specific system objectives.

## SUMMARY OF FINDINGS

Market research provides the foundation for effective transit service delivery. Acceptance or rejection of the system and mandated service modifications are dependent on the public's evaluation. The critical importance of sound marketing efforts emphasized the need for a basic guidebook, geared specifically to the transit industry, outlining the principles and procedures of market research.

The major responsibilities of a transit market research activity are to collect data, analyze the needs and preferences of the various target markets, and, subsequently, to forecast the potential demand for transit services. Other key functions of market research within the transit field include assessing needs for services by specific target population segments, evaluating the effectiveness of service improvements and alterations, determining the public's attitude toward the transit system, and measuring the effectiveness of specific advertising campaigns and themes. Market research cannot provide answers to all questions that might arise, nor can it take the place of sound judgment on the part of transit staffs and city representatives. However, research undertaken in a marketing capacity can reinforce management decisions and make other activities more productive by replacing intuition with objective information. Also, marketing staffs can periodically provide management with projections of transit market characteristics and trends to facilitate planning and service development.

Three general approaches to be used in a transit marketing capacity were discussed in the report:

- Sample surveys
- Field observation
- Secondary data analysis

In comparing these three broad procedures, each has strengths and weaknesses which make them distinct methods, as shown below:

Evaluation of the Three Basic Approaches  
Used for Transit Market Research

Evaluation Criteria	Approach or Methodology		
	Sample Survey	Field Observation	Secondary Analysis
1. Rapid method of data collection		X	X
2. Low cost approach		X	X
3. Flexible		X	
4. Currency of input data		X	
5. Consistency of input data	X		X
6. Use of quantifiable information	X		X
7. Use of longitudinal analyses	X		X
8. Use of intuitive, subjective information	X	X	

Sample Surveys

Questionnaires are the most common form of data-gathering utilized in a marketing capacity. In simplest terms, questionnaires provide a formalized, quantifiable approach to asking the public for information. Questionnaires can be used to measure a number of factors, including

- knowledge levels, attitudes, and evaluation of transit and specific service features
- behavior (travel patterns, trip purposes, and frequency of transit use)

- personal characteristics (age, socioeconomic status, sex, and auto availability)

In general, the increasing requirements by transit representatives for quantitative measurement of service needs suggests that surveys will play a more important role in all future transit marketing efforts. Therefore, a detailed discussion of this method is included in the report. Topics encompassed include question content, question phrasing, and question sequence. Possible formatting of survey responses and optimum physical characteristics of questionnaires also are presented. Perhaps the most important considerations in the actual task of questionnaire construction are:

1. knowledge of the exact information required to fulfill study objectives;
2. the identity of target respondents; and
3. method of administration to be used.

In addressing the last consideration -- method of administration -- four alternative measurement procedures may be utilized by the transit industry:

- Personal interview
- Telephone survey
- Mailed questionnaire
- On-board survey

### The Personal Interview

Listed below are some of the major advantages of the personal interview.

- People are more willing to cooperate in a face-to-face situation; therefore, a high return rate can be achieved.
- A very representative sample of the population can be obtained because most members of the population can be reached using this approach.
- The presence of the interviewer ensures that confusion on the part of the respondent will be kept at a minimum; therefore, the data are highly accurate.

- A greater number of returns are assured due to the feasibility of follow-up interviews when needed.
- The interviewer can adapt the language of the survey to meet the ability or educational level of the respondent.

Some of the weaknesses associated with personal interviews are:

- Costs related to both transportation and time requirements are higher than with other methods, particularly if the survey covers a large area.
- If the interviewer has a pro-transit bias, he may unconsciously ask the questions so as to obtain confirmation of his own views, and thus secure biased information.
- The data may be recorded inaccurately or incompletely unless those conducting the survey have been properly trained.
- If the interviews are conducted during the normal 8:00-5:00 time period, a biased sample will result; housewives will make up the majority of the sample and working males and females will be almost totally excluded.

### The Telephone Interview

The pros of the telephone interview are summarized below:

- Of all the survey techniques, the telephone interview is the fastest.
- Refusal rates have been found to be low using this technique, although in part this will depend on the topic being discussed.
- It is very easy to train and supervise those conducting the interviews because the supervisor can stay in the same room with them.
- Generally, the cost per completed interview is quite low.
- Sampling procedures are simplified because an address listing of telephone numbers is usually available.

The disadvantages of the telephone interview include:

- Telephone subscribers are not a representative sample of the entire population; lower income groups often do not have phones.
- It is difficult to gather detailed information over the telephone because respondents become easily annoyed or impatient if the call is too lengthy.
- Personal information is often difficult to secure, and opinions are less likely to be offered because the respondent cannot be certain of the surveyor's credentials.

- The person doing the interviewing has a very limited amount of time to record information, jot down comments, etc.
- Although time-consuming, the job of checking the wrong numbers, busy signals, and no answers must be done to ensure representativeness.

### The Mailed Questionnaire

The merits of the mailed questionnaire are shown below:

- It is possible to reach a much larger population and cover a wider geographical area with mailed questionnaires than with personal interviews.
- Mailed questionnaires are less expensive in that training a staff of surveyors is eliminated, and mailing costs are lower than transportation and time costs for a field staff.
- Because anonymity is assured, respondents may be more willing to answer personal and/or opinion questions.
- The problem of potential interview bias is eliminated.
- The mailed questionnaire can be answered at the respondent's personal convenience.

The mailed questionnaire suffers from the following disadvantages:

- The people who return questionnaires are not representative of the entire population surveyed; unless efforts are made to adjust for nonresponse or to obtain nearly complete schedules from everyone in the sample, mailed questionnaires should not be used.
- Return rates are often as low as 10 to 20 percent, but these figures vary greatly, depending on schedules and informants. (If mail surveys are geared to a small population, such as all local transit marketing directors within a state, a high return rate can be anticipated without follow-ups. Additionally, with three or four contacts, the returns for the general population may be increased to 70 or 80 percent of the sample [see Dillman, et al., 1974].)
- Without the aid of an interviewer, respondents may misinterpret questions, omit essential information, and so forth, making it necessary to discard the entire questionnaire.
- It is nearly impossible to return unsatisfactory or unfinished schedules to the informant for correction.
- Mailed questionnaires must be very brief if high returns are to be obtained.

## On-Board Survey

Listed below are some of the major advantages of on-board surveys:

- Every passenger on a bus is able to respond to the questionnaire, so that it is possible to obtain the universe of all riders for a specific day, rather than a sample.
- Bus riders are "captive respondents" so that participation is easily solicited.
- Refusal rates are quite low.
- Like the personal interview, face-to-face confrontation of the on-board researchers with respondents reduces suspicion of the survey and allows the rider to ask questions when necessary.
- The on-board survey can be undertaken fairly rapidly, whereas personal interviews may be time-consuming and require additional personnel.
- Unlike previously discussed procedures, the on-board survey addresses only transit patrons whereas in random sampling of the population the vast majority are nonriders.

The disadvantages of the on-board survey include:

- If the survey is more than one or two pages, the number of incomplete questionnaires can be quite high, especially on shorter bus routes, although refusals remain very low.
- If one bus rider refuses to respond, there may be a "domino effect" in that succeeding respondents also refuse to take a questionnaire.
- The researcher is often asked questions about the transit system or anticipated use of survey results that he/she is unable to answer.
- Even if on-board surveys are translated into several languages, there are often language barriers between researchers and respondents, in terms of describing the purpose of the survey and any additional instructions needed.
- The researcher has very little time to take notes on reasons for refusals, give out metered, self-addressed envelopes, or provide personal assistance to respondents.
- Crowded buses, with standing respondents, make it almost impossible for some patrons to complete the survey.

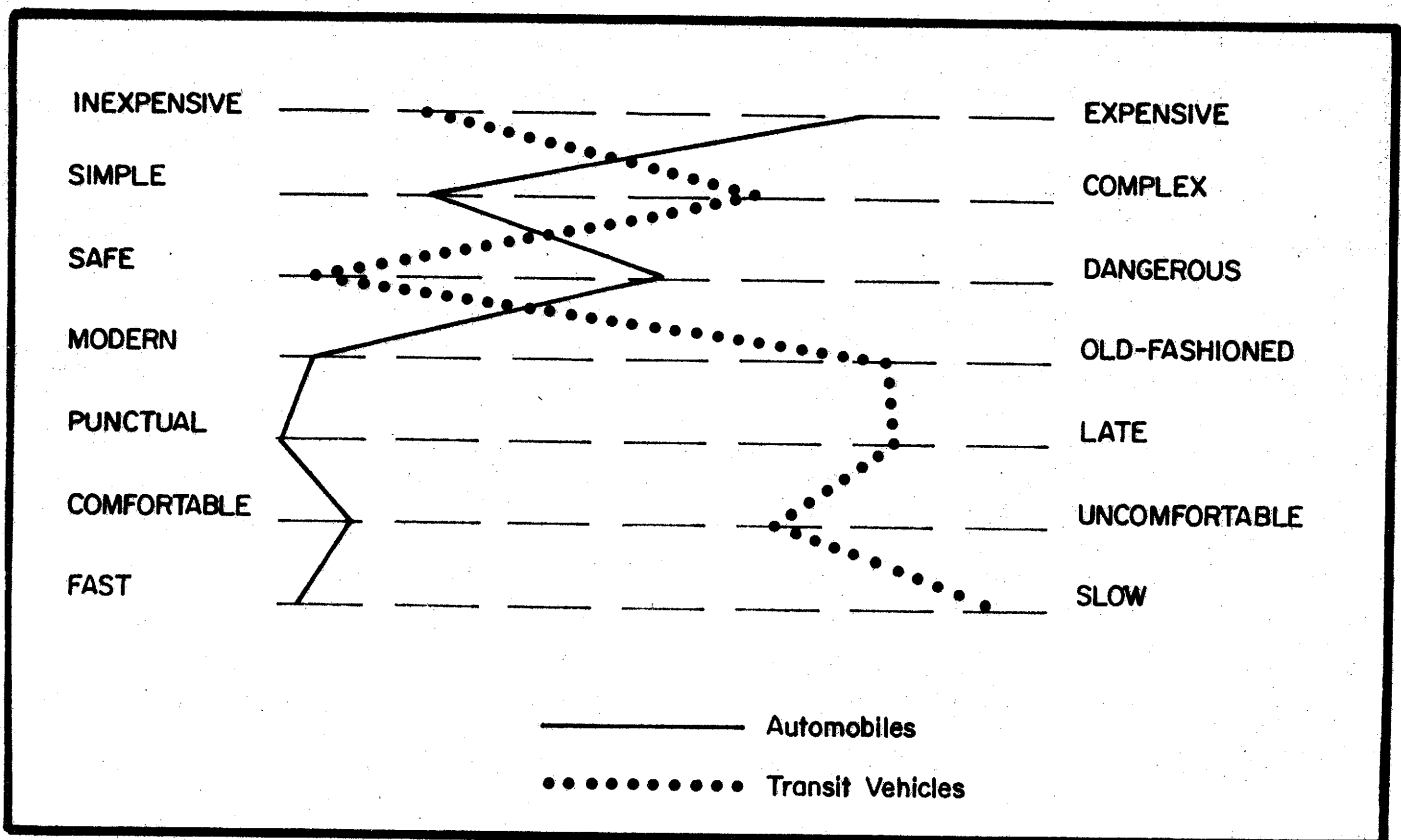
The measurement procedures are not mutually exclusive. For example, it may be desirable to combine telephone interviews with mailed questionnaires

or with personal interviews as a follow-up method when no response or incomplete responses are obtained from particular parts of the sample. The types of measurement procedures used determine to some extent the sampling method. Various sampling techniques are described in the report, including types of probability samples as well as nonprobability samples.

### Scaling Procedures

Scaling procedures also are described; the development of scales assists in clustering attitudes or service requirements. Additionally, scaling provides a means of ranking salient service features and evaluations of the system.

One scaling technique known as profile analysis involves computation of the mean value assigned to each item in a scale for a specific market segment. Profiles can then be visually compared to that of other market segments. The profile of automobiles is compared to that of transit vehicles in the following illustration:





It can be seen from this example that transit vehicles are rated more favorably than automobiles on only two dimensions -- cost and safety. Such comparisons provide the transit system with important information that can be used to guide the development of both changes in service and advertising and promotional campaigns.

With the computation of scale scores, the transit marketer gains insight into the composite attitudes and needs of the public -- information that is critical for the successful operation of the service.

### Field Observation as a Data Collection Method

In very general terms, field observation refers to any data collection method whereby the researcher witnesses firsthand the events or phenomena under investigation. The discussion here is limited to the more informal and unstructured field observation techniques which can be used within the transit industry.

#### Participant Observation

With this technique, the researcher directly observes events pertaining to the research objectives while actively participating in the situation at hand. Transit staffs are apt to find that by actually riding buses and making observations about the behavior of the people on the bus, they are in a much better position to recommend changes in service or plan promotional campaigns. Direct conversation with bus riders also can provide valuable information.

#### Focus Groups

Transit personnel may find it beneficial to periodically meet with members of the community to discuss issues and problems related to the transit system. While the meetings may be scheduled at regular intervals, they should

be conducted informally to encourage greater participation and openness among those in attendance. District representatives -- individuals who represent various geographic sectors of the community -- can act as liaisons between the local transit system and members of the community to which they belong. Both of these approaches provide an excellent opportunity for transit personnel to obtain feedback from the community on various aspects of transit service. Responsiveness to such information characterizes the consumer orientation which most transit systems feel is critically important for their successful operation.

### Unobtrusive Measures

This category contains all types of field observation data collecting techniques in which the researcher does not use some type of direct, face-to-face interaction with individuals to obtain information. Technically speaking, for almost any type of data that can be obtained from a sample survey or from secondary sources such as census data, a rough approximation may also be obtained from field observation techniques. However, as is discussed in the report, some types of data are more efficiently and inexpensively collected by methods other than field observation, but the latter method provides for the addition of heretofore unknown transit problems and potentially needed improvements to the objective quantitative data collected.

The following are some illustrations of ways unobtrusive measures can be used in the area of transit market research:

- A simple head-count of the number of persons standing at various bus stops in the city will enable transit personnel to determine which stops are used with the greatest frequency by the largest numbers of patrons. This information will aid in selecting appropriate locations for shelters, benches, information kiosks, etc.
- Casual observation of the people riding buses can help identify factors influencing ridership, such as the effects of a lack of adequate seating, the use of bus schedule information racks, and

## Use of Secondary Data

Market research to determine the need for transit service improvements can often make use of existing, readily available data sources. To develop effective marketing strategies, characteristics of the population and of specific service areas can be delineated with the use of secondary data. While surveys are normally used to determine transit demand and optimum promotional strategies, this approach is often costly and time consuming. In addition, transit patrons and the general public may tire of an overabundance of community surveys. Census data, especially census tract and block information, have a proven usefulness for providing an aggregate picture of residents and city subareas. Other types of secondary data, such as on-board counts of riders and recorded fare and pass patrons, as well as land use and other recorded data from city planning offices also provide important information.

### Demographic Data

For census tracts as well as for larger areal units, characteristics of area residents that have been effective for the prediction of transit demand are listed below.

Demographic Characteristics of Residents  
for Census Tracts in 1970

I. Transportation Characteristics

- (1) % Workers using transit
- (2) % Workers driving private vehicles
- (3) % Workers as passengers in private vehicles
- (4) % Workers walking to place of employment
- (5) Location of work relative to place of residence

II. Age Distribution

- (1) % Residents < 16
- (2) % Residents 60+

III. Socioeconomic Status of Residents

- (1) Median owner value
- (2) Median gross rent
- (3) Median family income
- (4) Median years of school completed
- (5) Percent of white collar workers

IV. Ethnic Characteristics

- (1) % Anglo
- (2) % Negroes
- (3) % Spanish-Americans

V. Residential Stability

- (1) Persons per acre or per square mile
- (2) % 5-Year residents
- (3) Median year moved to dwellings
- (4) % Owned dwellings

The delineation of these characteristics based on 1970 accounts have differential uses, depending on data collection requirements. The 1980 census form will include a substantial number of transportation-related items, with more new items regarding transportation patterns than any other topic addressed. Relevant items tentatively planned for inclusion in the 1980 census are:

- Travel time to work
- Location of work
- Means of transportation to work
- Persons in carpool
- Hours worked
- Number of automobiles
- Number of light trucks and vans

The majority of census data use is dependent on the decennial data, such as the items for 1970 and 1980 which have been discussed. For 1970, the data is available on computer tapes and in standard published volumes.

