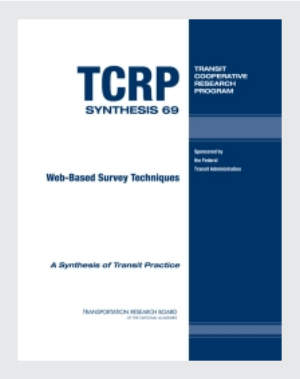


# Web-Based Survey Techniques

**DETAILS**

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**AUTHORS**

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TRANSIT COOPERATIVE RESEARCH PROGRAM

TCRP SYNTHESIS 69

# Web-Based Survey Techniques

## *A Synthesis of Transit Practice*

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**SUBJECT AREAS**
Public Transit

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the Transit Development Corporation

**TRANSPORTATION RESEARCH BOARD**

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2006
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## TRANSIT COOPERATIVE RESEARCH PROGRAM

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## FOREWORD

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Transit administrators, engineers, and researchers often face problems for which information already exists, either in documented form or as undocumented experience and practice. This information may be fragmented, scattered, and unevaluated. As a consequence, full knowledge of what has been learned about a problem may not be brought to bear on its solution. Costly research findings may go unused, valuable experience may be overlooked, and due consideration may not be given to recommended practices for solving or alleviating the problem.

There is information on nearly every subject of concern to the transit industry. Much of it derives from research or from the work of practitioners faced with problems in their day-to-day work. To provide a systematic means for assembling and evaluating such useful information and to make it available to the entire transit community, the Transit Cooperative Research Program Oversight and Project Selection (TOPS) Committee authorized the Transportation Research Board to undertake a continuing study. This study, TCRP Project J-7, "Synthesis of Information Related to Transit Problems," searches out and synthesizes useful knowledge from all available sources and prepares concise, documented reports on specific topics. Reports from this endeavor constitute a TCRP report series, *Synthesis of Transit Practice*.

This synthesis series reports on current knowledge and practice, in a compact format, without the detailed directions usually found in handbooks or design manuals. Each report in the series provides a compendium of the best knowledge available on those measures found to be the most successful in resolving specific problems.

## PREFACE

This synthesis documents the current state of the practice for web-based surveys. The intent of the report is to provide a resource for successful practice, discuss the technologies necessary to conduct web-based surveys, and present several case studies and profiles of transit agency use of web-based surveys. The topic will be of interest to transit planners and managers and those who work with them as they attempt to develop and refine web-based surveys for their own transit agencies. Particular emphasis is placed on understanding the strengths and limitations of all survey methods.

Information presented in this synthesis was obtained from a literature review, as well as from survey responses from 36 transit professionals. Follow-up telephone calls were made to gather further information. Longer telephone interviews were conducted to develop three detailed case studies: NJ TRANSIT, Southern California Regional Rail Authority (Metrolink), and Tri-County Metropolitan Transportation District of Oregon (TriMet).

Greg M. Spitz, Frances L. Niles, and Thomas J. Adler, Resource Systems Group, Inc., White River Junction, Vermont, collected and synthesized the information and wrote the paper, under the guidance of a panel of experts in the subject area. The members of the Topic Panel are acknowledged on the preceding page. This synthesis is an immediately useful document that records the practices that were acceptable within the limitations of the knowledge available at the time of its preparation. As progress in research and practice continues, new knowledge will be added to that now at hand.

# CONTENTS

# WEB-BASED SURVEY TECHNIQUES


## SUMMARY

This synthesis of transit research describes how web-based surveys are being used by transit agencies and other transit researchers and documents the experiences of web-based survey research as applied to transit. In addition, this study documents not only the current state of the practice, but also provides a resource for successful practices in web-based surveying, discusses the technologies necessary to conduct web-based surveys, and presents some specific case studies of transit agency use of web-based survey techniques.

This synthesis describes the survey conducted and the processes used, as it provided a sample of web-based survey research. The results of this synthesis survey are described in detail to understand the state of the practice in current transit research, such as what types of studies are being conducted, how studies are being administered, and whether or not studies are using web-based survey techniques. If researchers are using web-based surveys, the synthesis survey asked why they were doing so and how they were implementing them, and then requested specific comments on what they see as the strengths and limitations of these surveys. If web-based surveys are not being used, the synthesis survey asked why not and probed as to whether web-based methods might be used in the future.

The synthesis also describes successful practices of web-based surveys and research, with a particular emphasis on understanding the strengths and limitations of all survey methods. Because different survey methods have different levels and types of survey error, a section of the report discusses how to best conduct a study using multiple survey methods to optimize the strengths of each survey method while mitigating their limitations.

There were 175 researchers at both transit agencies and in the private sector in the selected/convenience sample of potential respondents that the topic panel and consultant chose to survey. Of those, 25 responses were received from researchers at transit agencies and 11 from researchers in the private sector of the transit industry.

A discussion on how to implement web-based survey technology is also included to provide transit researchers with an understanding of the options and costs involved in implementing web-based survey technologies and some of the issues in doing so.

Finally, the study details three case studies of transit research where web-based surveys were conducted and the methods used in each.

The main finding from the survey conducted for this study (it was web-based, of course) is that although a significant number of transit researchers are using web-based survey methods (approximately 40% of respondents), most respondents are currently not. It is also possible that transit researchers not currently conducting web-based surveys may have not responded to the synthesis survey believing it was not relevant to them. Of those who did respond, the primary reason cited for not using web-based survey research was concern about the limited Internet access of transit customers. This was also cited as a major limitation of web-based survey research by those who are conducting web-based surveys in the transit environment.

Another important finding was that of those researchers conducting web-based surveys, these surveys tended to be for "limited-focus" studies, such as surveys of employers in the transit service area, transit agency employees, product tests, marketing evaluations, new offers, and programs related to fares and fare payment cards and interactive map studies.

The synthesis ends with the conclusions including the following aspects of web-based surveys that transit agencies have found to be successful:

- Start simply with web-based surveys to learn the differences between web-based surveys and other survey methods.
- Attempt to collect databases of e-mails from customers and potential customers to use as a sampling source for research.
- Apply web-based survey methods in a multi-method survey environment to improve response rates by providing response alternatives and to enable the transit researcher to gain the benefits of web-based survey data and techniques. This finding is made knowing that measurement error is an issue with multi-method surveys; therefore, this must be balanced against the benefits.
- Research the issue of coverage error and try to minimize sampling bias.
- Remain cautious but optimistic about including web-based surveys in research programs as the survey methods and the Internet mature.

CHAPTER ONE

# INTRODUCTION

## OBJECTIVE

Over the last decade, the dramatic increase in the availability, popularity, and use of computers has made access to the Internet ubiquitous for the majority of Americans (*1*). Correspondingly, the popularity and use of web-based surveys have also been increasing in dramatic fashion, particularly in private-sector market research. This increase is because web-based surveys are often easier and less expensive to administer than alternative survey methods (once a learning curve has been overcome), and that they have the potential to offer more flexibility and features than other survey methods. (The term survey "modes" will not be used in this study and instead survey "methods" will be used to avoid confusion about transportation modes.) Correspondingly, web-based surveys also have a variety of limitations and other complexities that need to be understood, some of which are particular to the research issues faced by transit agencies.

Owing to the strong, general trend toward web-based surveys (*1*) and the need for transit researchers to understand the technique's strengths and limitations, this transit synthesis was undertaken. The synthesis describes how web-based surveys are being used by transit agencies and other transit researchers and documents the experiences of web-based survey research as applied in the transit context. In addition, this study not only documents the current state of the practice, but also provides a resource for successful practices in web-based surveying, discusses the technologies necessary to conduct web-based surveys, and presents some specific case studies of transit agency use of web-based survey techniques.

## METHODOLOGY

The primary means of gathering information for this project was a web-based questionnaire of transit research professionals. Thirty-six transit professionals from throughout the country—from large, medium, and small transit agencies; metropolitan planning organizations (MPOs); and private consultancies—responded to the study. This synthesis survey provides the basis for much of the material in this report, along with follow-up interviews with survey respondents based on their original web-based survey responses.

In addition, a literature review covering web-based survey research and web-based survey literature in the transit field was conducted. Very little material was discovered; most addressed the large body of general research on survey methods, which was then put into the transit context. Sources were found based on searches of Transportation Research Information Services (TRIS) and by using search engines, as well as from recommendations of the topic panel. These sources were helpful in forming an understanding of web-based survey techniques and their applications to transit issues.

## STATE OF PRACTICE

Currently, there is a limited number of web-based transit research studies taking place, and those that are being implemented are generally somewhat restricted in scope, such as studies testing the usability of various features on a transit agency's website. However, some notable exceptions have involved far-ranging and complex web-based surveys used in large-scale transit studies. Three of these are detailed in case studies found in chapter six of this report.

Based on the information gathered for this study it was determined that there is a strong belief among transit researchers that there is still a major coverage bias when using web-based methods. It was also found that web-based research is considered by transit researchers to be difficult and often costly. However, transit researchers also showed strong interest in web-based survey methods, and gave the impression that web-based research could become a major research medium, as more than 70% of respondents not currently using web-based survey methods noted they are "very likely" (28%) or "somewhat likely" (44%) to conduct such research in the next two years. Therefore, transit agencies need to be aware of how the medium works, how to implement it, what general costs to expect, and how to mitigate survey error issues. The purpose of this synthesis is to provide information that increases this awareness.

## SYNTHESIS ORGANIZATION

This report is organized as follows:

- Chapter two details the synthesis survey design and the methods used to conduct this survey to determine the current state of web-based survey practice in the transportation field.

- Chapter three presents the results and discusses what was learned from the web-based survey of transit professionals. It describes what is and *what is not* happening with web-based research in the transit arena and discusses the reasons for the current state of transit agency practice regarding web-based survey research.
- Chapter four describes some of the successful practices that are being employed in the transit research area as well as practices from the private sector and described in the literature. The chapter first describes how to design and format a web-based questionnaire. Next, it describes how to reduce and mitigate coverage and nonresponse errors in web-based surveys and presents the strengths and limitations of web-based surveys and other survey methods so that the transit researcher can evaluate whether and how to best conduct a web-based survey. Finally, the chapter describes the successful practices and strategies being employed to incorporate web-based surveys into transit research.
- Chapter five describes how to implement a web-based survey and the technology issues involved in doing so.
- Chapter six details three case studies describing projects conducted by NJ TRANSIT, Southern California Regional Rail Authority (Metrolink), and Tri-County Metropolitan Transportation District of Oregon (TriMet). The case studies are used to show what can and is being done with web-based research using actual projects from transit agencies. Various themes described in earlier chapters are reinforced and understood in a real-world context based on these case studies.
- Chapter seven describes the various lessons learned from this synthesis effort, including ideas for when, why, and how to conduct transit web-based surveys. It also makes suggestions for future research that can be conducted in this area.