In addition to information obtained from the decennial census, the Bureau periodically publishes reports based on Current Population Surveys. Data from these reports, when combined with transit operating statistics, can be used to compile more recent estimates of certain population characteristics and transit needs than is available from the decennial reports. Under certain conditions, the Bureau will add questions to its Current Population Survey interview schedules to obtain specific data for public agencies.

As an example of the periodic surveys' uses, a Current Population Report was recently disseminated entitled, "Selected Characteristics of Travel to Work in 20 Metropolitan Areas: 1976." This report discusses changes in modes of transportation to work and trends in the use of mass transportation.

#### Involvement in Transit Market Research

Transit staffs, particularly those who have not been actively involved with market research in the past, need be assured that efforts undertaken in a market research capacity can be effective if basic guidelines are followed. The handbook, Basic Market Research Techniques for Transit Systems, serves to acquaint system personnel and city representatives with the basic principles of research in transit marketing. It is anticipated that market research can be established as an integral part of transit's service delivery system.

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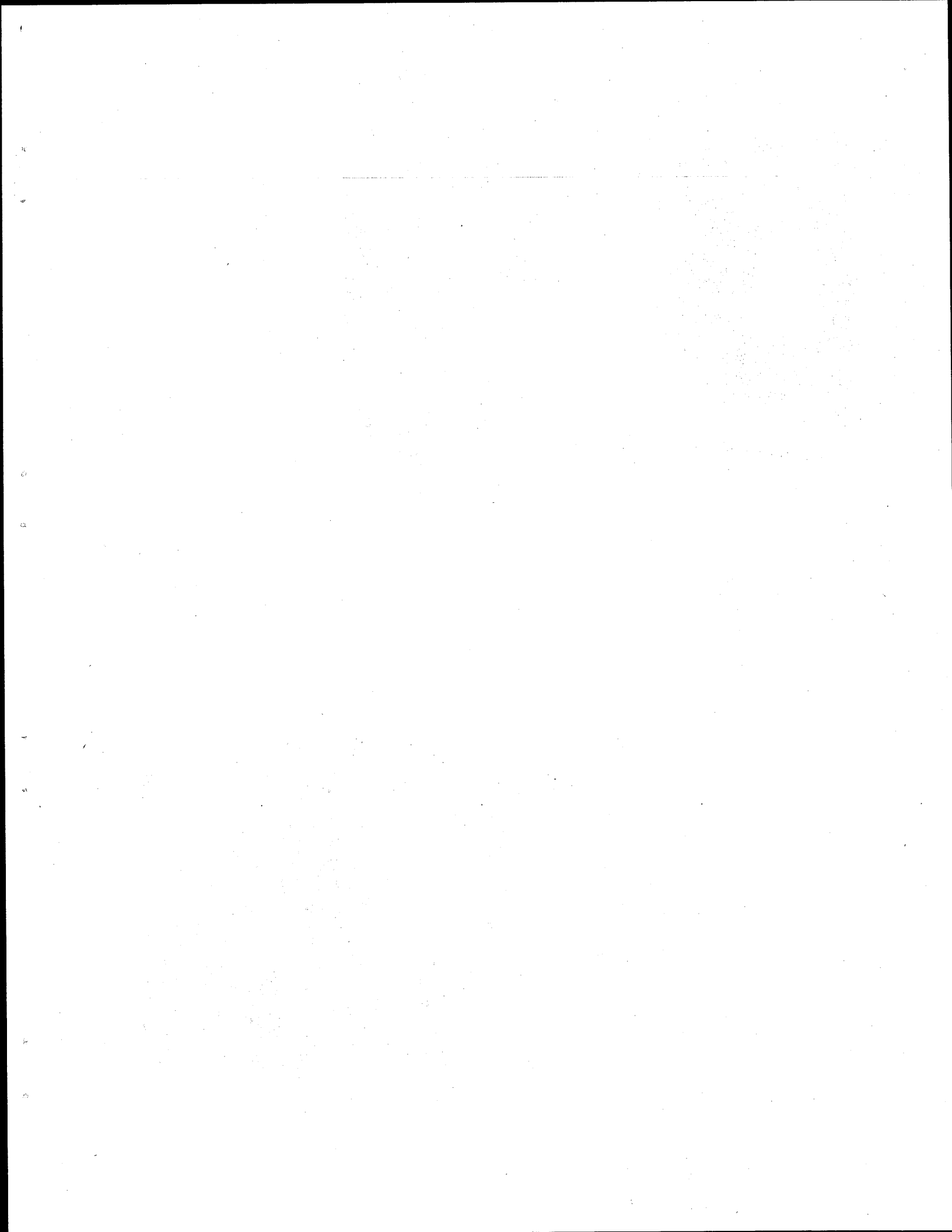
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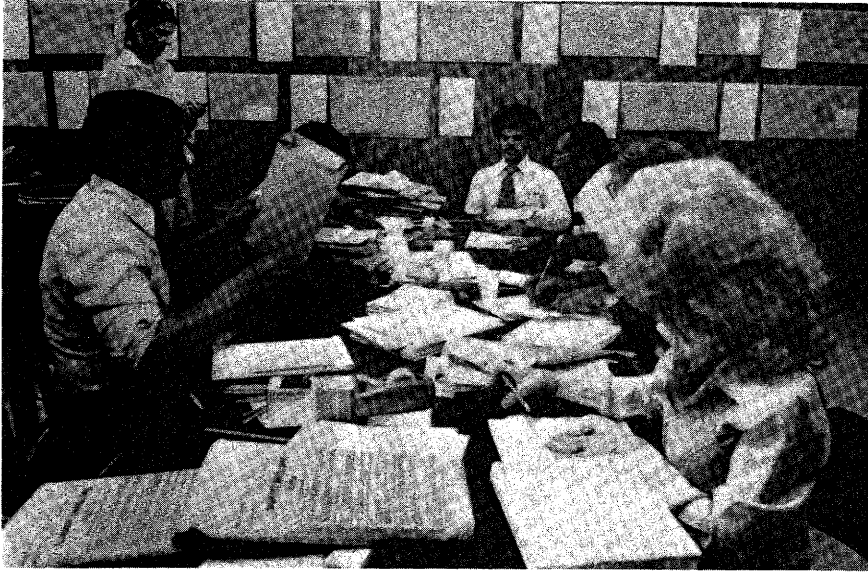
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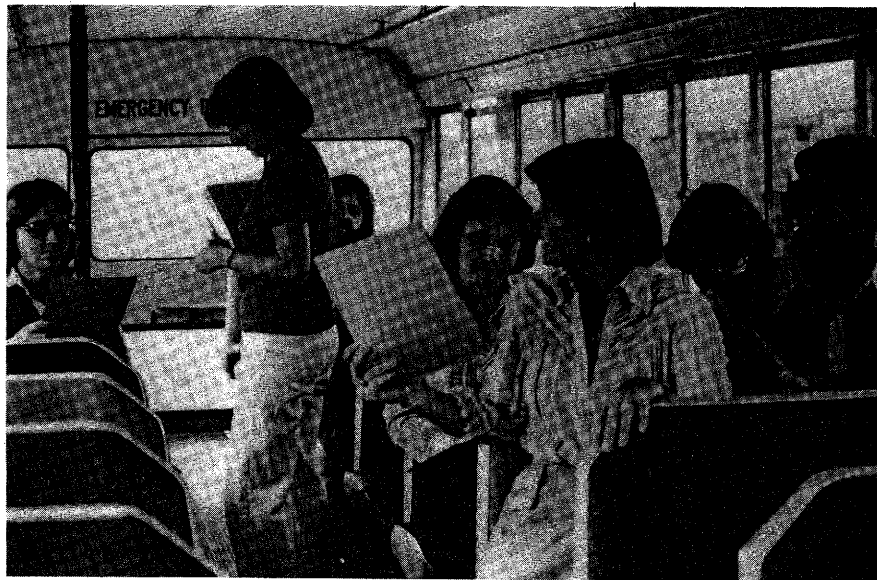
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*Transit market research is a pulse-taking of the demand for public transportation; without this examination there is no other means to effectively serve the public.*



## CHAPTER ONE

### INTRODUCTION

The importance of marketing activities within the transit industry has received a considerable amount of attention within the last decade. Yet, many systems still lack a commitment to undertake conscientious market research efforts. At the most basic level, transit market research enables those in the industry to understand what makes an individual decide to utilize transit services. More specifically, research helps identify the personal characteristics, travel patterns, attitudes, and transportation demands of the market segments transit seeks to serve.

Therefore, the goal which is set without a basis in market research is based on a combination of guesswork and wishful thinking. The plan which is drafted to achieve such a goal is misspent, as is every subsequent effort on through to the final management activity of evaluation. Market research is the keystone of transit marketing.

(Lesko, 1975:10)

Why, then, has the function of market research been ignored for so long? Part of the problem is thought to be budgetary in that very little funding for market research was available to the transit industry in the past. But a larger part of the problem was conceptual; transit management did not fully comprehend the importance of marketing research to the entire transit operation (Brown & Farris, 1976). According to one source, "...without market research and a constant investigation and pulse-taking of the relevant market in given areas for public transportation, there is really no way to efficiently and effectively serve the public" (Smerk, 1976:39).

As system management is well aware, the funding available for transit is not limitless. It is necessary, therefore, to make hard decisions as to who will be served by the system and how much service is to be provided (Polin & Caruolo, 1976). Solid market research can supply the information needed to facilitate such decisions as well as help to solve other transit problems, such as those listed below:

- Shelters: Do we really need them, or are they just something nice? Are they worth the maintenance cost? Do we know?
- Telephone information: What is the true cost per call? Are we paying enough to get good people?
- Routes: Far enough? Too far? Ridership by segments? Is on-time performance good? Where are problems? Do we know or do we only think we know?
- Promotions: Did we have a purpose, lead time and funds? What were all the costs? Did we help the system or just the ego?
- Fares: Are they too low? Is the zone structure confusing? How important is fare level to the consumer, rather than the politician?
- Our employees: Who are they? What do they think of our product? Might they be unselling us by their attitude and actions? Do we communicate well with them? Most likely not well enough!
- The consumer: Who is he/she? What do they really want? How much will they pay? Can we reasonably serve him/her? What do they think of us?

(Weiglin, 1977:60)

#### RESPONSIBILITIES OF A MARKET RESEARCH ACTIVITY

The major responsibilities of a transit market research activity are to 1) collect data; 2) analyze the needs and preferences of the various markets; and 3) forecast the potential demand for transit services. The

key functions of a market research activity within the transit field include assessing the need for transit services within specific market segments, evaluating the effectiveness of specific transit services and alterations, determining the public's attitude toward the transit system, and measuring the effectiveness of specific advertising campaigns and themes. In addition, market researchers can periodically provide management with projections of transit market characteristics and trends to support and facilitate planning and service development within the system (Lesko, 1975).

Research may not be able to answer all questions that might arise, nor can it take the place of sound judgment on the part of transit managers. It can, however, reinforce management decisions and make other activities more productive by replacing guesswork with objective data.

#### SCOPE AND PURPOSE OF THE PROJECT

The initial phase of any marketing research study focuses on establishing specific research objectives. Systems must decide, individually, their goals and research needs, but the importance of developing very specific objectives cannot be over-emphasized. For example, promotional campaigns are quite often aimed at vague goals such as improving transit's public image, obtaining community support, or increasing ridership. Although the activities are normally well-planned and implemented, promotion research is difficult to implement when the stated goals are so broad. Furthermore, such activities are rarely evaluated to determine if the goals were reached. Ideally, systems should establish research objectives with more limited scope that can later be evaluated to determine their effectiveness. For example, rather than "generating community support,"

systems might specify "increasing by 10 percent the number of community organizations displaying transit advertisements and distributing informational aids for the system."

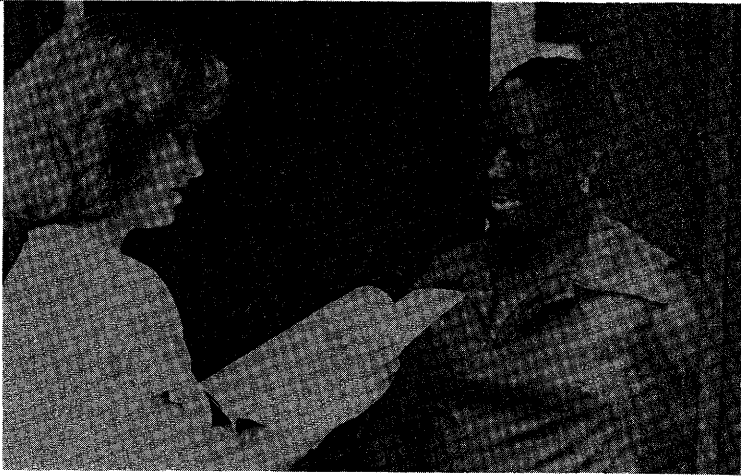
The second step in most research studies is developing a questionnaire that will generate the data needed to achieve the system objectives. Detailed instructions as to questionnaire design are provided in this report, as well as a discussion of the various methods of administration available to the transit marketer. Because it is seldom possible to survey an entire population, those conducting the study will need to select a sample of the population. Therefore, a variety of sampling methods are outlined, and other sampling considerations (e.g., development of the sampling frame and degree of precision required) are discussed.

Field observation techniques and the use of secondary analysis are presented as alternatives or supplements to sample surveys. While these techniques are not used as frequently as the sample survey, it is felt that systems can benefit from these types of studies and analyses, also.

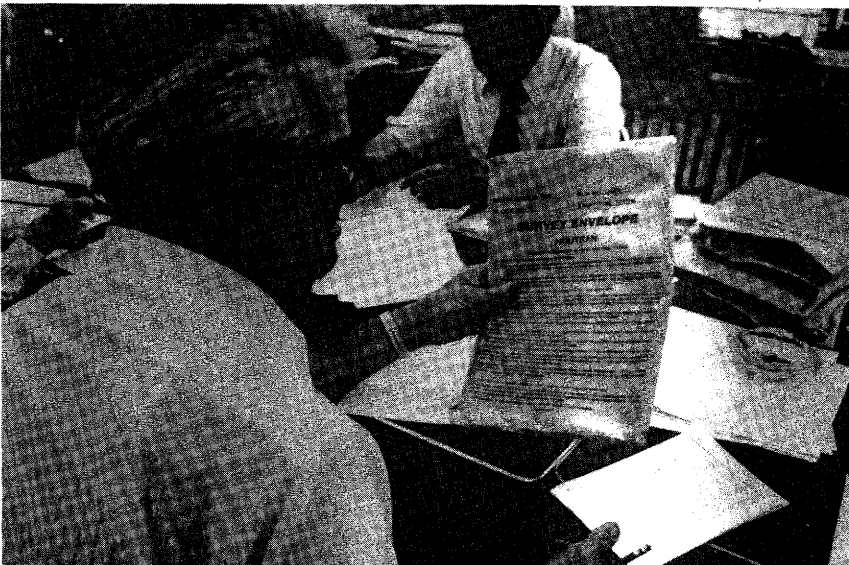
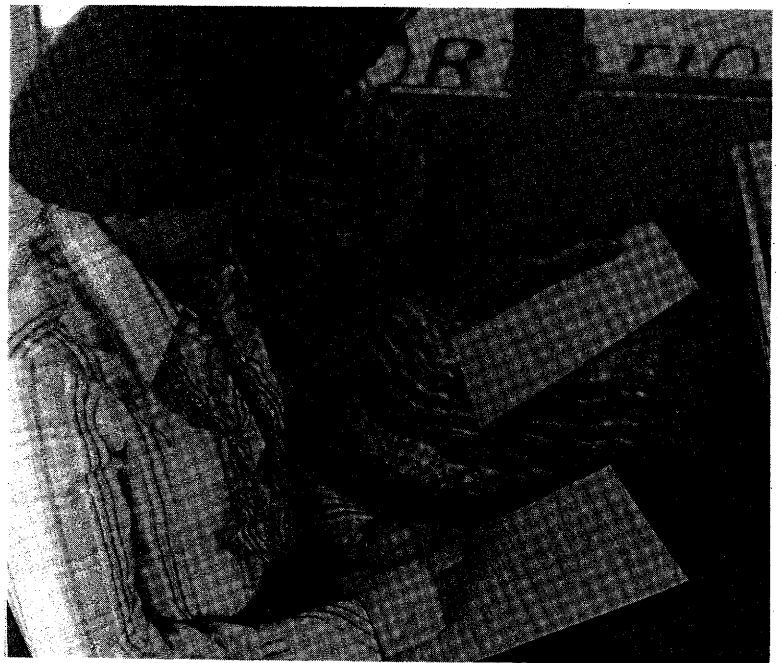
Because of the relative unfamiliarity of some transit personnel with market research techniques, as well as obvious space limitations, the discussions have been kept fairly general in nature. However, the purpose of the report is to present basic research principles, rather than in-depth procedures. A list of references for transit market research is also provided for those seeking more detailed explanations.

Transit managements, particularly those who have not been actively involved with market research in the past, need to be reassured that research is not all that complicated if certain basic guidelines are followed. This guidebook can serve to acquaint system personnel with these basic principles of market research so that they, in turn, can encourage

in-house staffs to undertake future market research efforts. Thus, market research can be established as an integral part of the marketing programs in all transit systems, with research expenditures being made a basic part of the overall marketing budget.



*Questionnaires comprise the most common form of data-gathering used in a marketing capacity. Major procedures discussed for dissemination of questionnaires include: (1) personal interviews; (2) telephone surveys; (3) mailed questionnaires; and (4) on-board surveys.*





## CHAPTER TWO

### USE OF QUESTIONNAIRES FOR A DATA BASE

In simplest terms, questionnaires are a formalized approach to asking individuals for information. They are a measurement tool normally associated with survey research, and are recognized as the most common form of data-gathering utilized in a marketing capacity.

Questionnaires can be used to measure a number of factors, but the most frequently investigated include:

- demographic characteristics (e.g. age, education, income)
- level of knowledge - attitudes and evaluations
- behavior - past, present or intended (Tull & Hawkins, 1976:240)

The applicability of these variables to transit market research can be easily clarified by examples. *Demographic characteristics*, for instance, are virtually essential for the task of market segmentation. These identifying characteristics will aid the investigator in differentiating the population into target subgroups, such as white- and blue-collar workers, males and females, young and middle-aged adults, etc. Such information can subsequently be linked to the analysis of current transit patronage to facilitate the identification of factors influencing the decision to use public transportation.

Also of interest to transit marketers is identification of *level of knowledge*. A low level of knowledge of the transit system is indicative of insufficient marketing, thus efforts must be made to increase the public's awareness of the system. Promotional campaigns designed to publicize routes and schedules are particularly beneficial in this area, although supplementary advertising can be used to stimulate interest and a basic awareness of the transit system.

Third, knowledge of public's *attitudes and evaluations* is fundamental to a transit marketing program, whose key purpose is increasing the

satisfaction of current and potential customers. Included in the study of attitudes are perceived needs and wants, such as the service requirements sought by target markets. Consideration of these factors allows system managers to objectively plan service improvements to maximize consumer satisfaction and thereby increase both ridership and revenues.

Finally, *behavior* patterns can be ascertained through the use of questionnaires, facilitating the analysis of current trends in system ridership. In addition, respondents may be questioned about intended behavior or desired patterns, so that personnel can better approximate future patronage of the transit system, which will, in turn, aid in planning the allocation of funds and equipment.

In general, transit personnel's increasing need for quantitative measurement of data, as illustrated by these examples, suggests that survey research and questionnaires, in particular, will play an increasingly important role in all future transit marketing efforts. Therefore, further discussion of this approach is warranted.

## DESIGNING THE QUESTIONNAIRE

### Preliminary Considerations in Questionnaire Design

Before the task of questionnaire construction is actually begun, several points should be considered by the investigator. Specifically, he must know:

1. exactly what information is required to fulfill study objectives
2. the identity of target respondents; and
3. the method of administration to be used.

These factors will affect both the content and the format of the questionnaire, and failure to recognize their importance often results in wasted time and

money for the researcher. One of the most common problems encountered in survey research, for example, is an abundance of surrogate information--that is, data which is not relevant to the specific research objectives. (More information about the implications of these items is presented later in this report.)

### Question Content

"Decisions concerning question content center on the general nature of the question and the information it is designed to produce rather than the form or specific wording of the question" (Tull & Hawkins, 1976:254).

The first point to keep in mind regarding question content relates to the previous discussion of surrogate information. The surveyor should be absolutely certain that all questions to be used are necessary. Those designed to produce information that is merely interesting, but not needed, should be excluded from the questionnaire. On the other hand, the researcher must ensure that questions are included to generate each separate type of data required for the analysis. The situation may arise where multiple questions would prove more effective than just one. To the extent possible, each question should be designed to provide data that are subject to only one interpretation.

Those conducting the research must also consider the ability of the respondent to answer accurately. The following points should be addressed to be sure that questions are appropriate for the target respondents:

- Does the question call for answers the respondent either cannot give, or cannot give accurately?
- Is the issue within the respondent's experience?
- Would the respondent have to do a great deal of work to answer the question?

- Does the question ask for opinions on matters so unfamiliar to the respondent that the answer does not mean what it seems to?
- Is the respondent to whom the inquiry will be directed the best source of information for the item or should this specific data be secured from someone else?
- Can the respondents be expected to remember the information?

Uninformed respondents are often hesitant to admit lack of knowledge on a topic so they will guess at an answer and, thus, become a source of measurement error. This situation occurs with greater frequency when the content or wording of the particular question implies that the individual should know the answer.

Similar problems arise when respondents are required to rely upon memory. The greater the length of time which has elapsed since an event in question, the greater the likelihood of an inaccurate response.

Finally, verbalizing answers to certain questions can be problematic for some individuals. This is often the case when respondents are questioned about their motives, preferences, or opinions, since these require a great deal more subjectivity on the part of the respondent.

An even greater concern for the researcher, however, may be the respondent's willingness, rather than ability, to respond accurately. Basically, refusals may take one of three forms:

1. The individual may refuse to answer a particular question but still complete the remainder of the questionnaire;
2. The respondent may refuse to complete the remainder of the questionnaire;
3. The individual may deliberately provide an incorrect answer.

Of all three possibilities, the third is the most problematic for the investigator because of the difficulty of detection.

Any number of factors may result in an individual's unwillingness to respond, but quite often the refusal is triggered by requests for

- personal information
- embarrassing information
- prestige or normative information
- information beyond the respondent's level of knowledge

Respondents are normally quite cooperative in providing answers to questions they consider legitimate; that is, "questions (that) are reasonable in light of the situation and the role of the person asking the question" (Tull & Hawkins, 1976:260). The fact remains, however, that many people do not want to divulge personal information, particularly income. If such information is not essential to the research, the surveyor should omit the question from the study in order to avoid offending the respondent. If, however, the information cannot be excluded, the researcher should make the question as unobtrusive as possible. Suggestions for how to do this include:

1. hiding the question among a group of other questions;
2. stating that the behavior or attitude is not unusual before asking the specific question of the respondent;
3. phrasing the question in terms of "other people" and how they might feel or act; or
4. stating the response in terms of a number of categories that the respondent may simply check (Churchill, 1976:188).

Requests for potentially embarrassing information can best be handled with the use of counterbiasing statements, which will make it easier for the individual to admit to an embarrassing behavior or opinion (number 2 above).

The third kind of question which might result in a refusal or an inaccurate answer is a request for normative or prestige information. Prestige-oriented questions are quite apt to produce answers with an upward bias, while questions with a normative or evaluative connotation are more apt to produce socially-desirable responses. The researcher might be able to avoid inaccurate responses by employing indirect questions designed to make it easier for the respondent to answer candidly (number 3 above), or he might try to be completely open with the respondent in terms of why this particular information is required.

### Question Phrasing

Question phrasing simply refers to the way in which the desired question content is transformed into actual words and phrases. It is imperative that the language used be understood easily and uniformly by all respondents. The key to evaluating questions is not the actual meaning, per se, but rather, the respondents' interpretation.

The difficulty of selecting words whose meanings are clear to respondents is not often acknowledged, but the researcher should try to evaluate each word chosen on the basis of the following points:

- Does the word mean what the researcher intends?
- Does it have any other meanings?
- If so, does the context of the question make the intended meaning clear?

- Is there a word of similar pronunciation that might be confused?
- Is a simpler word or phrase suggested? (Tull & Hawkins 1976:265-266)

The importance of the researcher's sensitivity to the effect of question wording on the survey results cannot be overemphasized. It has been suggested, for example, that survey data are in many ways created, rather than simply collected. Thus, the way in which data are sought determines the nature of the information received (Babbie, 1973:144).

Frame of reference refers to the point of view taken by the respondent when he answers a question. Unfortunately, his viewpoint may not coincide with what the researcher had in mind when he designed the question. While no specific guidelines have been developed to alleviate this problem completely, several general points should be kept in mind.

Questions on controversial issues, for example, are best handled by dividing them into components so that the researcher can assess the respondent's feelings about all aspects of the problem. Furthermore, when questions are designed to reveal emotional intensity or degrees of conviction, it is often equally important to determine the extent to which the individual's attitudes toward the subject have been crystallized (Young, 1966:196). A technique known as attitudinal scaling, which will be discussed in a later section, is often utilized for this purpose.

### Question Sequence

It is generally advisable to begin the questionnaire with items that are simple, objective, and interesting. This is important because a respondent's first impression may determine his level of cooperation. Uninteresting questions or ones that are too difficult to answer may result in the individual refusing to complete the rest of the questionnaire.

Succeeding questions should move in a logical progression from one topic to the next, so that the respondent is not forced to mentally jump from one area to another. A time sequence should be observed for the same reason, although in cases where time-sequence and subject-matter sequence conflict, it is usually more important to keep all questions pertaining to one subject grouped together (Young, 1966:197). For example, questions pertaining to route preferences and scheduling should be separated from questions dealing with current travel patterns.

Transition devices may be needed to avoid confusion when a change in subject matter is required. The most commonly employed bridge is the insertion of a short, explanatory statement to introduce the next topic (Churchill, 1976:194).

The sequence of questions must also be carefully planned to avoid conditioning the respondent in his answers to later questions. Asking general questions first reduces the likelihood of biasing answers to subsequent questions. Thus, the "funnel" technique is frequently used as the basis for question sequence. In addition, "...the method is particularly useful for learning something about the respondent's frame of reference from earlier open questions" (Chisnall, 1973:153). The reverse of this technique, known as an "inverted funnel" sequence, poses specific questions first, then moves to more general questions regarding the same topic. This strategy is not widely utilized, however, because it is not as effective at reducing potential bias.

After securing the basic information--data pertaining directly to the study problem--those questions seeking classification information are presented. These requests are intentionally placed at the end of the questionnaire because the researcher does not want to alienate the respondent prior



to obtaining the basic information. As mentioned previously, many respondents object to being asked for personal information, but after spending time completing prior sections of the questionnaire, some may be more willing to also answer classificatory questions.

### Response Format

There are two major types of questions utilized in surveys: 1) open-ended, and 2) fixed alternative (closed). The advantages and disadvantages of each type will be discussed briefly in this section of the report, followed later by a more detailed explanation of popular scaling techniques.

*Open-ended questions.* Open-ended questions allow the respondent complete freedom to structure his answer as he sees fit. No response categories are provided, thus individuals can determine for themselves the length and specificity of the answer, and they are able to phrase answers in their own words.

The advantages of open-ended questions can be summarized as follows:

1. open-ended questions elicit a wide variety of responses, making them especially appropriate for exploratory or problem identification research;
2. respondents are not biased by predetermined response categories;
3. the researcher has greater insight into the respondent's frame of reference and actual views on the topic, based on what the individual has written; and
4. open-ended questions serve as a good introduction to a subject in that they permit the respondent to express any pertinent viewpoints he may have on the topic (Tull & Hawkins, 1976:270).

Despite these desirable features, open-ended questions can be very problematic for the surveyor. One major disadvantage is that respondents are apt to vary a great deal in their ability to express themselves. Thus,

open-ended questions may "...measure articulateness rather than the real issue" (Tull & Hawkins, 1976:270). Those with higher educational levels seem to provide much more information in an open-ended format, while those with little education may leave the item blank. These questions also pose problems for interviewers, who must attempt to record all answers verbatim, regardless of length. When this is not possible, variations in interviewer interpretation and objectivity can produce measurement errors. Finally, the abundance of information makes coding the data an enormous task, requiring a sizable proportion of both time and research funds. Taking these points into consideration, it is recommended that transit marketers restrict their use of open-ended questions to only those instances when other questions cannot supply adequate information.

*Fixed alternative questions.* Unlike open-ended questions, fixed alternative questions present predetermined response categories from which the respondent must choose his answer. A multichotomous question, which is perhaps the most common form, has a series of response alternatives, whereas a dichotomous question allows only two responses. The advantages of the fixed alternative question include reduced interviewer bias and bias resulting from differences in respondents' abilities to express viewpoints. Additionally, this type of question is much simpler for the interviewer and the respondent; the interviewer merely checks the appropriate response category, and the respondent is freed from having to develop his own answer. Coding costs are greatly reduced with fixed alternative questions, also, although more time will be required to create each set of response categories for multichotomous questions. Listed below are some general guidelines for developing the list of alternatives:

- the response categories provided should be *exhaustive*; that is, they should include all the possible responses that might be expected;
- the categories must be *mutually exclusive*; no response should be able to fall into more than one category;
- the alternatives should be *equally balanced* (e.g., between "positives" and "negatives") so that the respondent is not biased.

In addition to these points, researchers will want to consider adding an "Other" category to each set of responses to allow for unanticipated answers. A short space often is provided for a brief explanation of the answer, also. Unfortunately, it is often difficult for the investigator to interpret this catch-all category, so valuable information may be lost.

Overall, the advantages of the dichotomous question are similar to those of the multichotomous question. When only two choices are given, however, the response may be influenced by the wording of the question--specifically, implied alternatives--to a greater extent.

In most cases, multichotomous questions do a better job of tapping the respondent's true feelings about a subject, therefore, their use is preferred over the simple dichotomy. Although constructing good multiple choice questions is not an easy task even for the experienced researcher, careful attention to the guidelines mentioned previously can help minimize measurement errors which could bias the results of the study.

### Physical Characteristics of the Questionnaire

The format of a questionnaire can be just as important as the nature and wording of the question asked. An improperly laid out questionnaire can lead respondents to miss questions, can confuse them as to the nature of the data desired, and, in the extreme, can lead to respondents throwing the questionnaire away (Babbie, 1973:145).

The researcher should normally try to maximize the "white space" in the questionnaire so that individual items do not appear cluttered. Although some may fear that a lengthy looking questionnaire will deter cooperation, the chances of error or refusal may be increased by measures taken to shorten the format. Placing two questions on a single line, for example, may cause respondents to overlook the second question. In addition, abbreviating words or omitting phrases can lead to misinterpretations and confusion. "And more generally, the respondent who finds he has spent considerable time on the first page of what seemed a short questionnaire will be more demoralized than the respondent who quickly completed the first several pages of what initially seemed rather long" (Babbie, 1973:145).

*Instructions.* It is always a good idea to begin the questionnaire with some general instructions for the respondent, such as the manner in which answers are to be recorded, and guides as to the length and specificity of desired responses to open-ended questions, as follows:

- Please check (or circle) the one best answer
- Please indicate your top three choices by placing a 1 beside your most favorite, a 2 beside the next most favorite, and a 3 beside your third choice
- Please place an X in the box beside the answer or answers you feel apply to you.

*Introductions.* In addition to basic instructions, it is often helpful to begin each section of the questionnaire with a brief introduction explaining its content and purpose. These statements make the questionnaire appear more organized for the respondent, particularly if a number of different topics are covered.

*Reproducing the Questionnaire.* This aspect of the overall research effort is not always given much prior consideration because of its mundane nature. However, the appearance of the questionnaire depends as much on the quality of reproduction as it does on lay-out. It is also believed that completion rates will be higher with a neatly reproduced questionnaire, which improves the reliability of the results.