CHAPTER TWO

# SYNTHESIS SURVEY METHODOLOGY

The project survey was designed to determine the ways that web-based surveys are being used in the transit field and to understand how transit researchers are conducting their studies. The respondents who were included in the survey sample came from a variety of organizations: public transit agencies, consultancies, universities, MPOs, and other government entities focused on transportation and transit-related issues (Table 1).

The "convenience sampling" method was used for this synthesis owing to the relatively small number of researchers in the field and the limited scope of the synthesis project. The sampling list was therefore developed using easily available and relevant sources that were not necessarily exhaustive. Specifically, the sample list came from the TCRP synthesis topic panel, the APTA Marketing and Communications Committee, the TRB Survey Methods Committee, the TRB Marketing and Fare Policy Committee, and other selected researchers in the transit field who were recommended by panel members and others affiliated with this project. The recruitment was conducted by means of e-mail, with each invitation containing a custom link with a unique embedded password, which limited a respondent to answering the survey only once.

Survey recruitment took place in three stages: the first invitations went to the TCRP Synthesis Topic Panel, the TRB Survey Methods Committee, and the TRB Marketing and Fare Policy Committee. During the second stage, e-mail invitations were sent to selected researchers in the transportation field. In the last stage, invitations were sent to the APTA Marketing and Communications Committee. The fieldwork for this synthesis survey took place during February and March 2006. Overall, the response rate for completed surveys was 21% (36 of 175 invited).

As well as being a convenience sample, it should also be noted that the sample may have nonresponse bias as a result of the survey invitation being titled "TCRP Synthesis Topic SH-07—Web-Based Survey Techniques." This nonresponse bias might have occurred because those who do not conduct web-based surveys may have elected not to respond, believing that they were not relevant to the study. Therefore, it is possible that the survey actually overstates web-based survey research in transit.

The synthesis survey was divided into four sections:

- Screener
  - Type of organization in which respondent works.
- General survey inventory
  - Frequency and types of surveys respondent is involved in conducting
    - △Origin–destination,
    - △Customer satisfaction,
    - △Mode choice,
    - △Planning, and
    - △Other.
  - Characteristics of those surveys; that is, panel, cross-sectional, etc.
  - Modes studied.
  - Recruitment, sampling, and administration methods.
  - Quality of results data set.
  - Purpose of survey.
  - To whom results were presented.
- Web-based survey specifics
  - Advantages and disadvantages to conducting web-based surveys.
  - Likelihood of implementing web-based surveys (if not currently in use).
  - Objectives of web-based surveys.
  - Design, software used, and hosting of web-based surveys.
  - Features of field for web-based surveys.
  - Support required for conducting web-based surveys.
  - Recruitment methods.
  - Resulting data set characteristics.
  - Response rates.
  - Costs.
  - Successful practices.
  - Web use by organization.
- Contact information.

A copy of the survey questionnaire is included in Appendix A.

The survey was converted into a web questionnaire using a proprietary software program developed by the research team. As with other computer-based survey methods, web-based surveys can be programmed to validate responses as they are entered.

TABLE 1
RESPONDENT ORGANIZATIONS TO SYNTHESIS SURVEY

| Organization | Count | Percent |
|---|---|---|
| Public transit agency | 25 | 69 |
| Consultancy | 4 | 11 |
| University | 2 | 6 |
| Metropolitan planning organization | 3 | 8 |
| Federal government | 1 | 3 |
| City government transportation department | 1 | 3 |
| Total | 36 | 100 |

Another favorable feature of web-based surveys is the ability to follow skip and branching patterns that depend on previous responses. In this regard, web-based surveys are much easier for the user than paper-based surveys, where skip patterns can become confusing. In the synthesis survey respondents were asked the frequency with which they conduct five different types of transportation-related surveys, as outlined earlier. To relieve respondent fatigue, respondents were asked detailed questions about a maximum of three types of surveys. If respondents had conducted more than three survey types, then the types of surveys they were asked about were randomly balanced to ensure enough of each survey type was collected. If respondents provided information on only one or two types of surveys, they were asked only about those types.

A successful practice for any web-based survey is to provide support for respondents with a "help desk." For the synthesis survey, a survey-specific e-mail account was created and monitored during the course of the survey's fieldwork schedule. A toll-free telephone number was placed on every page of the survey so that a respondent could immediately call the research staff if confused by a question or in case of technical difficulties. Beyond direct contact through phone and e-mail, the live survey data were monitored for comments that warranted attention from survey administrators. Finally, the database was also checked regularly to see if respondents were encountering any technical errors that were trapped by the software system and written to the database.

To complete the survey effort, the data were reviewed and any respondents that required or requested follow-up on their responses were contacted for further information.

CHAPTER THREE

# CURRENT STATE OF PRACTICE FOR WEB-BASED TRANSIT SURVEYS

This chapter details what was learned from, and discusses the results of, the web-based survey done for this synthesis study. The survey was completed by 36 transit professionals (25 transit agency employees and 11 other transit researchers). It is worth noting that this was a survey about surveys, or a meta-survey, which aimed to understand how research is being conducted by transit researchers. The survey has a relatively small sample and, as mentioned in chapter two, used convenience sampling owing to the relatively small number of researchers in the field and to the limited scope of the synthesis project. As also mentioned in chapter two, this survey likely has some nonresponse bias that might overstate the amount of web-based survey research currently occurring in transit. Even with these caveats, the survey provides a basis for understanding what is occurring in the transit industry with regard to transit web-based surveys. This chapter describes what is and *what is not* happening with web-based research and analyzes the reasons for the current state of practice of transit agencies and other transit researchers regarding web-based survey research. The topics covered in this chapter include:

- Current use of web-based surveys in the transit industry;
- Frequency, types, and areas of usage of transit surveys currently being conducted (web-based and not web-based);
- Areas where web-based survey techniques are most effective for the five types of surveys explored in this synthesis (origin–destination, customer satisfaction, mode choice, planning, and other); and
- Methods being employed for web-based surveys, including advice and concerns.

## CURRENT USE OF WEB-BASED SURVEYS IN TRANSIT INDUSTRY

The use of web-based surveys is limited in the transit industry, although there are a significant number of respondents from transportation agencies and other transit professionals using this method, which could be somewhat overstated as a result of the previously mentioned limitations of the sample. Those using the web in some form comprised 39% (14 of 36 completed questionnaires) of our survey sample. Agencies that responded to the survey varied in size: 40% large (more than one billion passenger miles annually), 30% medium (between 75 million and one billion passenger miles annually), and 30% small (fewer than 75 million passenger miles annually). Responding agencies currently using web-based surveys are distributed relatively evenly by size, indicating that not just large transit agencies are conducting such surveys. Table 2 shows the breakdown of respondents to the synthesis survey by region and agency size and by whether or not they currently use web-based surveys.

For the most part, web-based survey use appears to be specialized for many agencies as a result of coverage concerns and because agencies are moving into the technology slowly (e.g., using the web as a tool on small, specialized studies before using it on major research surveys such as origin–destination studies). However, there are some exceptions where transit agencies are using web-based survey research on significant studies. In general, trends indicate movement toward the increased use of web-based methods, with more than 70% of those currently not using the web noting that they are "somewhat likely" (44%) to "very likely" (28%) to begin using web-based surveys within two years.

The primary reason provided in the synthesis survey in support of the use of web-based surveys is the efficiency with respect to time and money. Seventy percent of respondents currently using web-based surveys made favorable comments about the technology, citing its effectiveness and efficiency in being able to reach certain target populations. Respondents stated that they believe that web-based surveys increase response rates because they are convenient and "provide an option for those who wish to use it [to] reach a certain group of people." Those using web-based survey technology also appreciate the "ability to present complicated subject matter, question design, and graphics." They value the opportunity for "fast turn-around and cost-effectiveness." Respondents recognize that the cost savings derived from conducting web-based surveys stems not only from the efficient manner of data collection that does not require significant on-the-street fieldwork, but also because data are brought in consistently and easily with real-time data validation providing a clean data set more quickly than other survey methods. One participant stated, "Respondents tend to answer more questions and work at it longer," which further improves data quality.

When asked about possible disadvantages to using the technology, nearly all respondents currently using web-based surveys cited their concern over a coverage bias resulting from limited Internet penetration in the target population. (One respondent asserted that "it [web-based surveys] can only be used as an optional response mechanism because of limited penetration.") Survey respondents worry that they may not be

TABLE 2
WEB-BASED SURVEY USE BY AGENCY SIZE AND REGION
(includes MPO respondents)

| | Total Number by Size | Currently Using Web-Based Surveys (%) | Not Currently Using Web-Based Surveys (%) | Total (%) |
|---|---|---|---|---|
| Agency Size | | | | |
| Large | 11 | 27 | 73 | 100 |
| Medium | 8 | 37 | 63 | 100 |
| Small | 8 | 37 | 63 | 100 |
| Total Agency Respondents | 27 | | | |
| Region | | | | |
| Northeast/Mid-Atlantic | 10 | 20 | 80 | 100 |
| Southeast | 3 | 33 | 67 | 100 |
| Midwest | 7 | 15 | 85 | 100 |
| West | 7 | 71 | 29 | 100 |
| Total Agency Respondents | 27 | | | |

reaching a reliable cross section of their target audience and as such they may not be able to discern what portions of their target market may be missing. "Web-based surveys will not reach less-literate people or people without computers. If that is your primary ridership, then web-based surveys may not capture the attitudes or behavior of these customers."

Over- or underrepresentation of various population segments raises problems when presenting valid research on behalf of transit systems, making the results "difficult to generalize to the public." Other concerns included technical problems limiting each respondent to completing only one survey (see chapter four) and the need to limit the focus of the survey research to only certain topic areas. Concerns about costs of web-based surveys, at least in terms of time, were also expressed: "However long you think it will take to implement the survey, double it!"

Words of advice given by respondents conducting web-based surveys directed to those considering starting the use of them were twofold:

- "Consider the target market segment and assess Internet availability among those people."
- "Make sure to incorporate it with other methods to get a greater response."

A discussion of multi-method administration follows later in this chapter and is also discussed later in this report (chapter four).

### FREQUENCY, TYPES, AND AREAS OF USAGE OF TRANSIT SURVEYS CURRENTLY BEING CONDUCTED

When asked about the types of surveys their organizations conduct and how often, respondents indicated that they do survey research in the following proportions, with some surveys conducted more than once each year: 25% customer satisfaction, 25% planning, 19% origin–destination, 13% mode choice, and 17% "other." "Other" types of surveys noted were household travel surveys, transit onboard surveys, interactive map studies, policy and issue analyses, marketing, market share, station evaluation, new offers and programs related to fares or fare cards, safety and security issues, product tests, new technology, copy testing, and employers/employees. Tabulations for all survey questions are in Appendix C. In the synthesis survey, individuals were asked to describe the number of different surveys they conduct and, as noted earlier, 39% of respondents described surveys that had a web-based component.

The uses for which these various surveys were conducted are shown in Figure 1. Customer satisfaction surveys show a high percentage of many different purposes, indicating that such surveys often do the work of multiple surveys (such as origin–destination surveys) at once by obtaining trip and other information beyond just satisfaction data.

Recruitment question results showed that for every type of survey researchers usually recruit respondents using a combination of methods (see Figure 2). For their most recent origin–destination surveys, more than 60% of researchers surveyed reported recruiting in person, by means of intercepts, or on board and/or at stations; 25% recruited on roadways or at toll plazas; another 25% recruited using the telephone; and just 6% indicated recruiting by e-mail or with a web link.

For their most recent customer satisfaction survey, three-quarters of respondents reported recruiting in person and by means of intercepts on board and/or at stations, with 50% combining that with a telephone recruit. Again, only 6% are adding an e-mail/web link recruit method to the other two methods.

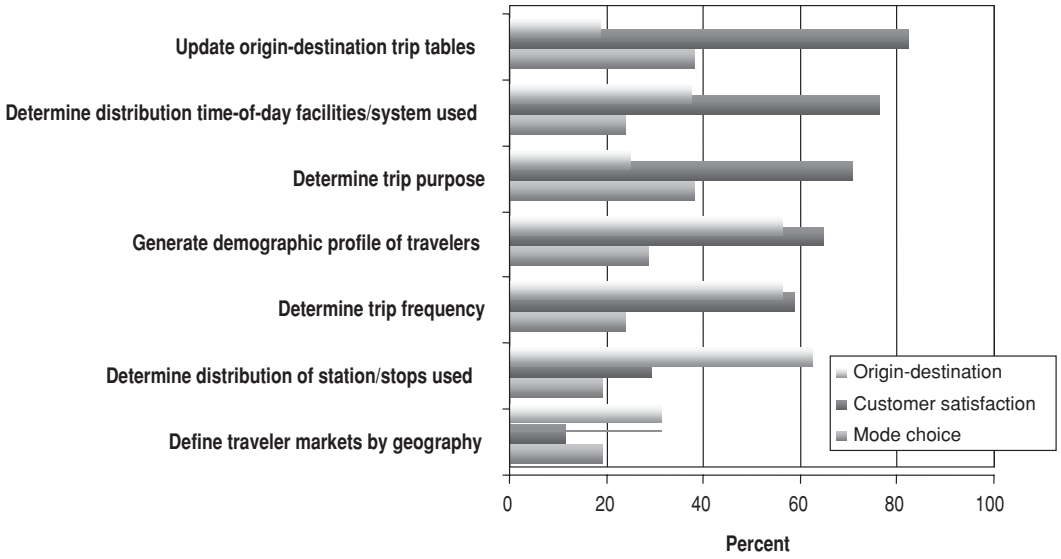



FIGURE 1 How research from origin–destination, customer satisfaction, and mode choice surveys are used (multiple responses allowed for this question; therefore, percentages for each purpose may be greater than 100%).

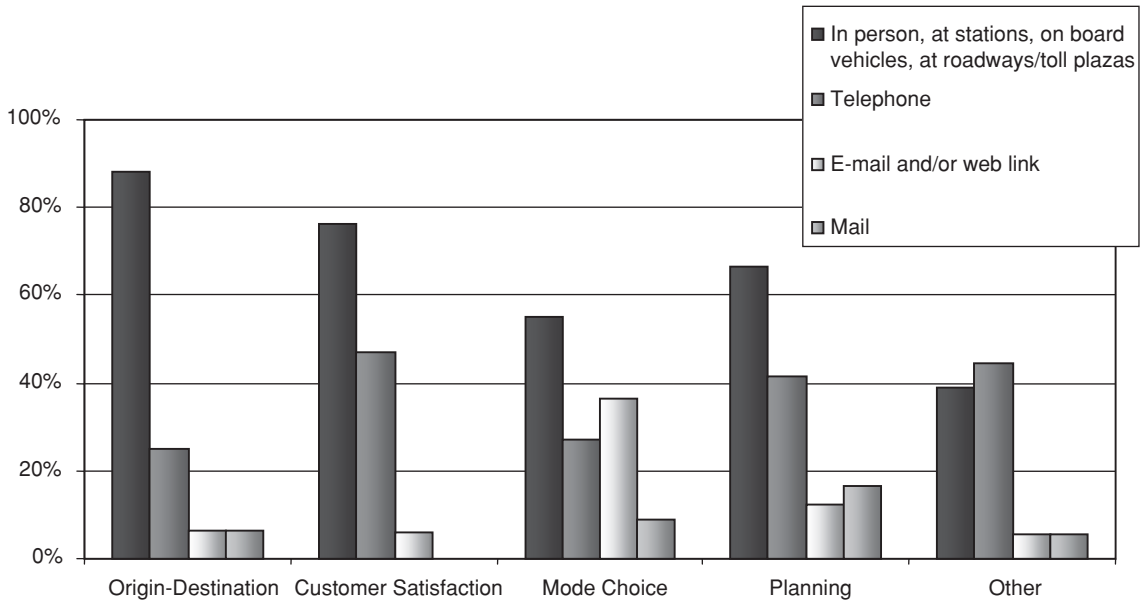



FIGURE 2 Recruitment methods.

Mode choice surveys had the highest percentage of researchers who indicated recruiting using e-mail and/or a web link (36%), with half of them using the e-mail/web link exclusively to recruit. Thirty percent of the mode choice surveys described by respondents were conducted over the web or had some component being conducted over the web.

Two-thirds of planning surveys used in-person recruiting by means of intercepts on board and/or at stations; 42% of respondents also combined this method with a telephone recruit; another 13% used e-mail and/or a web link. "Other" surveys were divided fairly evenly, with approximately 40% in person and somewhat more than 40% by telephone recruitment.

Sampling methods described by respondents varied primarily based on the type of survey being conducted (see Figure 3). Random sampling was used most often as the sampling method for all survey types; however, "total population" sampling, where all respondents in the sampling frame were given a survey, was also used between 10% and 30% of the time depending on the survey type.

Methods used for weighting of the data set varied by the type of study (see Figure 4). Origin–destination and customer satisfaction studies were most often weighted by ridership figures; 47% and 35%, respectively. "Other" weighting schemes mentioned included, "at the Day-Time-Route

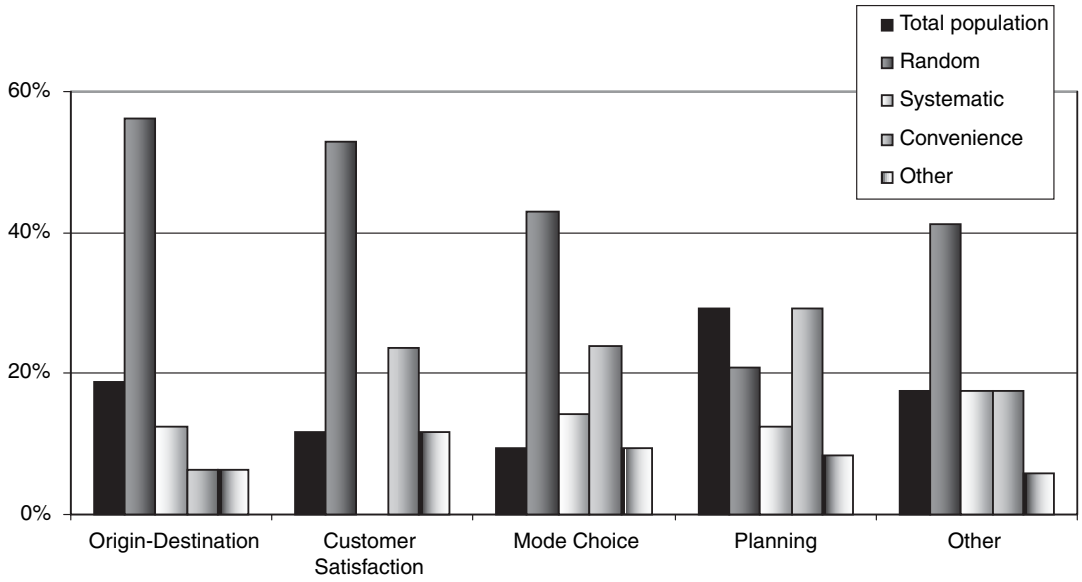



FIGURE 3 Sampling methods.

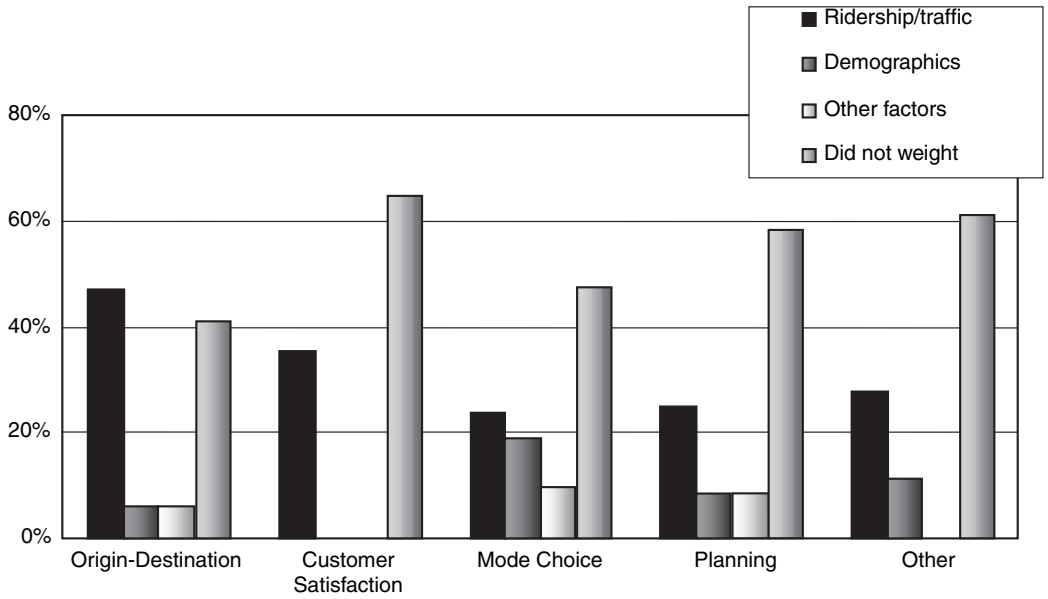



FIGURE 4 Weighting methods.

level—each survey was weighted and expanded based on the day of the week (i.e., weekday or weekend), time-of-day (a.m. peak, mid-day, p.m. peak, and evening) and route" as well as weighting "based upon the size (number of employees) of the employer." As seen here, many studies were not weighted at all, which can be a valid approach if the population is well represented and general behaviors are under consideration rather than specific representation of certain population characteristics.

Respondents were asked to evaluate the success of the surveys they are currently conducting, and 88% to 94% believed that they were either "very successful" or "successful." However, only 25% of those conducting origin–destination surveys believed that they were "very successful," whereas customer satisfaction, mode choice, planning, and other types of surveys received approximately 45% "very successful" responses (see Table 3).