The survey researcher has three basic methods of reproduction from which to choose:

1. Ditto or mimeograph
2. Photo offsetting
3. Type-set

As could be expected, the quality varies directly with the cost. Ditto reproductions are usually the least expensive to make and are readily available, but they lack a professional appearance. Photo-offsetting a typed copy of the instrument improves the quality and the cost may actually be less if a substantial number of copies is required. A single photo-offset master is used to make an infinite number of copies, whereas a mimeograph master is only good for a few hundred copies. The highest quality of reproduction will be achieved using type-set, but again, this method is more expensive and more time-consuming.

The researcher will also want to select a method of binding to be used. There is a wide variety of possibilities, and the final length of the questionnaire will be a major factor in the decision. The most professional looking instrument is a printed booklet bound with a saddle stitch, but this style is fairly expensive. A short questionnaire can sometimes be printed on a single oversized sheet of paper and folded into a booklet of panels.

For those operating on more restricted budgets, pages may simply have to be stapled together. For all methods, an attractive cover will improve the looks of the instrument.

Finally, the decision must be made as to the number of copies needed. As a general guideline, the researcher should estimate the number required for data collection and multiply that figure by a factor of 1.5 to determine the total number of questionnaires to be ordered. This allows for extra copies to be used as samples for other researchers, appendixes in research reports, code books, and follow-ups. The point to remember is that extra copies made in the first run are much less expensive than a second run.

### ALTERNATIVE METHODS OF MEASUREMENT

There are four major alternative measurement procedures that may be easily utilized by the transit industry to obtain the information desired. These alternatives are: 1) personal interview, 2) telephone interview, 3) mailed questionnaire, and 4) on-board survey. A brief discussion of the advantages and disadvantages of each technique follows.

#### The Personal Interview

Listed below are some of the major advantages of the personal interview.

- People are more willing to cooperate in a face-to-face situation; therefore, a high return rate can be achieved.
- A very representative sample of the population can be obtained because most members of the population can be reached using this approach.

- The presence of the interviewer ensures that confusion on the part of the respondent will be kept at a minimum; therefore, the data are highly accurate.
- A greater number of returns are assured due to the feasibility of follow-up interviews when needed.
- The interviewer can adapt the language of the survey to meet the ability or educational level of the respondent.

Some of the weaknesses associated with personal interviews are:

- Costs related to both transportation and time requirements are higher than with other methods, particularly if the survey covers a large area.
- If the interviewer has a pro-transit bias, he may unconsciously ask the questions so as to obtain confirmation of his own views, and thus secure biased information.
- The data may be recorded inaccurately or incompletely unless those conducting the survey have been properly trained.
- If household interviews are conducted during the normal 8:00-5:00 work period, a biased sample will result; housewives will make up the majority of the sample and working males and females will be almost totally excluded.

### The Telephone Interview

The pros of the telephone interview are summarized below:

- Of all the survey techniques, the telephone interview is the fastest.
- Refusal rates have been found to be low using this technique, although in part this will depend on the topic being discussed.

- It is very easy to train and supervise those conducting the interviews because the supervisor can stay in the same room with them.
- Generally, the cost per completed interview is quite low.
- Sampling procedures are simplified because an address listing of telephone numbers is usually available.

The disadvantages of the telephone interview include:

- Telephone subscribers are not a representative sample of the entire population; lower income groups often do not have phones.
- It is difficult to gather detailed information over the telephone because respondents become easily annoyed or impatient if the call is too lengthy.
- Personal information is often difficult to secure, and opinions are less likely to be offered because the respondent cannot be certain of the surveyor's credentials.
- The person doing the interviewing has a very limited amount of time to record information, jot down comments, etc.
- Although time-consuming, the job of checking the wrong numbers, busy signals, and no answers must be done to ensure representativeness.

### The Mailed Questionnaire

The merits of the mailed questionnaire are shown below:

- It is possible to reach a much larger population and cover a wider geographical area with mailed questionnaires than with personal interviews.
- Mailed questionnaires are less expensive in that training a staff of surveyors is eliminated, and mailing costs are lower than transportation and time costs for a field staff.



- Because anonymity is assured, respondents may be more willing to answer personal and/or opinion questions.
- The problem of potential interviewer bias is eliminated.
- The mailed questionnaire can be answered at the respondent's personal convenience.

The mailed questionnaire suffers from the following disadvantages:

- The people who return questionnaires are not representative of the entire population surveyed; unless efforts are made to adjust for nonresponse or to obtain nearly complete schedules from everyone in the sample, mailed questionnaires should not be used.
- Return rates are often as low as 10 to 20 percent, but these figures vary greatly, depending on schedules and informants. (If mail surveys are geared to a small population, such as all local transit marketing directors within a state, a high return rate can be anticipated without follow-ups. Additionally, with three or four contacts, the returns for the general population may be increased to 70 or 80 percent of the sample [see Dillman, et al., 1974].)
- Without the aid of an interviewer, respondents may misinterpret questions, omit essential information, and so forth, making it necessary to discard the entire questionnaire.
- It is nearly impossible to return unsatisfactory or unfinished schedules to the informant for correction.
- Mailed questionnaires must be very brief if high returns are to be obtained.

These three measurement procedures are not mutually exclusive. For example, it may be desirable to combine telephone interviews with mailed

questionnaires or with personal interviews as a follow-up method when no response or incomplete responses are obtained from particular parts of the sample. The method of administration used in a TTI transit marketing study was the drop-off/pick-up method, supplemented by personal interviews. Every person 18 years of age or over in the households selected was surveyed. Based on the number of adults in the dwelling unit, an equivalent number of questionnaires were left at the house, to be completed individually, with up to six return visits necessitated in some cases. For approximately 22 percent of the dwelling units, personal interviews were necessary to administer portions of the questionnaire to one or more household members.

It might also be possible in some cases to collect routine, nonsensitive data from one sample of the population by mail or phone, and to obtain sensitive information from another sample by personal interview.

#### On-Board Surveys

Unlike the sample surveys discussed previously, on-board surveys do not involve sampling procedures other than the initial selection of specific bus routes. Considerable effort should be made to survey every passenger on the bus so that results can be generalized to all bus riders, rather than a particular segment of the current transit patrons. City buses are good settings for the survey approach for several reasons: 1) for a brief period of time, the respondents are "captive" (i.e., they cannot escape at least until the bus makes a stop); 2) the universe of each bus is surveyed (excluding small children); and 3) participation has been found to be easily solicited.

Despite these important advantages, there is at least one major weakness of the on-board survey: low return rates. Although refusal rates are quite often low, the number of incompleting questionnaires can lower the actual return rates considerably. The shorter the bus route, the greater the number

of respondents who will be unable to complete the questionnaire due to lack of time. Stamped and addressed envelopes can be given to those patrons who must leave the bus before finishing the questionnaire to help alleviate the problem, but the expected rate of return for these is poor.

In designing the on-board survey instrument, transit marketers must keep in mind the limited time available for answering questions, and make sure that only the most essential information is requested. Open-ended questions, which require a great deal more time to answer, should be avoided if at all possible and questions should be very carefully and simply worded to avoid confusion. Although surveyors should be ready to help the respondents when necessary, crowded buses make it extremely difficult to offer much assistance.

#### THE PRETEST

It is extremely important to try out the questionnaire and the field methods on a small scale before actually conducting the sample survey. The real test of a questionnaire is how it performs under the actual conditions of data collection, and pretesting will always result in improvement in both the questionnaire and the techniques of administration.

Ideally, the pretest should use respondents who are as similar as possible to those in the target population, and one way to achieve this is to draw a subsample from the same population to be used in the final survey.

Most researchers feel that it is best to administer the questionnaire during the pretest in the same manner as will be utilized in the final stage, but others have suggested using personal interviews during the pretest, regardless of what method may later be decided upon. Interviews would enable trained personnel to detect problems in question wording, sequence, and content that might not show up in a mailed questionnaire. Those favoring use

of the same administration technique for both the pretest and the final survey have suggested that follow-up interviews could be conducted on pretest respondents to reveal the same kinds of problems. For example, respondents could be asked to explain in detail why they answered each question as they did, and to specify any difficulties they encountered.

It is often helpful to use an open-ended format in the pretest to determine appropriate response categories for what may eventually become close-ended questions in the final survey instrument. Individuals' answers would be coded by the researcher and standardized response categories subsequently created (Babbie, 1973:207).

Danger signs that may be apparent in the pretest results include the following:

failure to answer - When a given question produces a number of "no answers", it indicates problems with the item.

multiple answers - Multiple responses could mean the answer categories are not mutually exclusive or else the question is being misunderstood by the respondents.

"other" answers - Too many responses falling into this category indicate that the categories provided are not sufficiently exhaustive.

qualified answers - If respondents feel compelled to qualify or explain their answers, it suggests a lack of clarity in either the questions or the possible responses categories.

direct comments - Respondents may explicitly criticize certain questions or the overall format; researchers should take notice if this occurs with any degree of frequency for particular items (Babbie, 1973:215).

Finally, it is equally important to code and tabulate the results of the pretest. If "dummy tables" or table "shells" were constructed as a preliminary step in the process of developing the questionnaire, the task of tabulating pretest responses will be even easier. Furthermore, these dummy tables facilitate the evaluation of the questions included in the survey, in that they confirm the need for various sets of data.

"If we have no place to put the responses to a question, either the data are superfluous or we omitted some contemplated analysis. If some part of a table remains empty, we may have omitted a necessary question. Trial tabulations show us, as no previous method can, that all data collected will be put to use, and that we will obtain all necessary data" (Brown and Beik in Churchill, 1976:196).

#### ORGANIZATION OF THE FIELD WORK

The size of the survey, the techniques used in collecting data, and the amount of tabulation and analysis to be done will largely determine the extent and complexity of the organization required. Parten (1950: 126-129) provides the following useful rules which are applicable to every survey, regardless of size and complexity:

1. *Whenever possible, put instructions to surveyors in writing.*

This insures against making hasty and inconsistent judgments and precludes errors arising from forgotten instructions.

2. *Guard against too much division of authority and overlapping of responsibility.* Everyone should know (a) to whom he is responsible, (b) with whom he should consult if his instructions do not cover a specific situation, (c) for what operation he is responsible, and (d) what types of cases should be turned over to the person specializing in "problem cases".

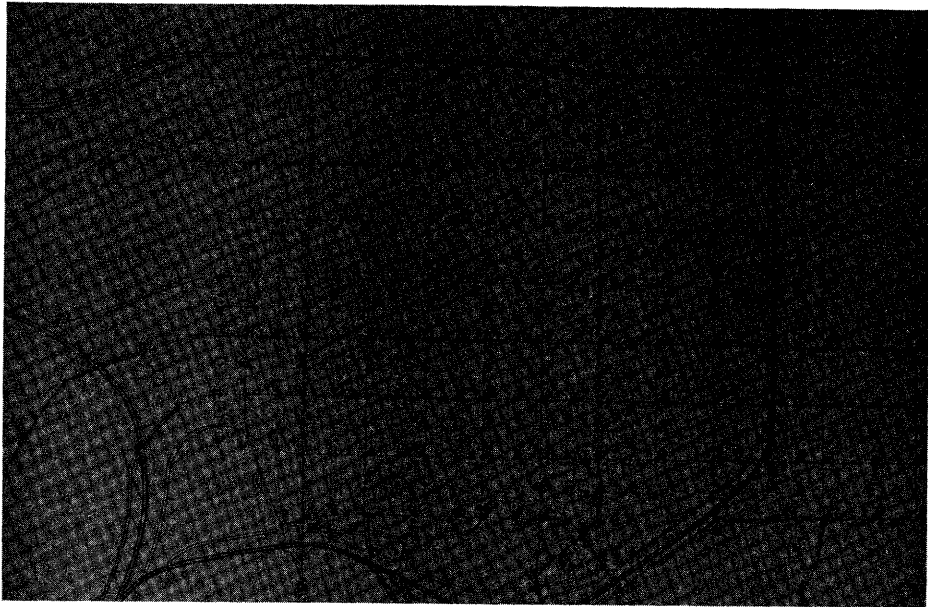
3. *Delegate some authority but also keep in touch with the details of the operation.* The survey director should always be aware that he is in the position of an executive of a business undertaking and follow good rules of business administration.
4. *Keep account of the time and cost of the survey.* Actual performance should be closely compared with the plans. If the survey is running ahead or behind the schedule or allocated budget, the plans should be adjusted accordingly.
5. *Set up a routine check of the quality of every operation.* It should be clearly understood by all survey personnel that all work will be checked (including the survey director's) and that incorrect work will have to be corrected. Standards of what constitutes "allowable" error should be clearly stated before the survey begins and strictly enforced.<sup>1</sup> (Most sources of error should have been located in the pretest and adjustments made before the main survey begins.)
6. *After errors have been detected, see that someone is responsible for making corrections at every point affected.* Often a staff worker corrects a mistake where he happens to catch it without going back to other tabulations or data in which the same error may have been made. The result is that when analysis is begun, figures that should agree do not.
7. *Require production reports periodically on the quantity and type of operations performed.* Frequent comparisons should be made

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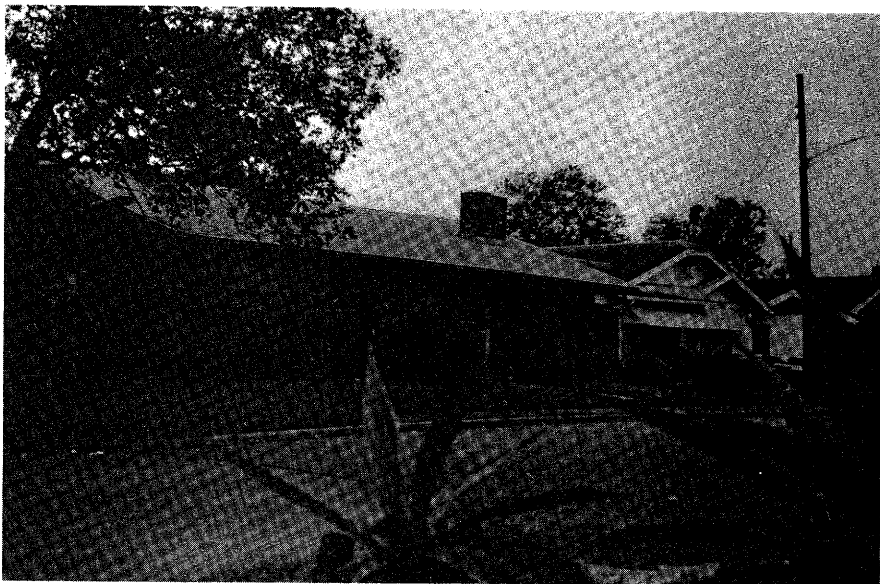
<sup>1</sup>It is often appropriate to notify investigators that a five percent follow-up of all respondents will be undertaken. This is especially useful when the survey has been undertaken as a personal interview or a telephone contact.

between the amount of work planned and amount accomplished by each individual in the survey. Such comparisons allow the survey director to spot problem areas and bottlenecks and to take appropriate action before they become major problems. For example, each member of the survey team should receive daily feedback on his or her questionnaire completion rate and return rate (i.e., the percent of surveys completed and the percent of the sample who successfully returned the survey).

8. *When possible, divide each job into several definite operations which can be done by one worker and checked by another within a specified time.*
9. *Avoid too many transcriptions of the data. The more times the data are transcribed, the greater the probability of mistakes in copying and verification.*
10. *Require the worker who does the operation to initial the record of it. This makes it possible to determine who makes an error or whose record requires further clarification.*



*Probability sampling provides a representative sample of the target population and is the most common of the major sampling techniques. Census tract maps provide a basis for simple random sampling. Another means of random selection includes the use of sampling intervals. For example, every third bus on specified routes is chosen as a sampling element or every 200th household in the transit service area.*





## CHAPTER THREE

### SAMPLING TECHNIQUES

Before beginning a general discussion of sampling procedures and techniques, it would be helpful to define some of the most commonly-used terms.

#### BASIC SAMPLING CONCEPTS

element: that unit about which information is collected and which provides the basis of analysis, usually a person or a household.

survey population: that aggregation of elements or persons from which the survey sample is actually selected.

sampling unit: that element or set of elements considered for selection in some stage of sampling.

(For example, in a previous TTI study, census tracts were randomly selected, then blocks within the specified tracts were chosen, and then every other household on these blocks were sampled. The sampling units for these three stages of sampling are, respectively, census tracts, blocks, and households).

sampling frame: the actual list of sampling units from which the sample, or some stage of the sample, is selected.

variable: a set of mutually exclusive characteristics such as age, sex, employment status, and so forth. The elements of a population may be described in terms of their individual characteristics on a given variable.

parameter: the summary description of a given variable in a population.

statistic: the summary description of a given variable in a survey sample.

#### POPULATION TO BE SAMPLED

As indicated above, the word population is used to denote the aggregate from which the sample is chosen. The population to be sampled (the sampled population) should coincide with the population about which information is wanted (the target population). Sometimes, for reasons of practicality or convenience, the sampled population is more restricted than the target population. If this occurs, it should be remembered that conclusions drawn from

the sample apply only to the sampled population. Judgment about the extent to which the conclusion will also apply to the target population must depend on other sources of information. Any supplementary information that can be gathered about the nature of the difference between the sampled and target population may be helpful (Cochran, 1963:6). The population must be clearly defined by a set of rules. In sampling a neighborhood as a population, for example, rules must be set up to define what comprises that neighborhood. These rules must be usable in practice. The researcher must be able to decide in the field, with little difficulty, whether or not a doubtful case belongs in the population.

#### DEGREE OF PRECISION REQUIRED

The results of sample surveys are always subject to some uncertainty because only part of the population has been measured and because there are errors in measurement. This uncertainty can be reduced by: (1) taking larger samples, and (2) using superior instruments and extensive quality control procedures. Both of these usually involve some increase in expenditures in time and money. For this reason, it is important to specify the degree of precision that is desired so that costs can be held to a minimum. It is strongly advised that the services of a professional statistician be obtained at this point to determine the sample size that can be tolerated and still be consistent with good decision-making.

There are two conditions a sample must fulfill in a transit survey:

- 1) This sample must be utilized to make *substantive statements*, i.e., statements about key indicators regarding the use and evaluation of transit with a tolerable amount of certainty, and

- 2) With the sample, it must be possible to generalize to the target population with a tolerable amount of certainty.

Fortunately, these two requirements can be met simultaneously through proper sampling techniques. However, the procedures involved require a high degree of technical knowledge, and should be performed by a researcher with prior sampling experience.

#### DEVELOPMENT OF THE SAMPLING FRAME

Before selecting the sample, the population must be divided into parts which are called *sampling units*. These units must: (1) cover the whole of the population, and (2) they must not overlap, in the sense that every element in the population belongs to one and only one unit.

As noted earlier, the complete list of sampling units is called a *frame*. The construction of the sampling frame is one of the major practical problems in conducting a survey. The person conducting the survey should have a critical attitude toward any list that has been routinely compiled for some prior purpose. Many times such lists are found to be incomplete or to contain an unknown amount of duplication. For example, if a city directory is used as the frame for the survey, households in housing units that have been built since the directory was compiled will be omitted. Similarly, housing units that have been subdivided into two or more apartments may only list one household. The drawing of a sample representative of the population requires an accurate sampling frame. For this reason, considerable time and effort should be devoted to this task.

## ALTERNATIVE SAMPLING METHODS

Two major types of sampling techniques may be distinguished: probability and nonprobability. Depending on the field situation, probability sampling will vary in terms of complexity, and time and money considerations. Regardless of the situation, however, this type of sampling is the most effective technique for selecting study elements for two reasons:

1. probability sampling eliminates bias which could influence the selection of sample members, and
2. probability sampling allows an estimation of sampling error.

### PROBABILITY SAMPLES

A basic principle of probability sampling is that if all members of the survey population have an equal, nonzero chance of being selected, the sample is more apt to be representative of that population. Although samples are seldom (if ever) completely representative, probability samples are generally considered more representative than other types because they avoid biased selection. The key to the process of probability sampling is random selection which, as previously mentioned, means that every element has an equal chance of being included in the sample.

#### Simple Random Sampling

This technique is accomplished by assigning numbers to each of the elements in the sampling frame and then randomly selecting numbers for inclusion in the sample. Typically, the survey researcher utilizes a table of random numbers or computer programs that provide a random selection of sampling units (Babbie, 1973:83).

In addition to the simple random sampling technique, a number of alternative probability sampling methods are available to the researcher.

### Systematic Sampling

If a complete listing of population elements is available, survey researchers will frequently employ a systematic sampling procedure. In this method, every "*k*th" element in the sampling frame is selected for the sample, usually with the first element picked at random. This technique is properly referred to as a "systematic sample with a random start" (Babbie, 1973:92).

To illustrate, if the sampling frame contains 2,000 elements and a sample size of 200 is needed, the researcher will select every 10th element for his sample. The sampling interval, which is defined as the distance between selected elements, would be 10 in this example. The sampling ratio, that is the proportion of elements in the survey population which are chosen, would be one-tenth in this instance. Because the results of systematic and simple random sampling are almost identical, the greater simplicity of systematic sampling makes it the preferred method. The one major danger involved with this technique is referred to as periodicity. "If the list of elements is arranged in a cyclical pattern that coincides with the sampling interval, it is possible that a grossly biased sample may be drawn". (Babbie, 1973:93).

### Stratified Sampling

The purpose of using a stratified sampling procedure is to insure that appropriate numbers of elements are selected from homogeneous subsets (or strata) of the survey population. A stratum is simply a segment of the population having one or more common characteristics. Examples include: an age stratum (age 65 and over), an income stratum (all families with incomes less than \$8,000), or occupation stratum (white-collar workers).

It is important in stratified samples, however, that there be heterogeneity between subsets (i.e., the elements in each subset should differ significantly from each other along the stratification variables).

Sex is related to many variables, and because it is readily available to the researcher for stratification purposes, it is commonly used. Stratification by geographic location in a city is also employed regularly, resulting in increased representativeness in social class and ethnic group. In general, this method is apt to be even more representative on a variety of variables than the simple random sample.

### Multistage Cluster Sampling

This technique is normally used when it is not feasible to compile an exhaustive list of elements in the target population. The design usually involves "...the initial sampling of groups of elements--clusters--followed by the selection of elements within each of the selected clusters" (Babbie, 1973:96).

Suppose, for example, that a sample was to be drawn from a city, for which no single list of the population existed. It would be possible to initially select a sample of city blocks, and then create a list of residents on each of the sampled blocks. From this list, a subsample of persons on each block could be drawn. As in this example, the multistage cluster sampling technique requires the repetition of both listing and sampling.

Researchers using this sampling method can vary either the number of clusters chosen or the number of elements selected from each cluster to achieve their desired sample size. As a general guideline, demographers will select approximately five households per census block (Babbie, 1973). Thus, if a total of 1,000 households are to be surveyed, the researcher would choose 200 blocks, and interview five households on each block.

## NONPROBABILITY SAMPLES

For the most part, researchers should rely on probability sampling techniques to ensure greater representativeness and thus increase the generalizability of study results. There may be occasions, however, when cost limitations prohibit the use of probability sampling, or when generalizing results is not critically important. At these times, the transit marketer may want to consider using a method of nonprobability sampling.

In addition, surveyors need to consider the "cost versus value" principle--that is, deciding which kind of sample will yield the greatest margin of value over cost (Tull & Hawkins, 1976:162). Listed below are some factors affecting the potential value of the information sought:

1. *"What kind of information is needed--averages and/or proportions or projectable totals?"*

Do we need to know only the proportion of users and/or the average amount used or do we need to estimate the overall market share and/or the total market for the product?

2. *"What kind of error tolerance does the problem allow?"*

Does the problem require highly accurate estimates of population values?

3. *"How large are the nonsampling errors likely to be?"*

How sizable are the population specification, frame, selection, nonresponse, surrogate information, measurement, and experimental errors likely to be?

4. *"How homogeneous is the population with respect to the variables we want to measure?"*

Is the variation likely to be low among the sampling units, or will it be high?

5. *"What is the expected cost of errors in the sample information?"*

What is the cost to me if the average(s)/proportion(s) I obtain from the data are above the error tolerance on the high side?

The low side? (Tull & Hawkins, 1976:162-3).

### Purposive (Judgmental) Sampling

Quite simply, purposive sampling involves selection of a sample based on the researcher's own knowledge of either the population, its elements, or the study goals. He might choose, for example, only those individuals who could supply necessary information, such as surveying all the transit managers statewide to obtain data about system budgets and operations.

### Quota Sampling

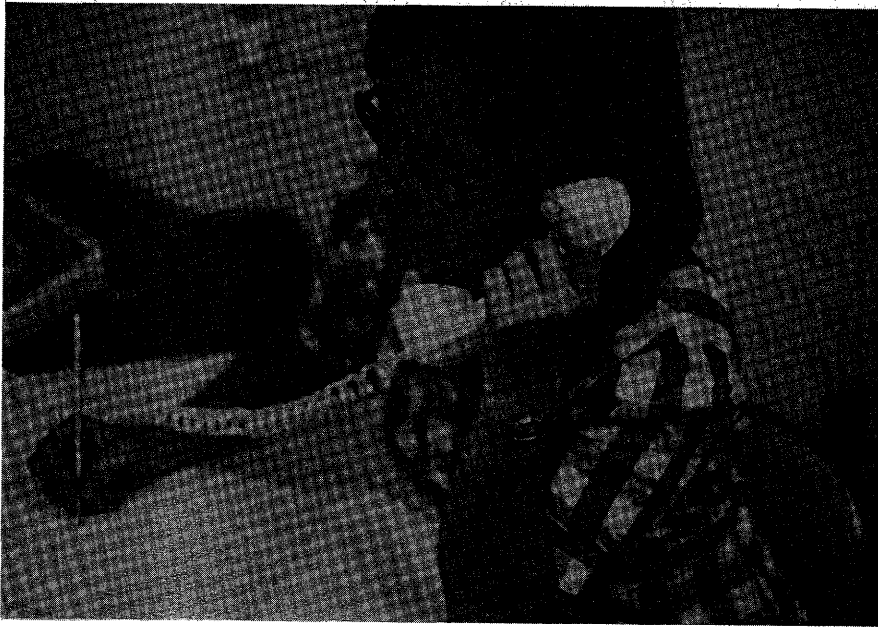
In quota sampling, the sample is selected in such a way that the characteristics of interest to the researcher are represented in the sample in the same proportion as they exist in the population. A matrix, describing the characteristics of the population, is usually created, and relative proportions are assigned to each cell. The researcher then collects data from individuals having all the specified characteristics of each particular cell, and individuals are later assigned a weight, in accordance with their proportion of the total study population.

It is often difficult to find accurate information to develop the matrix, however, and this problem, compounded by potential bias in the selection of elements, severely limits the utility of this sampling procedure.

There are similarities between quota sampling and stratified sampling techniques, and the inexperienced surveyor may confuse the two. Both methods involve the division of the study population into segments and the



selection of elements from each segment. The major difference, though, is that sample elements are selected on a probabilistic basis with stratified samples, whereas they are selected by personal judgment in quota samples.



*Scaling techniques are used to obtain a composite picture of perceptions toward transit service, as well as a good overview of specific service features. In addition, scaling procedures provide a means of ranking service requirements and other transit characteristics.*

STRONGLY AGREE . . . . .	STRONGLY DISAGREE
STRONGLY APPROVE . . . . .	STRONGLY DISAPPROVE
ALWAYS . . . . .	NEVER
YES. . . . .	NO
VERY LIKELY. . . . .	VERY UNLIKELY
POSITIVELY . . . . .	NEGATIVELY

## CHAPTER FOUR

### SCALING TECHNIQUES

In order for transit systems to satisfy the public, they must have a basic understanding of what the consumers want in the way of service provision. Furthermore, to be effective, promotional campaigns and service alterations should be based on an awareness of the public's attitudes toward transit. Attitudes are of special interest to the transit marketer for these reasons, and also because knowledge of an individual's feelings about transit will help to predict his subsequent behavior -- that is, whether or not he will use the transit system in the future.

Such attitudes and opinions can best be identified through the use of scaling techniques. By definition, these attitude scales assign each individual a score based on his responses to a series of statements related to a particular object. In general, there are two things to consider in selecting items to include on an attitude scale: 1) the items must elicit responses that accurately reflect the attitude being measured, and 2) all the items, taken together, must differentiate among respondents who hold various levels of the attitude in question (Tull & Hawkins, 1976).

While many techniques are available, selection of the most appropriate scaling technique should be based on the following criteria:

- the nature of the information required
- the abilities of the sample members
- time and cost limitations

#### LIKERT SCALES

Perhaps the most useful scaling technique for those in the transit industry is the Likert scale. Using this approach, the questionnaire respondent

is asked to respond to a statement by indicating whether he "strongly agrees," "agrees," "disagrees," "strongly disagrees," or is "undecided." Of course, modifications of the wording (e.g., "strongly approves") may be used when necessary.

Each item, or statement, should be scored in a uniform manner; with five response categories, as shown in the example given below, 1 to 5 would be assigned to the various categories. However, the direction of the items must be considered so that a score of "5" would always be given to the most positive response and a score of "1" assigned to the most negative category.

YOUR OPINIONS ON TRANSPORTATION AND PERSONAL TRAVEL

Below are listed a number of statements relating to transportation facilities and personal travel; you will probably agree with some of them and disagree with others. Please answer by circling the letter which best represents your feeling about each of the statements, according to the following codes:

- A means Strongly Agree
- a means Agree Somewhat
- o means Neither Agree nor Disagree
- d means Disagree Somewhat
- D means Strongly Disagree

- I really can't see much of a future for public transportation ..... A a o d D
- There should be greater emphasis on improving bus service and less on building freeways ..... A a o d D
- A major advantage of buses is that children (ages 6 - 15) can be less dependent on their parents ..... A a o d D
- Only the lower income groups will ever use buses ..... A a o d D

Finally, each respondent is given a single, overall score, equaling the sum of the scores he received for the individual attitude statements. For example, suppose Individual A answered the four questions in the following manner:

- I really can't see much of a future for public transportation ..... A a o  D
- There should be greater emphasis on improving bus service and less on building freeways ..... A  o d D
- A major advantage of buses is that children (ages 6 - 15) can be less dependent on their parents .....  A a o d D
- Only the lower income groups will ever use buses ..... A a o  D

He would receive a 4 for the first response  
 a 4 for the second response  
 a 5 for the third response, and  
 a 5 for the fourth response.

Thus, his total score would be 18. Individuals can later be compared on the basis of these scores to determine who holds the more positive evaluations and/or attitudes toward transit.

The advantages of the Likert scaling technique can be summarized as follows:

- 1) the scale is easy to construct
- 2) it is easy to administer (i.e., the instructions needed are easily understood, making this approach useful for mailed questionnaires)
- 3) the technique is thought to have high reliability; and
- 4) because of the wide range of possible responses, the scale provides a good indication or measure of the respondent's attitude relative to other individuals.

The major criticism of the Likert technique is that different response patterns can result in identical total scores. However, this is not believed

to be a serious shortcoming and should not jeopardize the scale's utility for transit marketers.