Use of transit-related research is often unique to a study; however, 40% of all respondents noted that they present research results to their own internal clients or management (see Figure 5). Overall, 15% of results are presented to the general public, with customer satisfaction

TABLE 3
SUCCESS RATING BY SURVEY TYPE

| Survey Type | Very Successful | | Successful | | Neither | | Unsuccessful | |
|---|---|---|---|---|---|---|---|---|
| | Count | Percent | Count | Percent | Count | Percent | Count | Percent |
| Origin–destination | 4 | 25 | 11 | 69 | 1 | 6 | | |
| Customer satisfaction | 8 | 47 | 7 | 41 | | | 2 | 12 |
| Mode choice | 10 | 48 | 9 | 43 | 2 | 10 | | |
| Planning | 11 | 46 | 11 | 46 | 2 | 8 | | |
| Other | 7 | 41 | 9 | 53 | 1 | 6 | | |

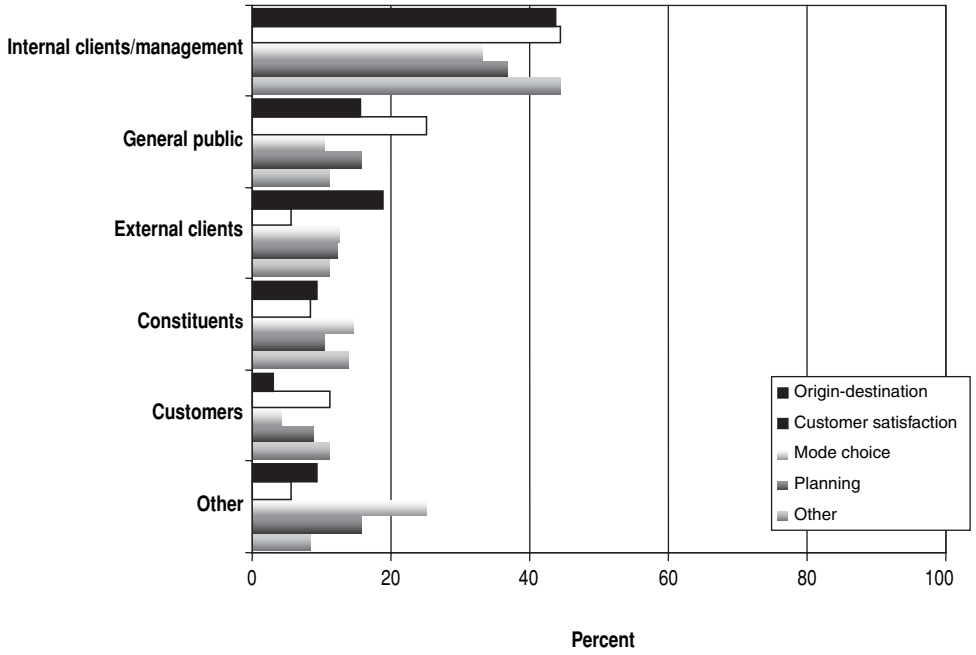



FIGURE 5 Where research results are presented.

results highest on this type of presentation at 25%, followed by 16% of planning studies and 16% of origin–destination studies.

Just under one-quarter of survey respondents reported that their organization conducts panel surveys, and of those who do, one-half are conducting longitudinal panel surveys. Panels are defined as studies that draw from an already collected sample source, which is called a panel. To conduct the study, the researcher samples the panel to obtain their responses to the research questions. A longitudinal panel is when the same people are surveyed over time about the same topic to see how they or their environment are changing, often using the same set of questions. For example, to track transit customer satisfaction, a researcher might track the same riders over time to see how their customer satisfaction is changing, either as a result of changes in the transit service (e.g., better on-time performance or higher fares) or to personal changes (e.g., a job change that caused a route change for the respondent).

Conducting panel studies can be effective and efficient for transit research because many transit agencies have contact information for their riders and therefore have the ability to conduct repeated research using that same sample population. Recontacting the same group of people in a longitudinal study allows a researcher to measure improvements over time and identify areas of concern that continue to need attention (*1*). Longitudinal panel studies allow more robust statistics, can better determine changes in behaviors, and can detect behavior trends over time because the research analyzes responses to the same questions from the same respondents at a different point in time (*2*).

Two case studies of web-based panel surveys used by transit providers are presented in chapter six of this report. Web-based panel surveys make conducting panel studies easier, because once contact is made and a respondent has become part of the panel it is very efficient to recontact them using automated e-mail routines (*2*).

It should also be noted that panel surveys have complex issues such as attrition of the sample (respondents who drop out over time) and the need to replenish the panel to ensure that new riders are continually added to the panel data set.

Without replenishment of the sample to include new riders, panel members over time would reflect only long-time users of the system. Therefore, every time the study goes out to survey, a sample of new or relatively new riders should be obtained so that the longitudinal panel reflects the ridership tenure for the transit system.

Attrition issues also need to be watched closely and addressed by longitudinal researchers, as respondents who drop out of a study may be different from those who remain in the study (a form of nonresponse bias). Therefore, it is important to ensure that any respondent attrition sample is replaced with others of similar characteristics (*3*). This additional replacement sample for the panel is typically conducted along with replenishment.

Owing to the issues of replenishment and attrition, missing values in the data set are common for longitudinal studies. Analyzing longitudinal data with missing values can be statistically complex (*3*). However, if enough of a sample is collected and an analysis of attrition does not show significant bias in attrition (e.g., attrition is found to be mostly random and not the result of a systematic effect) then it is possible to analyze the data with those records that are complete (*2*). The additional effort of conducting longitudinal panels, although significant at times, allows the transit researcher to gain significant insight and robustness for their study in comparison with cross-sectional studies (*3*). Furthermore, over time these studies may be less costly, because most of the sample work has already occurred and the survey instruments and analysis routines are already in place, providing researchers with the potential to have a more robust study with lower costs than if they were to conduct the study using more typical repeated cross-sectional sampling techniques.

Cross-sectional studies are defined as sampling a cross section of the population at a given time. Often, repeated cross-sectional sampling of customers is undertaken, where the same survey is used with a new cross-sectional sample each time (*2*). This method is much more common than longitudinal panels, with 63% of synthesis respondents indicating that they conduct repeated cross-sectional studies. Although differences in satisfaction scores are detected using repeated cross-sectional studies, the measurement of the difference may be confounded owing to differences within the sample itself, because of demographic differences or some other nonquantifiable difference between individuals. Cross-sectional studies require a larger sample than longitudinal studies to measure changes over time.

## AREAS WHERE WEB-BASED SURVEY TECHNIQUES ARE MOST EFFECTIVE

### Web-Based Technology's Effect on Survey Design

Reasons cited for using web-based surveys in the synthesis survey were "the ability to present complicated subject matter, question design, and graphics." The experience of the synthesis team shows that web-based surveys can be useful in different ways depending on the type of study they will support: origin–destination, customer satisfaction, mode choice, planning, or other. These various types of surveys will be discussed in the following subsections and specific examples will be cited from project experience to underscore the ways in which using web-based technology can benefit survey design.

### Origin–Destination Surveys

Origin–destination surveys can be well served by web-based technology, because when respondents are asked to describe their locations they can be instantly geocoded online to a latitude and longitude, making for substantial cost savings compared with other survey methods (e.g., Resource Systems Group: New York MTA Bridges & Tunnels Origin–Destination Study 2004; NY State Thruway Authority Westchester, Rockland, & Orange County Travel Study 2003; and Florida's Turnpike Origin–Destination Study 2003). Two-thirds of respondents to this synthesis survey who are currently using web-based technology mentioned that they have collected geographical data by means of the web, coded by latitude and longitude, and the other one-third noted that they have collected data coded by zip code. Online geocoding is a very difficult technical aspect of web-based surveys and is discussed further in chapters four and five. Clean geocoded data can be used in geographic information system software to analyze and present information that is often very important to transit research, such as the commuter shed of a station or the number of origins on the system within each zone.

In recent years, geocoding survey and analysis tools have been used successfully in several major transit markets on a variety of projects. An example is the Metropolitan Transportation Authority–New York City Transit's (MTA NYC) JFK Airport–Lower Manhattan 2005 study in which survey respondents were asked to provide origin and destination information using one of three search methods in the geographic information system component of the survey: by selecting a location on a map, by entering a specific address, or by entering a nearby intersection. By clicking on the mapping option, the respondent is shown a map of the local area and simply clicks on the area of his or her location to indicate where the trip began or ended (see Figure 6). The map zooms in one or two times, enabling the respondent to select an exact location that is instantly assigned a latitude and longitude in the project database. This option enables the respondent to indicate the location relatively easily and allows researchers to screen the response (i.e., the geocode must reside within the study area or the respondent will be screened out of the survey). The system automatically geocodes the location in real time, thereby avoiding the need to geocode later,

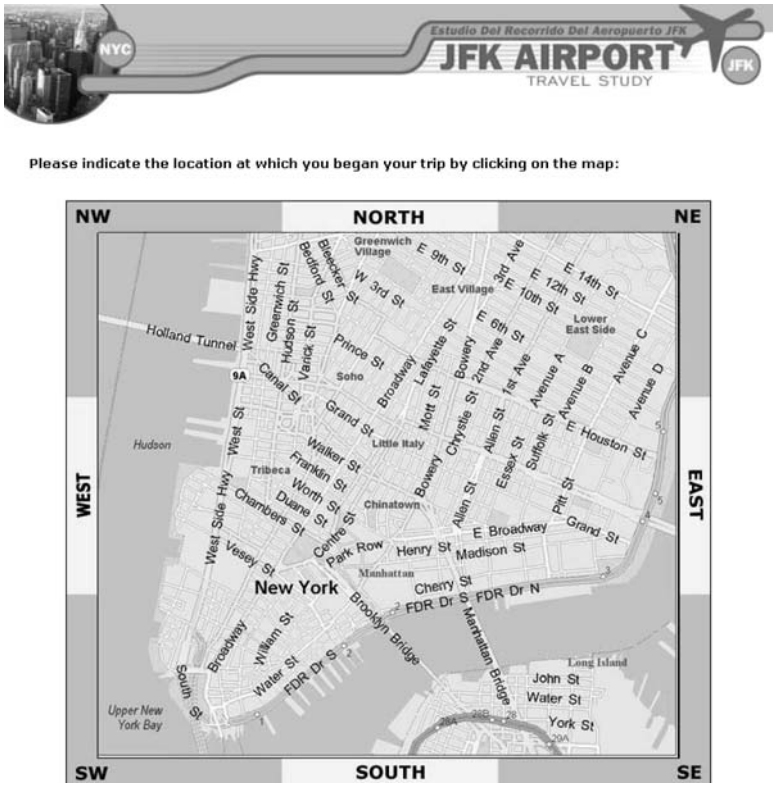



FIGURE 6 Screen shot of geocoding technique on the JFK Airport–Lower Manhattan 2005 study.

which is frequently based on erroneous word descriptions of geographical data.

Another way origin–destination surveys can be enhanced for data validation is by using web-based technology to show maps of transit systems and linking them directly with the schedules of specific lines and stations. An example of this can be seen in a series of screen shots captured from NJ TRANSIT's 2003 Rail ePanel study. In this survey the respondent was first asked which commuter rail line they used (see Figure 7).

Once a specific line was selected (color coded to match NJ TRANSIT's schedules), the respondent was directed to a page showing only the stations on that rail line (see Figure 8). Each rail line's train schedule has been processed into a database with exact times and stations, for weekdays and weekends, for the entire system. When the respondent chose his particular station, the schedule data that was linked to the survey offered the respondent only actual train times and train numbers available (Figure 9). Offering correct available train times and numbers is one example of how web-based technology can help improve data quality and, in this case, decrease item nonresponse in surveys. A discussion of item nonresponse follows in chapter four: Item Nonresponse in Web-Based Surveys. Problems resulting from guessing and/or faulty memory on the part of the respondent are therefore mitigated, resulting in clean data for the planners at NJ TRANSIT.

#### Mode Choice Surveys

A mode choice study can be difficult to do using paper-based survey methods, particularly for stated preference surveys. Mode choice can be evaluated much more efficiently using computer-based technology because customized branching can obtain a clearer picture of each distinct respondent's choices based on his mode path; and then realistic alternative scenarios can be constructed to understand the respondent's behaviors to variables such as time, cost, and comfort. As will be discussed in chapter four, offering the survey by means of the Internet can increase response rates over the survey offered only to those respondents who can be recruited in person. One respondent stated that a web-based survey can be "an easy tool for the end user and our staff to gather data on work trips for employees at large employers in the county."

#### Planning and Other Surveys

Respondents indicated that for planning surveys, web-based surveys are beneficial "as a way to gather public input on our planning studies, in addition to holding public meetings which are usually poorly attended." The ability to quickly and easily reach out to the public, provided agencies have a satisfactory list of e-mails and/or a well-publicized website, is another benefit to using web-based surveys.


FIGURE 7 Screen shot requesting commuter rail line from NJ TRANSIT's Rail ePanel survey.


FIGURE 8 Screen shot to select boarding station of chosen rail line from NJ TRANSIT's Rail ePanel survey.

A variety of uses for "other" surveys were also noted in the synthesis survey. One agency researcher described an interactive map study that had been conducted where they needed to "solicit customer feedback on their experiences with the interactive map" on their trip planning section of their website. Using a web-based survey, they were able to "determine if there are any fatal flaws that need immediate attention." This particular study is detailed as a case study in chapter six. Another "other" type of survey mentioned by a respondent was a household travel survey, and this type of survey can benefit greatly by being conducted online. First, respondents have a difficult time remembering all of their daily trips for an assigned travel day. With web-based technology, respondents can be prompted to include all trips by simplifying data entry. Depending on what the respondent describes for activities and/or purposes, they can be shown

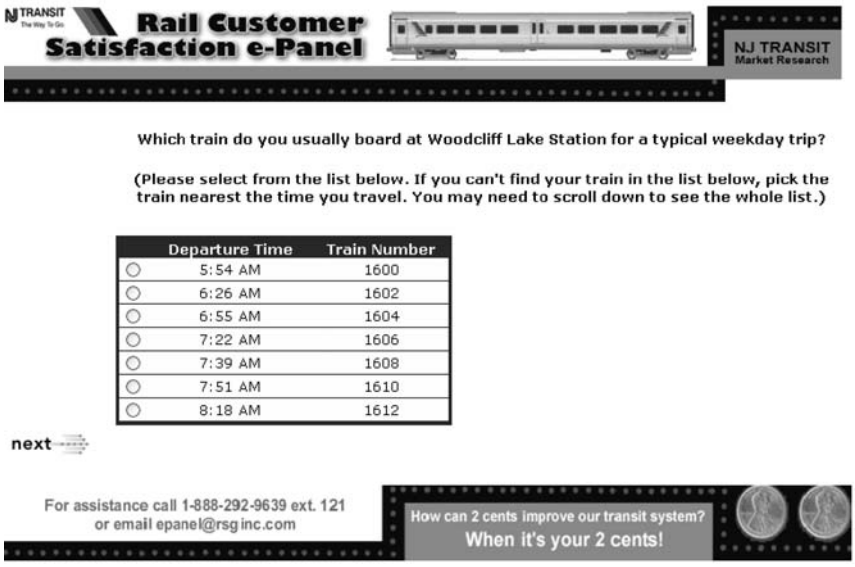



FIGURE 9 Schedule page from NJ TRANSIT's Rail ePanel survey.

customized screens and drop-down boxes on those screens. For example, if a respondent starts out a trip from home to work by walking, he or she can be shown a drop-down box with a variety of choices for the second mode on their trip to work (see Figure 10).

The respondent can be prompted to enter all trips for the survey day, and can be shown various trip purposes for each trip in drop-down boxes. In the example shown here, the respondent went to work at his construction site, then went out for lunch with five friends. Each trip requires a start and an end

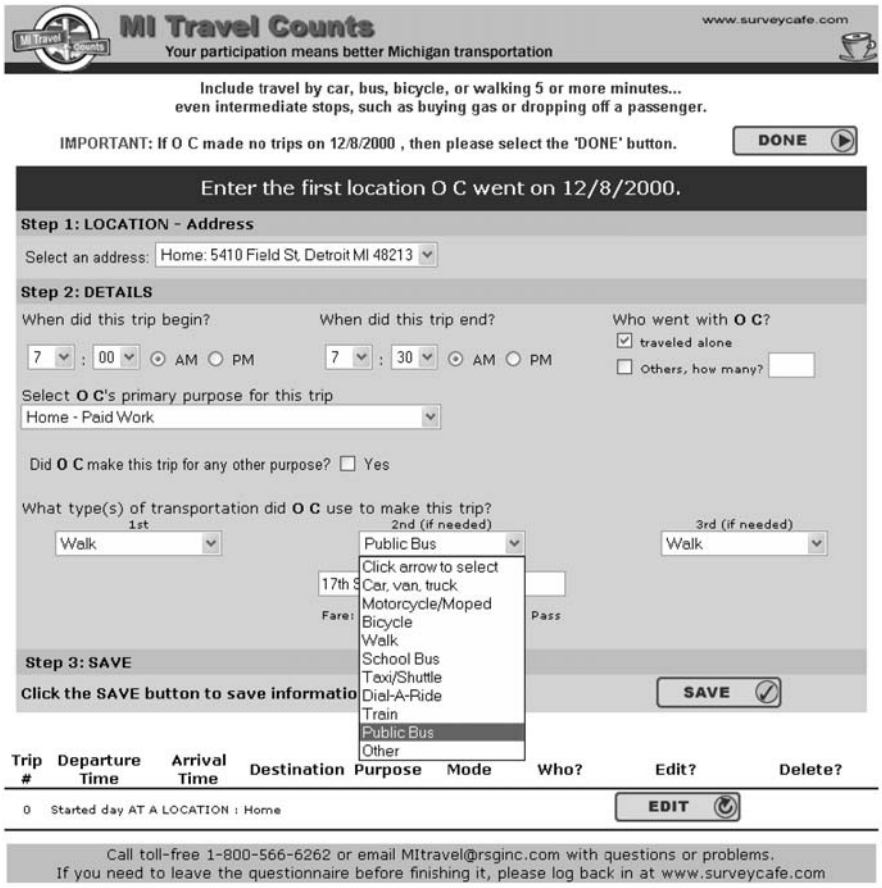



FIGURE 10 MI Travel Counts (Michigan DOT) activity input page.

time, and these times are validated such that no trip can have overlapping times with any other trip (see Figure 11). The data set for a study such as this will be clean and validated, saving on agency costs for data entry and data cleaning.

As a respondent enters each new trip made throughout the course of the day, the details of the validated trips can be shown at the bottom of the page (see Figure 12). This makes for an easy reference, and the respondent can easily check to confirm that every trip made has been entered and that all the times are correct. Again, this technology ensures complete and validated data.

As with many transit and transportation surveys, household travel diaries require the geocoding of trip start and end locations and web-based technology can provide major benefits in this aspect of the survey:

- As mentioned previously, online surveys can offer a respondent several ways to input an address: by entering the specific address, by entering a nearby intersection, or by offering an interactive map to search.
- Online surveys can "remember" all addresses input by a respondent and easily offer that address, if it comes up again, which then only needs to be checked, not rewritten.

## METHODS BEING EMPLOYED FOR WEB-BASED SURVEYS

### Survey Design, Hosting, and Invitations

Approximately half of respondents using web-based surveys have contracted with an outside consulting or web development firm to design and host their surveys (see Figure 13). SurveyMonkey and SurveyTracker were the two software applications identified by those who used an online survey development tool to create their surveys. These were the applications identified during the survey process and are not an endorsement of specific products and services.

Web-based survey invitations are frequently sent by e-mail to potential respondents. However, one serious and frequent downside to e-mail is the tendency for mass e-mail to be rerouted by spam filters meant to capture unsolicited junk e-mail. Several solutions to the problem do exist, including these two cited by survey respondents: using e-mail lists containing existing customers from transit agencies and/or using third-party bulk-e-mailer reputation monitoring tools. Third-party monitoring tools will automatically notify a sender if they have been placed on a filtered list and are not having e-mail delivered at the Internet service provider (ISP) level. In using lists provided by transit agencies, the sender would

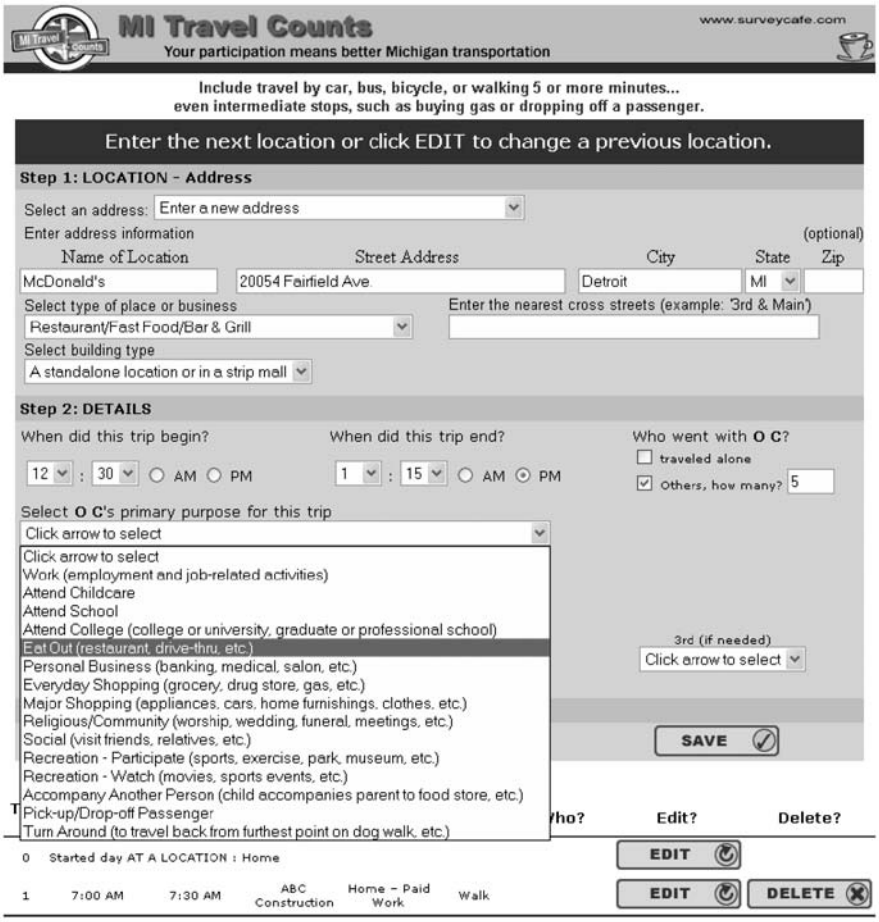



FIGURE 11 MI Travel Counts (Michigan DOT) trip details page.