### ALTERNATIVE SCALING TECHNIQUES

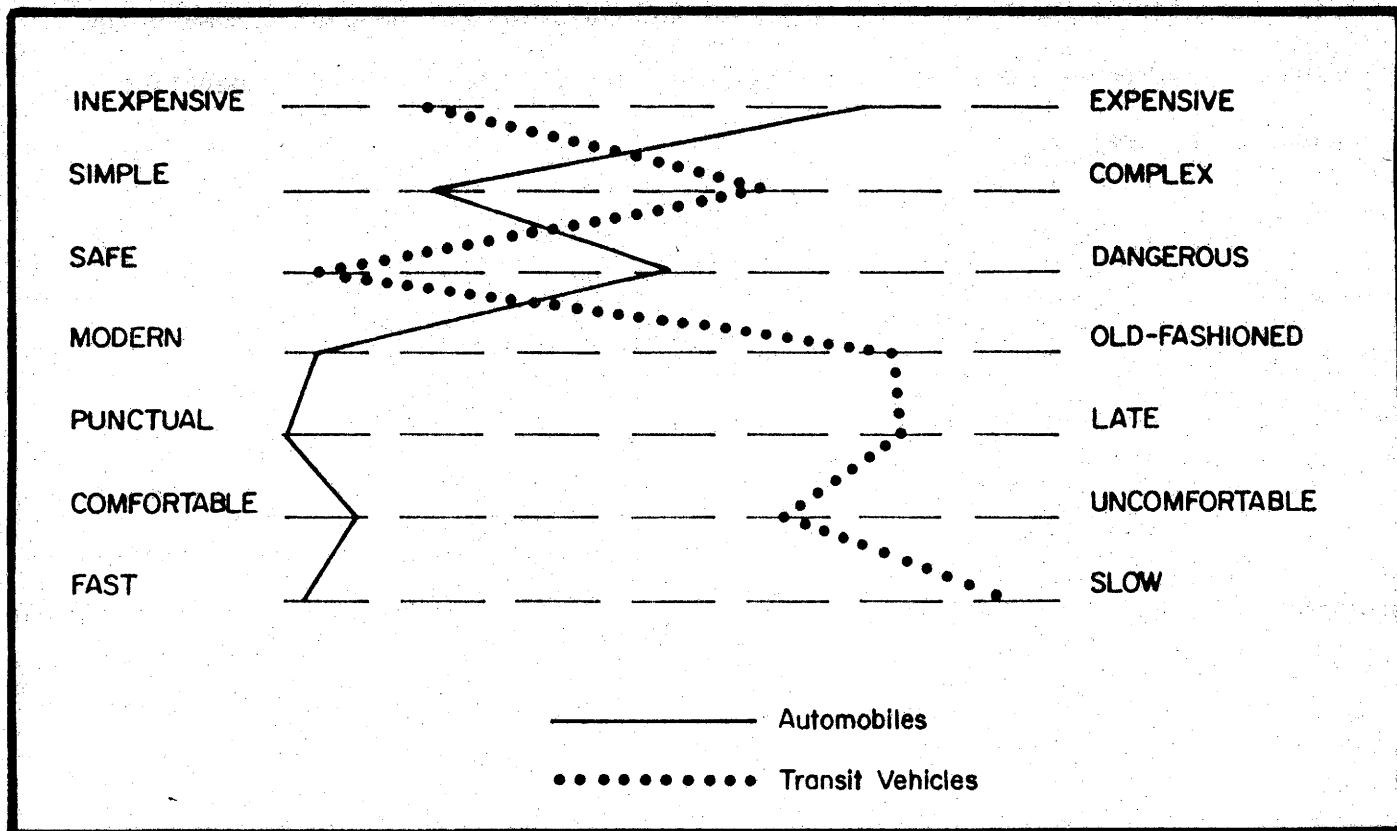
The Semantic Differential Scale is quite frequently used in the area of market research. Basically, it requires the respondent to rate an object on a variety of seven-point scales that are bounded at each end by one of two bi-polar adjectives. Respondents are instructed to check the blank that best describes how closely one or the other adjective fits the object of interest, as shown below:

Check the blank space for each "bus travel characteristic" to describe the most appropriate description. For example, on the COST OF TRAVEL characteristic, if you think a bus is extremely expensive, check the blank closest to expensive; however, if you think a bus is fairly inexpensive, check a blank closer to the inexpensive end of the scale, and so forth.

INEXPENSIVE	_____	_____	_____	_____	_____	_____	_____	EXPENSIVE
SIMPLE	_____	_____	_____	_____	_____	_____	_____	COMPLEX
SAFE	_____	_____	_____	_____	_____	_____	_____	DANGEROUS
MODERN	_____	_____	_____	_____	_____	_____	_____	OLD-FASHIONED
PUNCTUAL	_____	_____	_____	_____	_____	_____	_____	LATE
COMFORTABLE	_____	_____	_____	_____	_____	_____	_____	UNCOMFORTABLE
FAST	_____	_____	_____	_____	_____	_____	_____	SLOW

Scoring is similar to that used with Likert Scales in that each blank is assigned a numerical value (1 to 7) with the largest number consistently assigned to the blank closest to the more favorable term. Each respondent is assigned a summated score to be used for comparative purposes. Additionally, a technique known as profile analysis can be employed. This technique involves computing the mean (average) value assigned to each adjective pair by

a specific group (e.g., market segments). Profiles can then be visually compared to that of either another group or another object. The profile of automobiles is compared to that of transit vehicles in the following illustration:

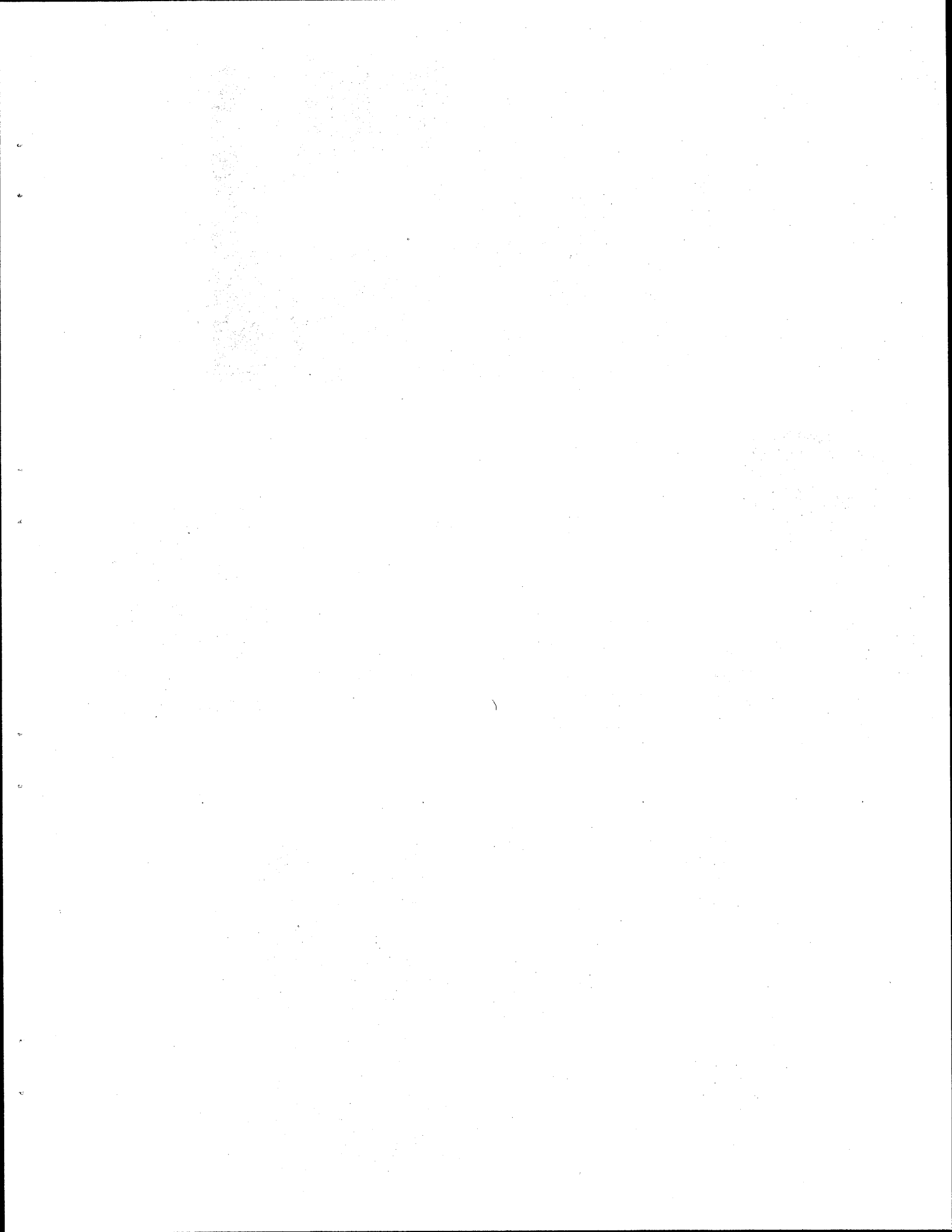


It can be seen from this example that transit vehicles are rated more favorably than automobiles on only two dimensions -- cost and safety. Such comparisons provide the transit system with important information that can be used to guide the development of both changes in service and advertising and promotional campaigns.

As mentioned previously, other scaling techniques do exist (e.g., Guttman, Thurstone, and Bogardus), but these are not discussed in this report because they do not offer unique advantages to the transit market researcher.

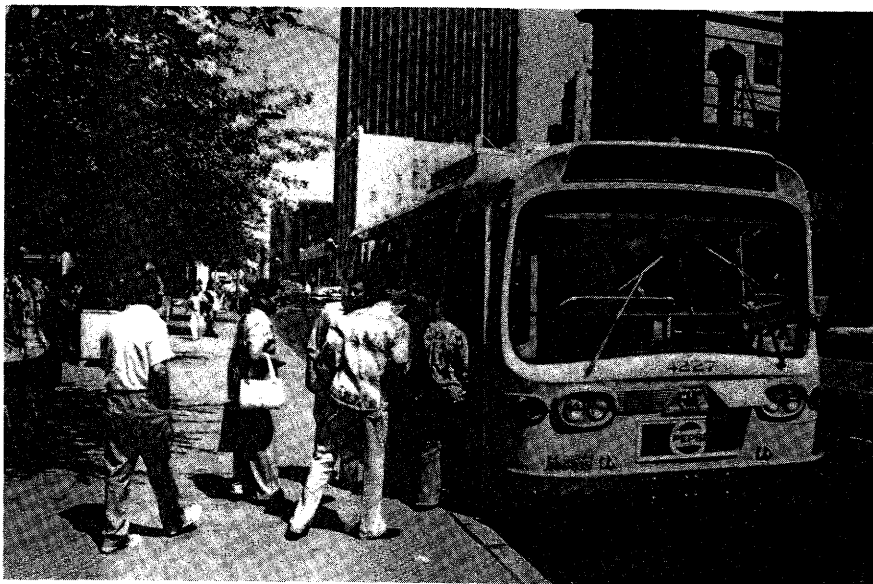
To summarize this section on scaling techniques, it should be pointed out that scales are considered the best way to accurately assess attitudes because they enable a composite score to be assigned, based on a variety of related items. Once such scores have been computed, all subsequent comparisons offer the marketer insight into the attitudes and opinions of the public toward the transit system -- information that is critical for the successful operation of the service.







*Field observation provides transit marketing staffs with data that cannot be obtained from surveys, in that it is actually observed by transit representatives. Field observation includes the use of unobtrusive measures, such as head-counts by drivers on specified routes, focus groups, where transit personnel meet periodically with community members and interest groups, and participant observation, such as riding buses to converse with patrons.*



## CHAPTER FIVE

### FIELD OBSERVATION AS A DATA COLLECTION METHOD

In very general terms, field observation refers to any data collection method whereby the researcher witnesses firsthand the events or phenomena under investigation. The discussion here is limited to the more informal and unstructured field observation techniques which can be used within the transit industry.

#### ALTERNATIVE METHODS OF FIELD OBSERVATION

##### Participant Observation

With this technique, the researcher directly observes events pertaining to the research objectives while actively participating in the situation at hand. A transit marketer is apt to find that by actually riding buses and making observations about the behavior of the people on the bus, he is in a much better position to recommend changes in operations or plan promotional campaigns. For example, if he notes a good deal of confusion among riders at the bus stop as to which bus provides the most direct route to various destinations, he can interpret this to mean that new route maps need to be created which can be more easily understood by the average bus patron. Direct conversation with other bus riders can provide similar information, and the transit marketer often can confirm the findings on the basis of his own bus-riding experiences.

##### Focus Groups

Transit personnel may find it beneficial to periodically meet with members of the community to discuss issues and problems related to the transit system. While the meetings may be scheduled at regular intervals, they should

be conducted informally to encourage greater participation and openness among those in attendance. District representatives -- individuals who represent various geographic sectors of the community -- can act as liasons between the local transit system and members of the community to which they belong. Both of these approaches provide an excellent opportunity for transit personnel to obtain feedback from the community on various aspects of transit service. Responsiveness to such information characterizes the consumer orientation which most transit systems feel is critically important for their successful operation.

### Unobtrusive Measures

This category contains all types of field observation data collecting techniques in which the researcher does not use some type of direct, face-to-face interaction with individuals to obtain information. Technically speaking, for almost any type of data that can be obtained from a sample survey or from secondary sources such as census data, a rough approximation may also be obtained from field observation techniques. However, as is discussed in another section of this report, some types of data are more efficiently and inexpensively collected by methods other than field observation, but the latter method provides for the addition of heretofore unknown transit problems and potentially needed improvements to the objective quantitative data collected.

The following are some illustrations of ways unobtrusive measures can be used in the area of transit market research:

- A simple head-count of the number of persons standing at various bus stops in the city will enable transit personnel to determine which stops are used with the greatest frequency by the largest numbers of patrons. This information will aid in selecting appropriate locations for shelters, benches, information kiosks, etc.

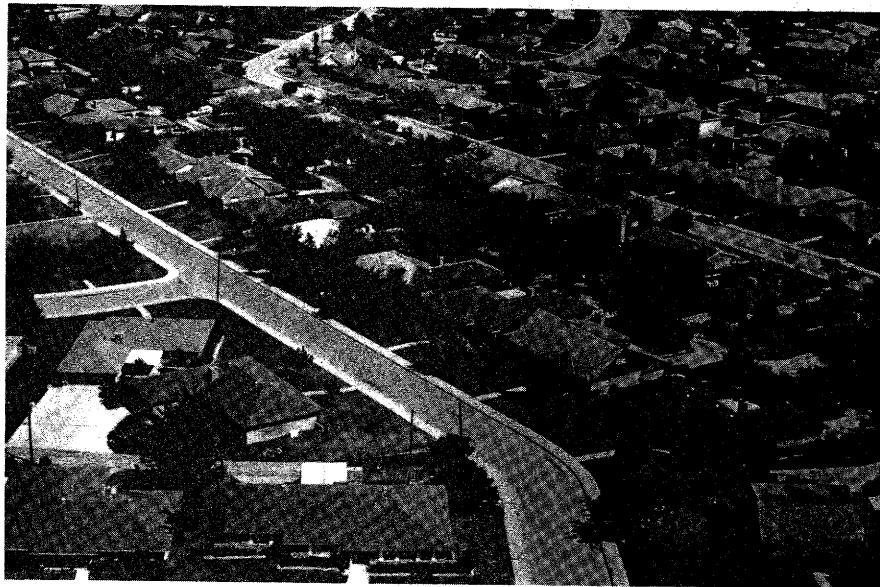
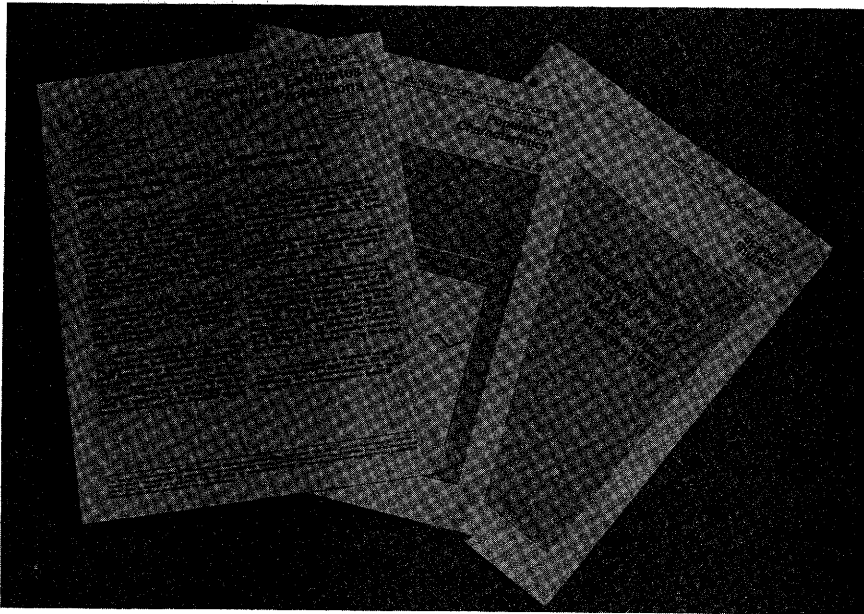
- A general idea of common trip purposes can also be determined by taking note of both the time of day people ride the bus, and also the origins and destinations of patrons.
- Casual observation of the people riding buses can help identify factors influencing ridership, such as the effects of a lack of adequate seating, the use of bus schedule information racks, and the use of specially allocated seats for the handicapped.