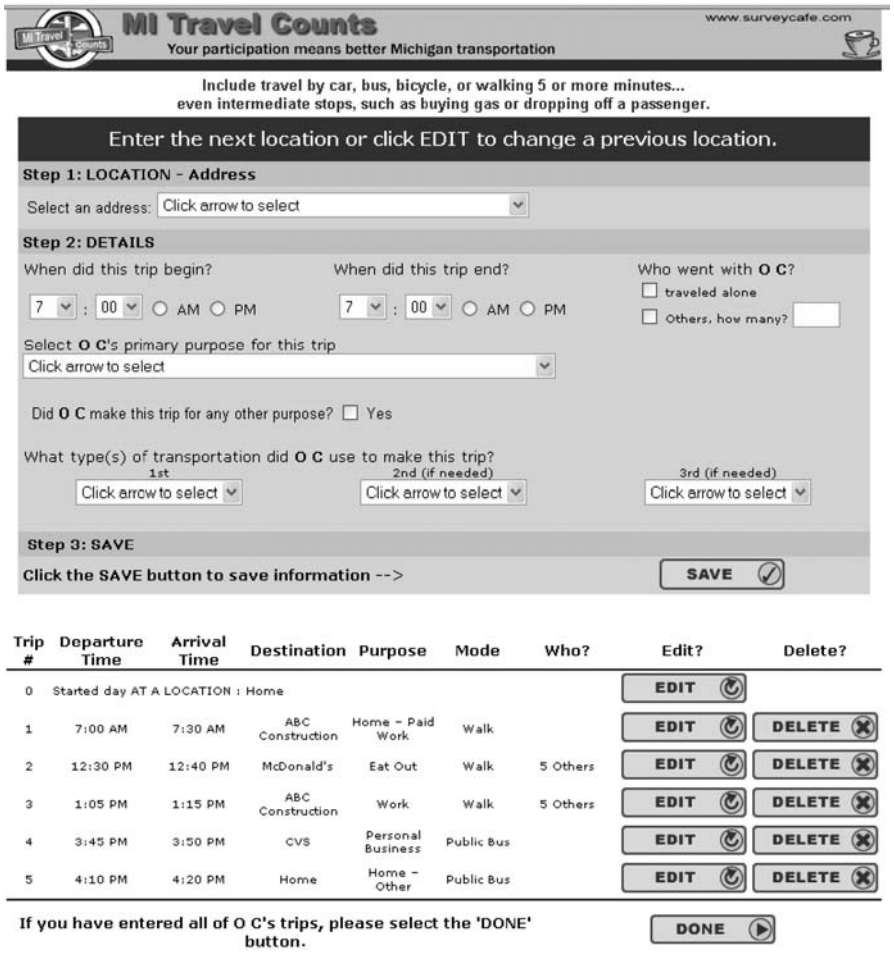



FIGURE 12 MI Travel Counts (Michigan DOT) trip rostering page.

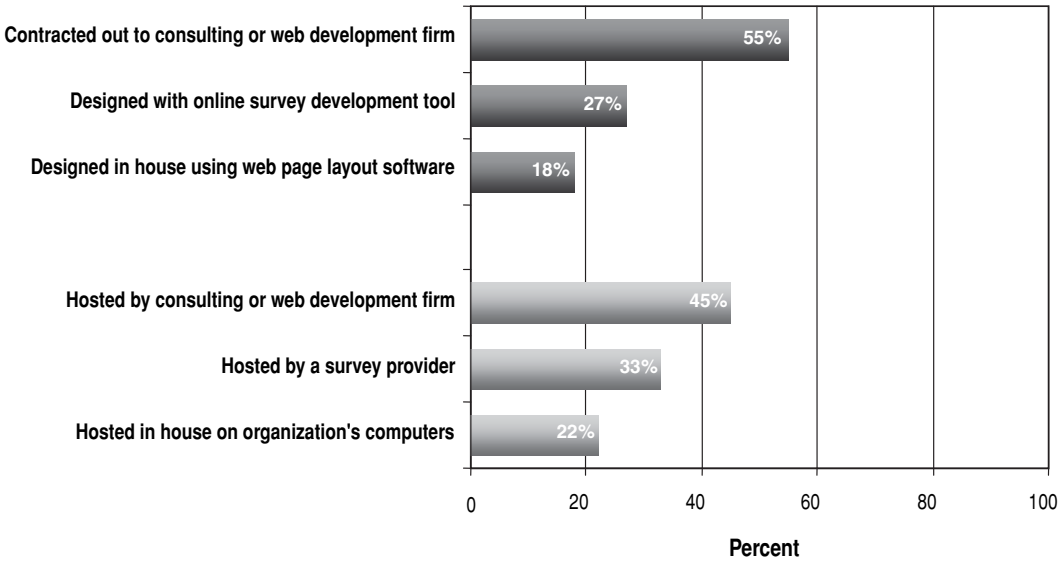



FIGURE 13 Survey design methods.

hope that the e-mail recipients recognize the subject and content of the e-mail and have expressly permitted mail regarding that agency. Other tools to increase e-mail delivery include hosted e-mail solutions, in which a third party sends the e-mail; sender authentication; and software tools to identify words, phrases, and common e-mail structures that often trigger spam filters. These solutions are discussed further in chapter four.

Three-quarters of respondents using e-mail invitations also noted that they send e-mail reminders to those who do not respond within a certain time frame and indicated providing an average of two reminders. Other means to remind respondents were by telephone or mail.

### Survey Administration

As mentioned previously, 39% of researchers described one of their most recent surveys as a web-based survey for this synthesis. Of those web-based surveys, approximately one-third were exclusively web-based, with two-thirds using a "multi-method" administration, combining the web-based portion with either paper, telephone, or a personal interview (see Table 4).

Reasons given for doing a multi-method survey included reaching a larger sample "to cover all target audiences," maximizing response rate by making the survey more easily available by ". . . giving people who are in a hurry an alternative to taking time on the spot," and getting more in-depth details following a broad survey ". . . later in the year a telephone survey is done with a smaller sample and fewer questions." One researcher noted, "We use the online survey because it is so easy to disseminate and no data entry is required. We use paper because some employers . . . have large populations of employees without access to computers."

To facilitate the response to web-based surveys, researchers reported that they provided several means of support for respondents including a toll-free contact number for questions, e-mail support, a link on the survey website to frequently asked questions, and/or links with context-specific help on the web page.

TABLE 4
WEB-BASED SURVEY ADMINISTRATION COMBINATIONS

| Administration Type | Percent |
|---|---|
| Online web survey | 36 |
| Online web survey, paper | 29 |
| Online web survey, telephone, paper | 21 |
| Online web survey, telephone, paper, computer-based, personal interview | 14 |
| Total | 100 |

Researchers also pointed out that they are not using web-based surveys across the board, but are using such surveys for smaller, more focused studies. "The online web survey was a different type of planning survey. It was focused on planning for a new regional transit ticket. The paper survey is our basic planning survey." One respondent noted that they were conducting web-based surveys on a limited basis "as they relate to marketing promotions," whereas another cited such a web-based survey "to university and college students."

Signs indicating increased web-based survey use coming in the near future are linked to increased access to e-mail and the Internet. One respondent noted that, "We are waiting for our customer base of smart card users to grow . . . and give an e-mail address. Then we will have the opportunity to e-mail them a survey, but we need to create the questionnaire online . . ."

### Data Quality and Validation in Web-Based Surveys

In addition to being more convenient for many respondents to access, researchers appreciate web-based surveys for their high-quality data with online validation, consistency, and geocoding. Researchers also believe that a technical benefit of web-based surveys is the ability to link between tables in databases to prevent incorrect entries, as in the NJ TRANSIT example connecting train numbers and train times. Another technical benefit mentioned was, "The ability to ask questions and evaluate concepts that may be too complicated to present on the phone." On the individual response level, web-based technology yields "superior data quality" and allows collection of "customer comments that are more unbiased than from other survey methods." Moreover, researchers felt "respondents give more honest answers" because of the anonymity of completing surveys over the Internet and that they obtain "more complete answers" to questions because of the ease of entering comments and not being rushed in their response. In sum, those using web-based surveys are generally satisfied with the quality of their resulting data sets (see Figure 14).

### Concerns About Web-Based Survey Use

As discussed before, sample bias is the primary concern of both those currently using and those currently not using web-based surveys. Two-thirds of respondents not currently using web-based surveys mentioned that they are concerned with their inability to completely reach their target market and with the resulting sample bias owing to a lack of Internet access by transit users; "[we] are skeptical about assuming [web-based] results will reflect our riders."