It should be re-emphasized, however, that other more reliable methods of data collection, such as sample surveys, should be used to supplement the unstructured techniques just discussed. While unobtrusive measures and casual observations do lend insight into basic behavior patterns, they are subject to error because of the subjectivity required of the observer as well as potential bias. Most important, the findings are less credible to city councilmen, transit boards, and others who prefer more objective data bases.

In addition to these basic data collection methods, some systems have successfully employed their bus drivers in a simple research capacity. For example, in several cities, drivers have done a "boarding count" in which the number of passengers boarding the bus at each stop was recorded. Such a count can be used to support decisions regarding the placement of bus shelters, benches, and information displays, as well as to provide data on current ridership totals for each of the current transit routes.

As mentioned previously, these various field observation techniques are somewhat more subject to error or bias than the sample survey approach, but they have often proven invaluable to the transit industry in terms of providing additional insight into the needs and preferences of the public it is designed to serve.

*An inexpensive and readily available data source for transit marketing purposes is secondary data, primarily census information. Especially for demand estimation purposes, census information may be more easily utilized than either survey or field observation data.*



## CHAPTER SIX

### USE OF SECONDARY DATA

Market research to determine the need for transit service improvements can often make use of existing, readily available data sources. To assess beneficial as well as potentially adverse marketing strategies, characteristics of the population and of specific service areas can be delineated with the use of secondary data. While surveys are normally used to determine transit demand and optimum promotional strategies, this approach is often costly and time consuming. In addition, transit patrons and the general public may tire of an overabundance of community surveys. Census data, especially census tract and block information, have a proven usefulness for providing an aggregate picture of residents and city subareas.<sup>2</sup> Other types of secondary data -- such as on-board counts of riders, recorded fare and pass patrons, and various performance indicators which are routinely collected -- are often suitable data for use in a marketing capacity. Land use and other recorded data from city planning offices also may provide valuable information.

#### DEMOGRAPHIC DATA

For census tracts as well as for larger areal units, characteristics of area residents that have been effective for the prediction of transit demand are listed.

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<sup>2</sup>For assistance in the use of census data for localities, individual Bureau of the Census representatives can be contacted. For travel survey data, contact John Cannon (301) 763-1798; for journey to work (means of transportation) demographic information, contact Philip Fulton (303) 763-5226; and for local area population estimates and projections, contact Frederick Cavanaugh (301) 763-7722.

Demographic Characteristics of Residents  
for Census Tracts in 1970

I. Transportation Characteristics

- (1) % Workers using transit
- (2) % Workers driving private vehicles
- (3) % Workers as passengers in private vehicles
- (4) % Workers walking to place of employment
- (5) Location of work relative to place of residence

II. Age Distribution

- (1) % Residents < 16
- (2) % Residents 60+

III. Socioeconomic Status of Residents

- (1) Median owner value
- (2) Median gross rent
- (3) Median family income
- (4) Median years of school completed
- (5) Percent of white collar workers

IV. Ethnic Characteristics

- (1) % Anglo
- (2) % Negroes
- (3) % Spanish-Americans

V. Residential Stability

- (1) Persons per acre or per square mile
- (2) % 5-Year residents
- (3) Median year moved to dwellings
- (4) % Owned dwellings

The delineation of these characteristics based on 1970 accounts have differential uses, depending on data collection requirements. The 1980 census form will include a substantial number of transportation-related items, with more new items regarding transportation patterns than any other topic addressed.

Relevant items tentatively slated for inclusion in the 1980 census are:

- Travel time to work
- Location of work
- Means of transportation to work
- Persons in carpool
- Hours worked
- Number of automobiles
- Number of light trucks and vans



The majority of census data use is dependent on the decennial data, such as the items for 1970 and 1980 which have been discussed. For 1970, the data is available on computer tapes and in standard published volumes, as listed in Table 1.

In addition to information obtained from the decennial census, the Bureau periodically publishes reports based on Current Population Surveys. Data from these reports, when combined with transit operating statistics, can be used to compile more recent estimates of certain population characteristics and transit needs than is available from the decennial reports. Under certain conditions, the Bureau will add questions to its Current Population Survey interview schedules to obtain specific data for public agencies.

As an example of the periodic surveys' uses, a Current Population Report was recently disseminated entitled, "Selected Characteristics of Travel to Work in 20 Metropolitan Areas: 1976." This report discusses changes in modes of transportation to work and trends in use of mass transportation.

#### STRENGTHS AND WEAKNESSES OF CENSUS DATA

One of the problems of using decennial census data to analyze trends in population characteristics is that data collected at one time may not be directly or even indirectly comparable to similar data collected at another time. Three reasons for this problem are: (1) changes in the definition of items or ways of classifying data, (2) changes in enumeration procedures, and (3) changes in the boundaries of enumeration areas such as census tracts. There are many instances where the Bureau of the Census has changed the definition of items in order to make them more meaningful or because the old definitions have become obsolete. For this reason, the marketer should carefully read the definitions provided by the Bureau for each time period

Table 1. Publications and Computer Tapes Available for the 1970 Census of the Population

**Population Census Reports**

**Volume I.**  
**CHARACTERISTICS OF THE POPULATION**  
 This volume will consist of 58 "parts"—number 1 for the United States, numbers 2 through 52 for the 50 States and the District of Columbia in alphabetical order, and numbers 53 through 58 for Puerto Rico, Guam, Virgin Islands, American Samoa, Canal Zone, and Trust Territory of the Pacific Islands, respectively. Each part, which will be a separate cloth-bound book, will contain four chapters designated as A, B, C, and D. Each chapter (for each of the 58 areas) will first be issued as an individual paperbound report in four series designated as PC(1)-A, B, C, and D, respectively. The 58 PC(1)-A reports will be specially assembled and issued in a clothbound book, designated as Part A.

■ **Series PC(1)-A.**  
**NUMBER OF INHABITANTS.**

Final official population counts are presented for States, counties by urban and rural residence, standard metropolitan statistical areas (SMSA's), urbanized areas, county subdivisions, all incorporated places, and unincorporated places of 1,000 inhabitants or more.

■ **Series PC(1)-B.**  
**GENERAL POPULATION CHARACTERISTICS**

Statistics on age, sex, race, marital status, and relationship to head of household are presented for States, counties by urban and rural residence, SMSA's, urbanized areas, county subdivisions, and places of 1,000 inhabitants or more.

■ **Series PC(1)-C.**  
**GENERAL SOCIAL AND ECONOMIC CHARACTERISTICS**

Statistics are presented on nativity and parentage, State or country of birth, Spanish origin, mother tongue, residence 5 years ago, year moved into present house, school enrollment (public or private), years of school completed, vocational training, number of children ever born, family composition, disability, veteran status, employment status, place of work, means of transportation to work, occupation group, industry group, class of worker, and income (by type) in 1969 of families and individuals. Each subject is shown for some or all of the following areas: States, counties (by urban, rural-nonfarm, and rural-farm residence), SMSA's, urbanized areas, and places of 2,500 inhabitants or more.

■ **Series PC(1)-D.**  
**DETAILED CHARACTERISTICS**

These reports will cover most of the subjects shown in Series PC(1)-C, above, presenting the data in considerable detail and cross-classified by age, race, and other characteristics. Each subject will be shown for some or all of the following areas: States (by urban, rural-nonfarm, and rural-farm residence), SMSA's, and large cities.

**Volume II.**  
**SUBJECT REPORTS**

Each report in this volume, also designated as Series PC(2), will concentrate on a particular subject. Detailed information and cross-relationships will generally be provided on a national and regional level; in some reports, data for States or SMSA's will also be shown. Among the characteristics to be covered are national origin and race, fertility, families, marital status, migration, education, unemployment, occupation, industry, and income.

**Housing Census Reports**

**Volume I.**  
**HOUSING CHARACTERISTICS FOR STATES, CITIES, AND COUNTIES**

This volume will consist of 58 "parts"—number 1 for the United States, numbers 2 through 52 for the 50 States and the District of Columbia in alphabetical order, and numbers 53 through 58 for Puerto Rico, Guam, Virgin Islands, American Samoa, Canal Zone, and Trust Territory of the Pacific Islands, respectively. Each part, which will be a separate cloth-bound book, will contain two chapters designated as A and B. Each chapter (for each of the 58 areas) will first be issued as an individual paperbound report in two series designated as HC(1)-A and B, respectively.

■ **Series HC(1)-A.**  
**GENERAL HOUSING CHARACTERISTICS**

Statistics on tenure, kitchen facilities, plumbing facilities, number of rooms, persons per room, units in structure, mobile home, telephone, value, contract rent, and vacancy status are presented for some or all of the following areas: States (by urban and rural residence), SMSA's, urbanized areas, places of 1,000 inhabitants or more, and counties.

Table 1. (Continued)

■ Series HC(1)-B.  
**DETAILED HOUSING  
CHARACTERISTICS**

Statistics are presented on a more detailed basis for the subjects included in the Series HC(1)-A reports, as well as on such additional subjects as year moved into unit, year structure built, basement, heating equipment, fuels, air conditioning, water and sewage, appliances, gross rent, and ownership of second home. Each subject is shown for some or all of the following areas: States (by urban, rural-nonfarm, and rural-farm residence), SMSA's, urbanized areas, places of 2,500 inhabitants or more, and counties (by rural and rural-farm residence).

**Volume II.  
METROPOLITAN HOUSING  
CHARACTERISTICS**

These reports, also designated as Series HC(2), will cover most of the 1970 census housing subjects in considerable detail and cross-classification. There will be one report for each SMSA, presenting data for the SMSA and its central cities and places of 50,000 inhabitants or more, as well as a national summary report.

**Volume III.  
BLOCK STATISTICS**

One report, under the designation Series HC(3), is issued for each urbanized area showing data for individual blocks on selected housing and population subjects. The series also includes reports for the communities outside urbanized areas which have contracted with the Census Bureau to provide block statistics from the 1970 census.

**Volume IV.  
COMPONENTS OF INVENTORY CHANGE**

This volume will contain data on the disposition of the 1960 inventory and the source of the 1970 inventory, such as new construction, conversions, mergers, demolitions, and other additions and losses. Cross-tabulations of 1970 and 1960 characteristics for units that have not changed and characteristics of the present and previous residence of recent movers will also be provided. Statistics will be shown for 15 selected SMSA's and for the United States and regions.

**Volume V.  
RESIDENTIAL FINANCE**

This volume will present data regarding the financing of privately owned nonfarm residential properties. Statistics will be shown on amount of outstanding mortgage debt, manner of acquisition of property, homeowner expenses, and other owner, property, and mortgage characteristics for the United States and regions.

**Volume VI.  
ESTIMATES OF "SUBSTANDARD"  
HOUSING**

This volume will present counts of "substandard" housing units for counties and cities, based on the number of units lacking plumbing facilities combined with estimates of units with all plumbing facilities but in "dilapidated" condition.

**Volume VII.  
SUBJECT REPORTS**

Each report in this volume will concentrate on a particular subject. Detailed information and cross-classifications will generally be provided on a national and regional level; in some reports, data for States or SMSA's may also be shown. Among the subjects to be covered are housing characteristics by household composition, housing of minority groups and senior citizens, and households in mobile homes.

**Joint Population-Housing Reports**

**Series PHC(1).  
CENSUS TRACT REPORTS**

This series contains one report for each SMSA, showing data for most of the population and housing subjects included in the 1970 census.

**Series PHC(2).  
GENERAL DEMOGRAPHIC TRENDS FOR  
METROPOLITAN AREAS, 1960 to 1970**

This series consists of one report for each State and the District of Columbia, as well as a national summary report, presenting statistics for the State and for SMSA's and their central cities and constituent counties. Comparative 1960 and 1970 data are shown on population counts by age and race and on such housing subjects as tenure, plumbing facilities, value, and contract rent.

**Series PHC(3).  
EMPLOYMENT PROFILES OF SELECTED  
LOW-INCOME AREAS**

This series will consist of approximately 70 reports, each presenting statistics on the social and economic characteristics of the residents of a particular low-income area. The data relate to low-income neighborhoods in 54 cities and seven rural poverty areas. Each report will provide statistics on employment and unemployment, education, vocational training, availability for work, job history, and income, as well as on value or rent and number of rooms in the housing unit.

Table 1. (Continued)

**Additional Reports**

Series PHC(E).

**EVALUATION REPORTS**

This open series will present the results of the extensive evaluation program conducted as an integral part of the 1970 census program, and relating to such matters as completeness of enumeration and quality of the data on characteristics.

Series PHC(R).

**PROCEDURAL REPORTS**

This open series presents information on various administrative and methodological aspects of the 1970 census, and will include a comprehensive procedural history of the 1970 census. The first report issued focuses on the forms and procedures used in the data collection phase of the census.

**Computer Summary Tapes**

The major portion of the results of the 1970 census will be produced in a set of six tabulation counts. To help meet the needs of census users, these counts are being designed to provide data with much greater subject and geographic detail than it is feasible or desirable to publish in printed reports. The data so tabulated will generally be available—subject to suppression of certain detail where necessary to protect confidentiality—on magnetic computer tape, printouts, and microfilm, at the cost of preparing the copy.

**First Count**—source of the PC(1)-A reports; contains about 400 cells of data on the subjects covered in the PC(1)-B and HC(1)-A reports and tabulated for each of the approximately 250,000 enumeration districts in the United States.

**Second Count**—source of the PC(1)-B, HC(1)-A, and part of the PHC(1) reports; contains about 3,500 cells of data covering the subjects in these reports and tabulated for the approximately 35,000 tracts and 35,000 county subdivisions in the United States.

**Third Count**—source of the HC(3) reports; contains about 250 cells of data on the subjects covered in the PC(1)-B and HC(1)-A reports and tabulated for approximately 1,500,000 blocks in the United States

**Fourth Count**—source of the PC(1)-C, HC(1)-B, and part of the PHC(1) reports; contains about 13,000 cells of data covering the subjects in these reports and tabulated for the approximately 35,000 tracts and 35,000 county subdivisions in the United States; also contains about 30,000 cells of data for each county.

**Fifth Count**—will contain approximately 800 cells of population and housing data for 5-digit ZIP code areas in SMSA's and 3-digit ZIP code areas outside SMSA's; the ZIP code data will be available only on tape.

**Sixth Count**—source of the PC(1)-D and HC(2) reports; will contain about 260,000 cells of data covering the subjects in these reports and tabulated for States, SMSA's, and large cities.

The tapes will generally be organized on a State basis. To use the First Count and Third Count tapes, it will be necessary to purchase the appropriate enumeration district and block maps.

The term "cells" used herein to indicate the scope of subject content of the several counts refers to each figure or statistic in the tabulation for a specific geographic area. For example, in the Third Count, there are six cells for a cross-classification of race by sex: three categories of race (white, Negro, other race) by two categories of sex (male, female).

In addition to the above-mentioned summary tapes, the Census Bureau will make available for purchase certain sample tape files containing population and housing characteristics as shown on individual census records. These files will contain no names or addresses, and the geographic identification will be sufficiently broad to protect confidentiality. There will be six files, each containing a 1-percent national sample of persons and housing units. Three of the files will be drawn from the population covered by the census 15-percent sample and three from the population in the census 5-percent sample. Each of these three files will provide a different type of geographic information: One will identify individual large SMSA's and, for the rest of the country, groups of counties; the second will identify individual States and, where they are sufficiently large, will provide urban-rural and metropolitan-nonmetropolitan detail; and the third will identify State groups and size of place, with each individual record showing selected characteristics of the person's neighborhood.

Source: U.S. Bureau of the Census, Characteristics of the Population, 1970.

under consideration to make sure the data are comparable. In specific instances, a conversion factor can be used where the definition of a variable has changed, in order to make data comparable.