Respondents also expressed concern that the sample for web-based surveys might be viewed as "self-selected" and

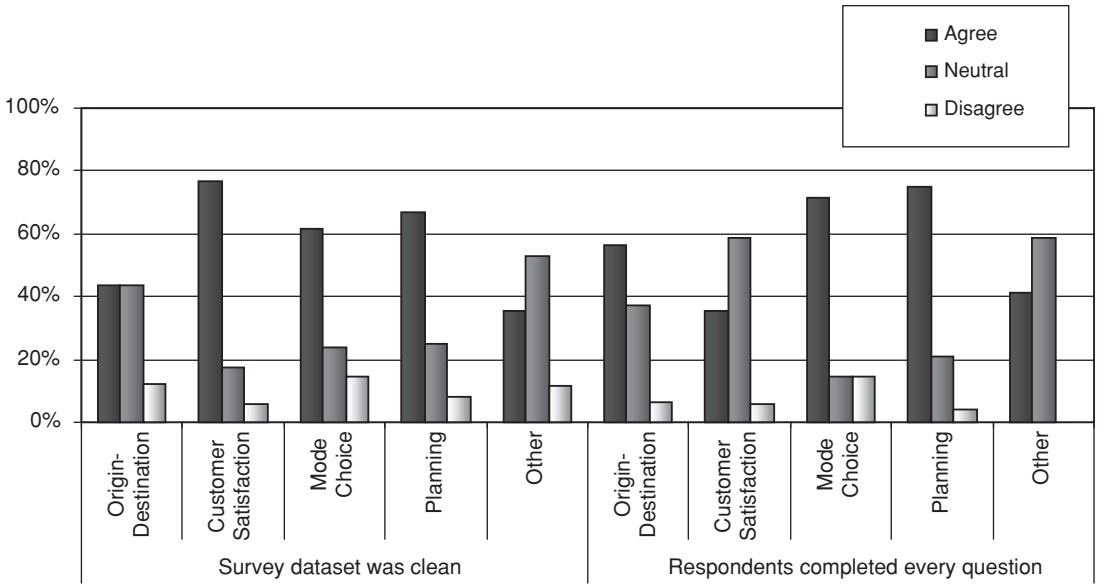



FIGURE 14 Data set results from web-based surveys.

worried about their inability to guarantee "one survey complete per person." One researcher noted that their "organization feels that web-based response will *bias* the results because of differences in demographic characteristics of those *with* and *without* Internet access." The next most important concern, given by one-quarter of respondents, was the lack of in-house expertise in web-based survey technology or inadequate funds to enable them to develop their capabilities in the area. Several researchers expressed the reality that their organizations "are slow to change" as far as their current ways of conducting research. Approximately 10% of respondents said that they had no need for conducting web-based surveys because they are looking only for on-board users of their transit systems and are therefore able to conduct their surveys on board their trains, buses, etc. A few respondents reported that they were just beginning to try out this method or would be in the next few years. Despite these concerns, 70% of those not currently conducting web-based surveys said that they are likely to begin within the next two years.

CHAPTER FOUR

# WEB-BASED SURVEY METHODOLOGIES AND SUCCESSFUL PRACTICES

This chapter first discusses successful techniques for and issues related to design and formatting of web-based surveys. Next, it compares the strengths and limitations of other survey methods with the strengths and limitations particular to web-based surveys, so that the transit researcher can evaluate whether and how to best conduct a web-based survey. It then describes ways to handle survey errors in web-based transit surveys, which include coverage error (which occurs when a portion of respondent population is not reached), unit nonresponse error (when there are significant differences in results owing to over- or underrepresentation of groups within the sampling frame), and item nonresponse error (which occurs when respondents skip questions or fail to complete a questionnaire). Finally, the chapter describes successful practices and challenges faced when incorporating web-based surveys into transit research. This includes discussion of the advanced capabilities of web-based surveys, particularly those that improve the data and information necessary for transit research.

## QUESTIONNAIRE DESIGN AND FORMATTING

There is no single way to design and format a questionnaire. As with good books that can be written using different styles, formats, and methods, so can questionnaires. If the questionnaire is well-constructed and clear, it will be an effective survey instrument that encourages potential respondents to participate in the study. That said, there are some fundamental principles and techniques that questionnaire writers should understand and be familiar with. These techniques are different from questionnaires that use paper, the telephone, or other media, and are presented in this section to help the transit researcher understand what issues need to be addressed to create an effective web-based questionnaire.

The individual who has conducted some of the most significant research into what is considered good questionnaire design and formatting for web-based surveys is Dr. Donald Dillman. In this section, we will review the guidelines that Dillman has outlined as to what constitutes good questionnaire formatting and design for web-based surveys as described in his book *Mail and Internet Surveys: The Tailored Design Method* (*1*). For each guideline, an example will be provided when appropriate, and commentary on various experiences implementing web-based surveys will also be provided. Not all guidelines by Dillman are always adhered to exactly by experienced web survey researchers, and any reasons for diverting from his suggestions will be discussed as well. Some of Dillman's most important guidelines are:

- Use a welcome screen that is motivational, emphasizes the ease of responding, and that instructs users how to proceed.

An example of this technique was employed in the survey for this synthesis (see Figure 15). Research team experience on many web-based surveys suggests that this is an important aspect of a questionnaire and a good way to ease respondents into the survey instrument. Graphics and graphic design that are interesting, eye catching, and relevant to the topic matter give the respondent the impression that the questionnaire is legitimate and worth taking.

- Use a password or personal identification number to restrict access to the survey.

This technique is important to control access to the survey and ensure one person/one response. This technique was used in this synthesis survey. One effective way to make password protection easy for respondents is to embed the password into the link to the survey in the invitation e-mail as was done for this survey. By using this embedding technique, respondents do not have to type any password or code into a password screen and are taken directly to the welcome screen.

- Present an initial question that is interesting and easy for respondent to answer and that does not require any scrolling.

As seen in Figure 16, the first question of the synthesis survey was easy for respondents to answer, because it was asking for what type of organization they work. Often respondents find talking about themselves and what they do interesting. In addition, the question is short enough where it does not, for typical screen resolutions, require scrolling.

- Present each question in a conventional format that is similar to paper-based self-administered questionnaires.

Dillman recommends treating a web-based questionnaire like a paper-based questionnaire, where there are many

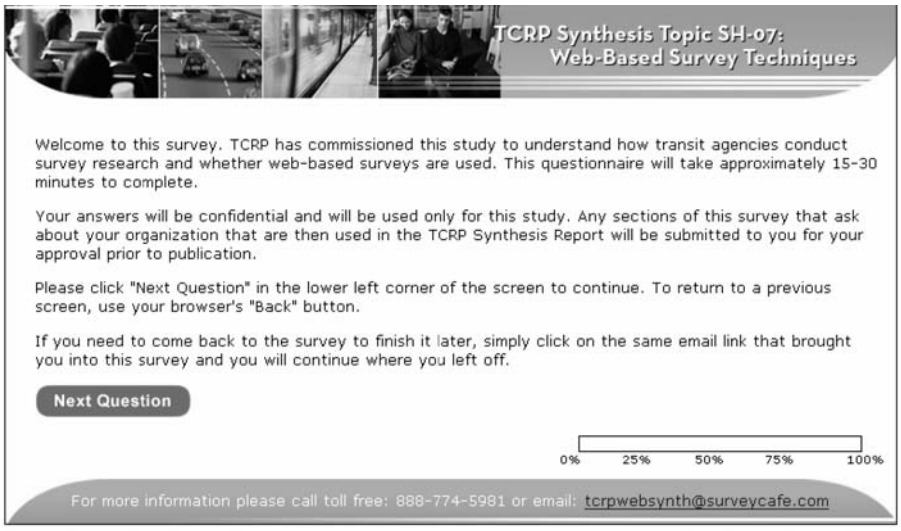



FIGURE 15 Welcome screen for this synthesis survey (Topic SH-07).

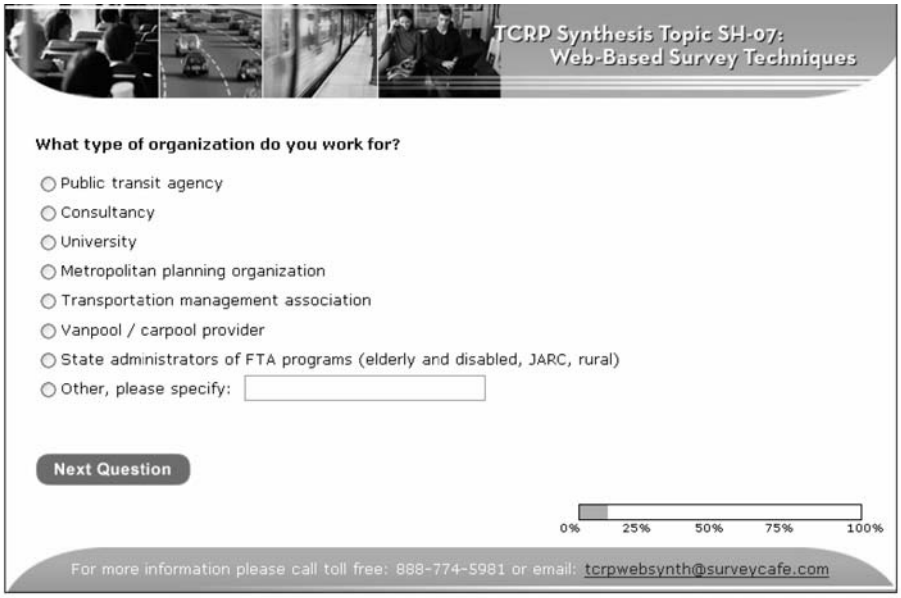



FIGURE 16 First question of this synthesis survey (Topic SH-07).

questions on each page and where branching is done explicitly by telling the respondent what question to go to next. (Dillman suggests that the web survey provide a hyperlink; however, the respondent must still actively click on it to link with branch.)

However, the technique employed by the research team for its surveys that has been found successful is using one question per screen, which keeps it simple for the respondent, as there is only one question, and it also means that scrolling is reduced or eliminated altogether. When the respondent clicks "next," all branching is done automatically using this technique. This technique runs somewhat contrary to Dillman's recommendation to treat a web-based questionnaire like a paper-based questionnaire; however, the research team's experience suggests that web surveys work better by making the branching seamless so that the respondent does not even notice it. This is accomplished effectively by using the one-question-per-page method and programming any required branching logic in the underlying web-based survey code.

Dillman also recommends numbering questions so that the respondent understands where the question begins and where it ends. The research team did not do this because the often complex branching employed in questionnaires can make it difficult to know what the exact number of the question is for any respondent and because the one-question-per-page method makes numbering unnecessary. However, as seen in Figures 15 and 16, employing a status bar (also suggested by Dillman), which is heuristic and not precise for complex surveys, gives the respondent an idea of how much

of the questionnaire remains. Experience with the status bar has proven to be mixed; with some respondents appreciating it and others finding it distracting and not particularly informative owing to its heuristic properties. Based on the research team's experience, the status bar does not do harm per se; however, it does require significant programming effort for what appears to be little gain for respondents and the response rate.

- Restrain the use of color so that readability is maintained, navigational flow is unimpeded, and measurement properties of questions are maintained.

The basic point of this guideline is to ensure that colors are only used for the purpose of making questions clearer and do *not* affect the way a question might be interpreted (e.g., a satisfaction scale using colors, which might cause measurement bias). Web-based questionnaires make it easy to add color and other formatting techniques that are more difficult when using paper instruments. Before implementing such additions, the researcher is advised to be sure that the color *improves* the clarity of the situation and does not make things worse.

- Avoid differences in the visual appearance of questions that result from different screen configurations, operating systems, browsers, etc.

This guideline is very important and is a continual challenge for researchers conducting web-based surveys. There are some techniques and trends that are improving these issues, including:

  - Using the technique of relative (proportional) HTML table sizing instead of absolute sizing. This technique can significantly help with the issue of different screen resolution settings.
  - Although there are more browsers than ever before, most will read proper HTML code correctly in any operating system, particularly if they are the equivalent of Microsoft Internet Explorer Version 5 (introduced in 1999) browsers or newer. Based on the research team's experience, almost all respondents to web-based surveys have browsers that are equivalent or newer.
  - Automatic updates are now standard on all browsers, primarily for security purposes. This means that Internet users are more likely than just a few years ago to have browsers that are current with the latest technologies.
  - Monitors, in general, are getting larger and cheaper. Many more respondents have monitors that are now large enough to support higher resolutions and provide more screen space.