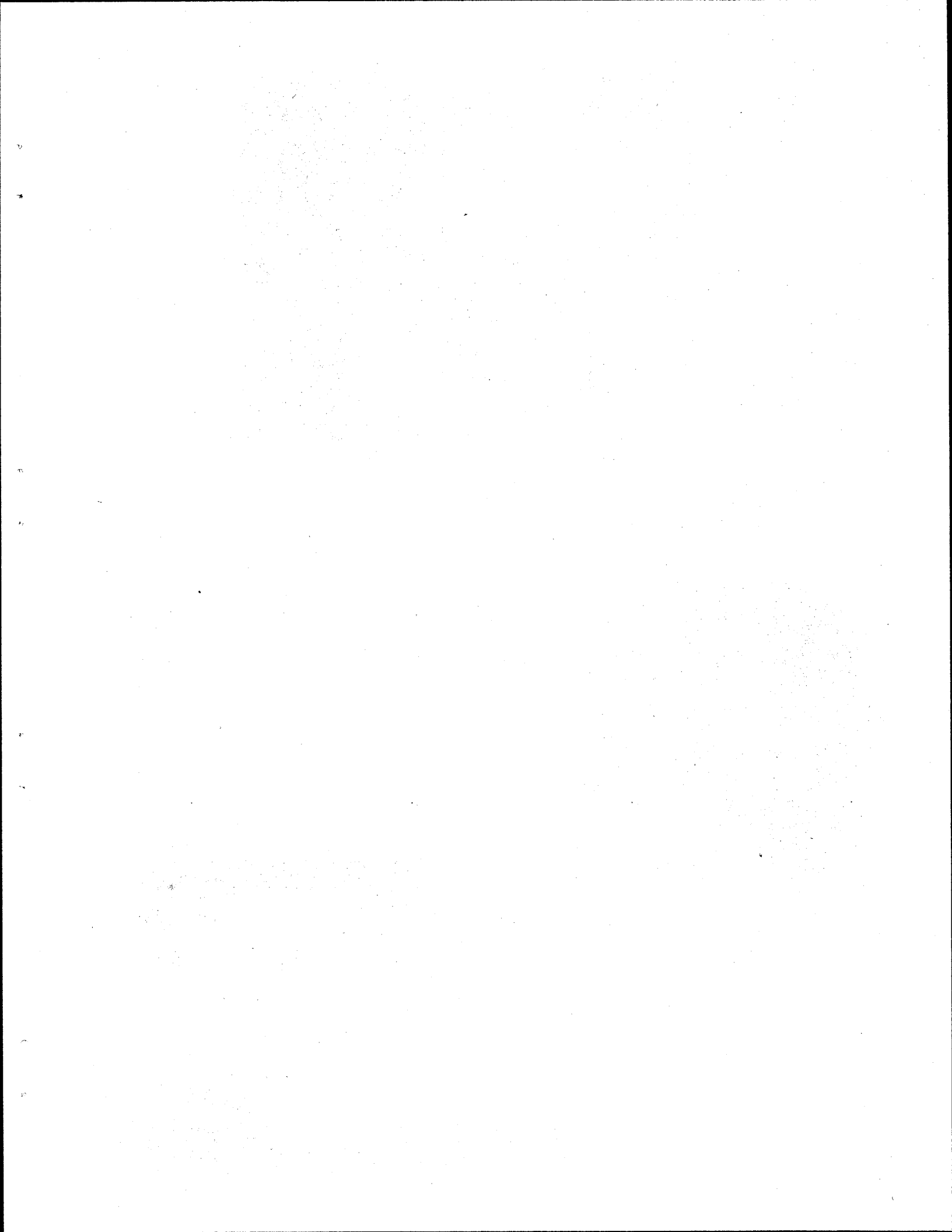
In some cases, an implicit redefinition of a variable occurs because of a change in the way data were collected. For example, the 1970 census was largely conducted by means of mailed, self-administered questionnaires. Under this procedure in several Texas locations a small percent of the population reported using trains or railroads as the primary means of transportation to work, which is very unlikely in reality.

A major weakness of census or other secondary data is the limitations as to topical areas addressed and the specific items included which have some utility for transit market research. However, for broad, sketch planning purposes, such as those listed below, secondary data may be useful:

1. The need to use survey findings from other cities or earlier market research efforts which necessitate the estimation of aggregate population characteristics;
2. The need to plan or implement marketing strategies without benefit of a marketing survey, either because of time or resource constraints; and
3. The need to assess transit demand and awareness levels, and desirable promotional strategies for city or service subareas which entail data on demographic characteristics of area residents.

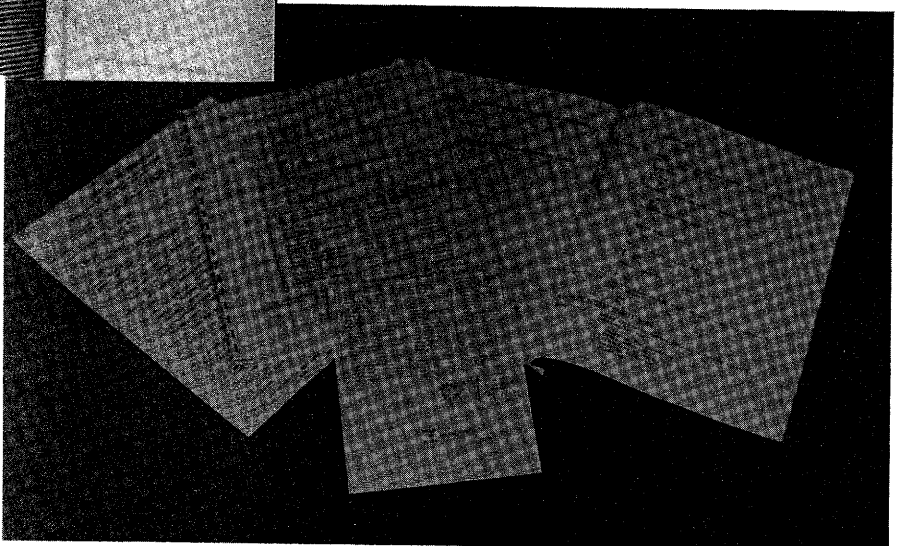
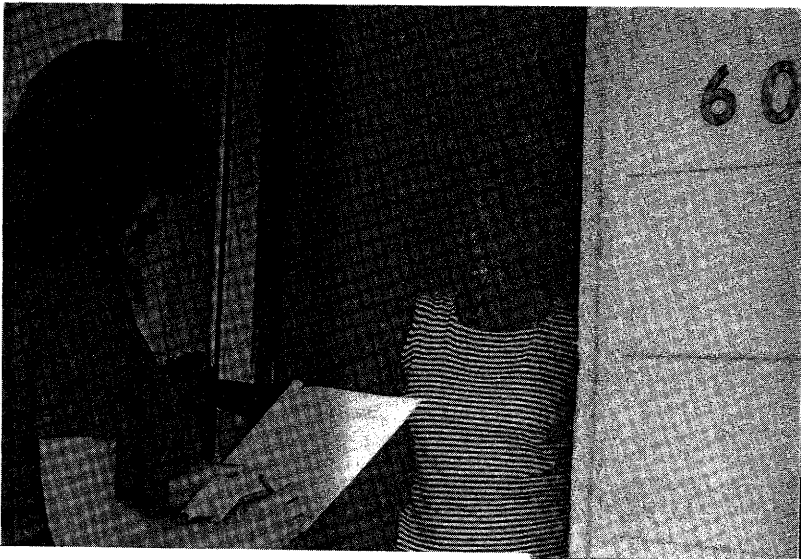
There are a number of advantages to using census and other secondary data which make their use attractive to those conducting research. Perhaps the most important feature of census data is the high quality of enumeration; census surveys provide a high degree of accuracy from which a very dependable data base can be obtained. Furthermore, census publications, such as those outlined in Table 1, are readily obtained and require low monetary costs for the user.

Most transit marketers cannot attain the sampling reliability of the decennial census because census tabulations either: (1) cover the total population of a particular areal unit, or (2) encompass a carefully selected sample of the population, depending on the actual data descriptors utilized. In addition, the utilization of secondary data provides a much larger data base than can be obtained by local transit personnel in most circumstances. Thus, those involved in market research for the transit system should not overlook the usefulness of census data and previously recorded ridership and performance information for addressing various research needs.





*By following basic methodological guidelines, market research can be undertaken successfully by transit personnel.*





## CHAPTER 7

### SUMMARY

Market research, as indicated earlier, should be viewed by every individual in the transit industry as the foundation of a transit marketing program. Without careful investigation of the market transit is intended to serve, systems cannot hope to meet customer needs and preferences effectively. The critical importance of sound market research efforts emphasized the need for a basic guidebook, geared specifically to those in the transit industry, outlining the principles and procedures of research.

There are three general approaches which can be used in the area of transit market research:

- 1) sample surveys;
- 2) field observation; and
- 3) secondary analysis.

As shown in Table 2, each has strengths and weaknesses compared to the other techniques, and the decision as to which methodology to use will depend largely on each system's specific research objectives.

#### USE OF QUESTIONNAIRES FOR A DATA BASE

Much of this report is devoted to the topic of questionnaire design and alternative methods of administration since sample surveys are thought to provide highly accurate and useful data for those in the transit industry. Though more costly and time-consuming than either field observation or secondary analysis, questionnaires can be used to measure a number of important factors affecting transit patronage, including:

Table 2. Evaluation of the Three Basic Approaches  
Used for Transit Market Research

Evaluation Criteria	Approach or Methodology		
	Sample Survey	Field Observation	Secondary Analysis
1. Rapid method of data collection		X	X
2. Low cost approach		X	X
3. Flexible		X	
4. Currency of input data	X	X	
5. Consistency of input data	X		X
6. Use of quantifiable information	X		X
7. Use of longitudinal analyses	X		X
8. Use of intuitive, subjective information	X	X	

- demographic characteristics
- attitudes toward and evaluations of transit
- bus riding behavior (past, present, and intended)

Such data is extremely important to systems for evaluating current bus patronage and estimating future ridership trends. Furthermore, knowledge of the demographic composition of riders and non-riders enables an accurate identification of feasible target markets.

Developing the survey instrument requires careful attention to certain details. Included in the report are discussions of the following considerations:

- question content
- question phrasing
- question sequence
- response format
- physical characteristics of the questionnaire (e.g., instructions, introductions, and reproduction )

The inexperienced survey researcher may not be aware of the significance of these factors, but the quality of the data obtained depends largely on the quality of the questionnaire. Therefore, the surveyor is advised to spend the time and effort necessary to design an effective research instrument.

Once the questionnaire is developed, the transit market researcher has a variety of administration methods from which to choose. The four most common techniques used in the transit industry are on-board surveys, personal interviews, mailed questionnaires, and telephone surveys. The advantages and disadvantages of each approach are outlined

in the report, but again, the choice of one or a combination of several methods should reflect the needs and objectives of each particular system.

### The Pretest

Pretesting the questionnaire and the field methods on a smaller scale before actually conducting the sample survey is of the utmost importance to the researcher. A number of potential problems can be spotted and corrected prior to administering the survey instrument to members of the sample. Examples of danger signs which might show up in results of the pretest include:

- failure to answer
- multiple answers
- "other" answers
- qualified answers
- direct comments

In addition, pretest results should be coded and tabulated so that information included in the survey can be more easily evaluated and unnecessary questions omitted from the questionnaire.

### SAMPLING TECHNIQUES

The sample utilized in a transit survey should fulfill two basic requirements:

- 1) it must enable the surveyor to make statements about key indicators regarding the use and evaluation of transit with a tolerable amount of certainty; and
- 2) it must allow the market researcher to generalize the results to the target population with a tolerable amount of certainty.

Both conditions can be met through proper sampling techniques.

Probability sampling eliminates bias which could influence the selection of the sample and it allows an estimation of sampling error. For these reasons, it is considered a more effective technique than nonprobability sampling. The key principle of probability sampling is random selection, which means that every element in the population has an equal chance of being included in the sample. Among the alternative probability sampling methods available are:

- simple random sampling
- systematic sampling
- stratified sampling
- multistage cluster sampling

Brief discussions of these techniques are provided in Chapter III.

At times when cost limitations prohibit the use of probability samples and generalizing survey results is not essential, the transit market researcher may select one of the following methods of non-probability samples:

- purposive (judgmental) sampling
- quota sampling

In general, however, surveyors should rely on probability sampling procedures to ensure greater representativeness and increased generalizability of study results.

#### SCALING TECHNIQUES

An understanding of what customers desire in the way of service provision and an awareness of the public's attitudes toward transit are essential for effective transit operations. Such attitudes and evaluations are most accurately assessed by using scaling techniques, which

assign each sample member a score based on his responses to a series of related statements.

The Likert scale, which is perhaps the most useful scaling technique for transit marketers, has several major advantages:

- 1) the scale is easy to construct;
- 2) it is simple to administer;
- 3) the technique has high reliability; and
- 4) it provides a good measure of the respondent's attitude relative to other sample members.

A second technique which might be utilized by transit personnel is the Semantic Differential scale. While scoring is similar to that used with Likert scales, the Semantic Differential scale enables a visual comparison of the profiles of several groups (e.g., market segments) or several objects (e.g., transit vehicles vs. automobiles). Such comparisons can be used in the transit industry to aid in the development of service alterations and/or promotional and advertising campaigns.

#### FIELD OBSERVATION TECHNIQUES

Three general methods of field observation are discussed in Chapter V:

- 1) participant observation
- 2) focus groups
- 3) unobtrusive measures

With participant observation, the transit researcher observes firsthand those events pertaining to the objectives of the study, while actively participating in the situation. By actually riding buses and observing the behavior of those on-board, the transit marketer is better able to make recommendations concerning changes in system operations or promotional campaigns.

Focus groups provide an opportunity for system personnel to meet with members of the community and to discuss current operations or planned changes, and thus, obtain essential community feedback. Similarly, district representatives who serve various geographic areas can act as liaisons between the transit system and their particular communities.

Finally, systems can make use of various unobtrusive measures -- that is, any kind of field observation that does not require the use of direct, face-to-face interaction to obtain information. Perhaps the most common method employed by the transit industry is a simple head-count of individuals at bus stops throughout the city. These counts can be used to justify changes in routing or in the placement of bus shelters and benches.

Though useful, the researcher should remember that unobtrusive measures are more subject to error because of potential bias, thus making findings less credible to city officials and transit boards. Therefore, other techniques, such as sample surveys, should often be used to supplement these more unstructured methods of data collection.

#### USE OF SECONDARY DATA

Although surveys and field observation techniques are most frequently used to obtain data for the transit system, census data have proven very useful for providing an overall picture of city residents and local area characteristics. In 1970, for example, the census provided information on:

- transportation characteristics
- age distribution
- socioeconomic status of residents
- ethnic characteristics
- residential stability

New items regarding transportation patterns which will be included in the 1980 census should prove highly useful to transit managers, also. These relevant items include:

- travel time to work
- location of work
- means of transportation to work
- persons in carpool
- hours worked
- number of automobiles
- number of light trucks and vans

In addition, the Bureau periodically publishes reports based on Current Population Surveys which can be used to obtain more recent estimates of transit needs and population characteristics than is available from the decennial reports.

The high degree of accuracy from which a very dependable data base can be obtained is, perhaps, the major advantage to using census data. Because transit researchers cannot attain the sampling reliability of the decennial censuses, and periodic population surveys, those conducting market research for the system should not overlook the usefulness of census data for achieving their research objectives.

#### RESEARCH AS AN IN-HOUSE VS. OUTSIDE ACTIVITY

Some systems, particularly those operating on larger budgets, may opt to allocate funds to outside marketing agencies for research activities. The Metropolitan Tulsa Transit Authority, for example, hired a team of experts to undertake a major comprehensive operational analysis for their system. As a part of this research effort, the team identified



target markets for future promotional and marketing campaigns, evaluated each transit route, and logged passenger travel patterns. Among the techniques utilized by the research team were on-board surveys and field observation, with some supplementary information obtained through secondary data analysis.

Many other transit systems, however, will want to utilize their own personnel, thus making market research an in-house activity. On-board surveys conducted within the past year by the Birmingham-Jefferson County Transit Authority provided the system with valuable information concerning bus rider characteristics and perceived critical factors of the current transit patrons, as well as trip-making patterns. In addition, a comprehensive ridership survey provided data required for UMTA and aided in cost/feasibility analyses and planning for operational changes within the system.

Similarly, the TRI-MET System in Portland, Oregon undertook an attitude and awareness survey in 1977 to assess: frequency of transit use, trip purpose, critical factors, awareness of advertising efforts, and the use of telephone information and other special services, as well as the basic demographic characteristics of the survey sample.

The point to remember is simply that market research can be done -- and done well -- by system personnel if certain basic methodological guidelines are followed. The information provided in this report is intended to facilitate subsequent market research endeavors, particularly for those systems that may not have attempted such activities in the past. By establishing market research as an integral part of the overall marketing program, systems can more accurately assess their target markets and, in turn, improve the consumer-orientation so necessary for effective service provision.

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