These points are not to suggest that web survey designers should assume that most respondents have browsers with all the latest features. However, somewhere a line must be drawn as to the browser version that a web questionnaire will support. Recent experience suggests supporting browsers equivalent to Microsoft Internet Explorer Version 5 or later (browsers that are seven years old) is sufficient to capture the vast majority of Internet users.

- Do not require respondents to provide an answer to each question before being allowed to answer any subsequent ones.

The difficulties in resolving item nonresponse are examined later in this chapter. However, item nonresponse in web-based surveys is a very important aspect to web survey design. If respondents are not permitted to skip questions, survey "drop out" rates can be very high. Conversely, if respondents are allowed to skip questions, missing data from item nonresponse is an issue. These tradeoffs are discussed in greater depth later in this chapter and must be considered by all web-based researchers.

Besides these important guidelines from Dillman, there are a few other design and formatting issues about web-based questionnaires worth mentioning. One has been alluded to earlier; cascading style sheets (CSS). CSS is a power tool that disassociates the content of the questionnaire from its formatting. This allows the researcher to focus on two important issues separately: first, designing the survey content, and second, being able to format that content easily later using CSS techniques. Examples of how CSS can take the same content and format it very differently are shown effectively at the following link: http://www.csszengarden.com/.

Finally, it is important to note that web-based surveys can provide access to people with disabilities. By using screen readers and other devices, those who are deaf, blind, and otherwise disabled can access surveys that they could not previously using other survey media. However, to allow these devices to work correctly, the web designer must ensure that the web-based survey follows the Section 508 guidelines of the Rehabilitation Act requiring federal agencies to make their electronic and information technology accessible to those with disabilities. Among many other things, Section 508 guidelines include requirements such as putting text tags on images. One advantage of using CSS is that it can make the process of complying with 508 guidelines significantly easier for the web survey designer.

### COVERAGE AND UNIT NONRESPONSE ERROR AMONG DIFFERENT SURVEY TYPES

Although this synthesis report is focused on web-based surveys, it is important for transit researchers to understand when it makes the most sense to incorporate a web-based survey into their research. In making this decision, an understanding of the strengths and limitations of different survey

TABLE 5
STRENGTHS AND LIMITATIONS OF DIFFERENT SURVEY TYPES

| Considerations | Survey Methods: | Online Web | CATI (Computer-assisted telephone interview) | Computer-Based Surveys, Not Online | Paper-Based, via Hand or Mail-out | In-Person Interviews |
|---|---|---|---|---|---|---|
| **Coverage Rate of Population** | | | | | | |
| | 97.6% [U.S. population (Census)] | | x | | | |
| | 72% (Pew Internet & American Life Project) | x | | | | |
| | Not applicable | | | x | x | x |
| | | | | | | |
| **Strengths** | | | | | | |
| Coverage | Wide coverage of most U.S. adults | (growing) | x | | | |
| | | | | | | |
| Administration | Self-administered, giving user flexibility for when they respond | x | | x | x | |
| | Administered via an operator interview with the ability to guide respondents through the questionnaire | | x | | | |
| | Administered via interviewer with ability to guide respondent through questionnaire; therefore, low respondent burden | | | | | x |
| | Inexpensive and easy to contact respondents when an e-mail address is known | x | | | | |
| | With interceptor staff present on site, immediate survey or technological help is available | | | x | | x |
| | | | | | | |
| | Low nonresponse error because respondent "can't say no" in person | | | | | x |
| | | | | | | |
| Survey design | Ability to provide interactive content like maps, customized screens, etc. (not possible with non-web-based survey methods) | x | | x | | |
| | Allows complex questions to be asked while keeping the survey simple for the respondent | x | | x | | |
| | Multi-method and validated geocoding<br>Error checking | x<br>x | <br>x | x<br>x | | |
| Sampling | Allows for targeted sampling of a population | x | x | x | x | x |
| | "Captive audience" with face-to-face contact | | | | x | x |
| | | | | | | |
| Data collection | Centralized data collection | x | x | | | |
| | Respondent keys data | x | | x | | |
| | Interviewer collects data: therefore, low respondent burden | | | | | x |
| | | | | | | |
| Technology | Technology is provided for the respondent | | | x | | |
| | Technology (paper/speech) is universal and built into the survey instrument | | | | x | x |

*(continued on next page)*

methods is necessary. Table 5 describes the strengths and limitations regarding coverage, costs, survey design, unit nonresponse errors, language requirements, sampling restrictions, and ease of administration of the following survey methods: web-based surveys, CATI (computer-assisted telephone interviews) surveys, paper-based surveys, computer-based surveys (not online), and in-person interview surveys. By considering the strengths and limitations of each survey type, the transit researcher can develop an understanding of each method and how best to utilize them in their research context.

As shown in this table, there are strengths and weaknesses inherent in every survey method. For example, it is still the case (although this is changing rapidly) that telephone surveys can reach a larger portion of households than web-based surveys. This is clearly a strength of the telephone survey method. However, although the coverage error is lower in telephone surveys, unit nonresponse error is large and growing, because a large percentage of telephone customers screen their calls (*1,4,5*). In urban areas, the number of mobile-phone-only households is increasing at a significant rate, and currently researchers are by law not permitted to call these households for the purpose of administering CATI surveys, because the recipient of the call will be charged for the call. Even if this barrier is overcome, mobile phone numbers are not geographically representative the way households with landline phones are. If mobile phone numbers are eventually allowed to be called using CATI techniques, geographical representation will still be a major issue.

For any study, the researcher must review all sources of error and not dwell solely on one type. For example, it is

TABLE 5
STRENGTHS AND LIMITATIONS OF DIFFERENT SURVEY TYPES (*continued*)

| Considerations | Survey Methods: | Online Web | CATI (Computer-assisted telephone interview) | Computer-Based Surveys, Not Online | Paper-Based, via Hand or Mail-out | In-Person Interviews |
|---|---|---|---|---|---|---|
| **Limitations** | | | | | | |
| Coverage | While improving, coverage issues are still a problem | x | | | | |
| | Limited ways to randomly sample a known geographic area | x | | | | |
| | Coverage error is a problem among very low income populations and is a growing issue for other populations (often in urban transit environments such as major metropolitan areas) due to "mobile-phone-only" households who make up an increasing share of the U.S. households. This issue is particularly concentrated among young and mobile people, causing coverage issues that are becoming significant as households drop their land lines. Mobile phone lines are not included in CATI sampling frames. | | x | | | |
| | Only allows for a targeted segment of the population and cannot be used for wide, random geographic sampling | x | | x | | x |
| | | | | | | |
| Administration | Delivery to respondent not as efficient as electronic delivery | | x | x | x | x |
| | Requires computer proficiency | x | | x | | |
| | Respondent must have the time to respond at time of contact | | x | x | | x |
| | | | | | | |
| Language | Requires literacy | x | | x | x | |
| | Those without computer literacy are less likely to respond | x | | x | | |
| | Spoken language/native tongue issues can be problematic | | x | | | x |
| | | | | | | |
| Nonresponse Error | Nonresponse issues due to spam filters and the abundance of spam messages that do not get filtered, causing potential respondents to ignore many e-mail messages | x | | | | |
| | Call screening is a significant non-response issue that may systematically exclude various subpopulations | | x | | | |
| | | | | | | |
| Data | Data quality can be low due to the inability to validate user input | | | | x | |
| | Requires that data be coded again into digital form, adding further input cost and error | | | | x | x |
| | Static format limits the types of questions that can be asked. | | | | x | x |
| | | | | | | |
| **Costs** | | | | | | |
| | Range from low to high depending on the complexity of the survey and the method of recruitment. Costs can be very low for recurring surveys, as the marginal costs of re-contacting a respondent are extremely low. | x | | | | |
| | Range from low to high cost depending on the extent of the sampling frame. Costs can be particularly high when contacting potential respondents multiple times through reminders and pre-survey instruments to try and encourage response. | | | | x | |
| | Typically expensive due to the high cost of reaching respondents and because it uses an interviewer to administer the survey. | | x | | | |
| | Typically expensive, as requires on-site staff | | | x | | x |
| | | | | | | |

clear that the synthesis survey found that coverage error was a major concern on web-based surveys. However, also consider that web-based surveys appear to have an advantage over CATI surveys in terms of nonresponse error.

There has never been one survey method with the ability to reach all households equally. Therefore, studies with multi-method approaches and that use the optimal survey method(s) to target the sampling population are the "best" practice. A detailed discussion of multi-method approaches follows later in this chapter: Multi-Method Surveys to Mitigate Coverage Error. Budget constraints on a study will determine which methods to use; however, if optimal survey methods are considered, costs should be mitigated somewhat by using the most efficient survey method(s); controlling costs may only be a matter of managing the number of survey methods.

Responses to the synthesis survey indicated that optimized multi-method surveys are the current state of practice, with

two-thirds of those conducting web surveys implementing multi-method surveys to improve the response of their sampling population.

## SURVEY ERROR CONSIDERATIONS IN WEB-BASED TRANSIT SURVEYS

There are a variety of survey error issues for researchers and agencies to consider when using web-based transit surveys. All survey methods have survey errors; therefore, each survey method's errors must be understood in the broad context of all available survey methods, so that the transit researcher can understand which survey method is best in a given situation. It is also important to know when it is appropriate to use multiple survey methods in a study to improve response and to mitigate and minimize survey error for the entire study. Survey error can include coverage error, nonresponse error (both unit nonresponse and item nonresponse), measurement error, and sampling error. This chapter focuses on coverage error and nonresponse error, which are both seen as critical issues for web-based transit surveys based on the results of the synthesis survey. Measurement error is discussed briefly as part of the multi-method survey approach. However, the primary concern of transit researchers is coverage error in web-based transit surveys and therefore first addresses this topic.

## COVERAGE ERROR

Results of the synthesis survey make it clear that potential bias from coverage error in web-based transit surveys is a primary concern of transit researchers and agencies. When asked "What do you think are the disadvantages of web-based surveys?," all of the transit researchers currently conducting web surveys cited coverage error and/or sampling bias owing to coverage concerns. When asked "What do you feel are the reasons your organization does *not* conduct web-based surveys?," two-thirds of researchers not currently conducting web surveys also cited coverage error/sampling bias as reasons.

Coverage error occurs when a potential respondent within a population cannot be accessed by the survey method being used. Good sampling practice aims to ensure that all members of the population of interest have a chance of being sampled for the study. For example, absence of Internet access for a potential respondent to a web-based survey would be considered coverage error, as would lack of telephone access for a potential respondent to a telephone survey (*1,6*).

In light of concerns about coverage error in web-based surveys, transit researchers must be able to measure potential coverage error in their target populations and understand how much importance to place on coverage error when choosing a survey method for their study. Coverage error varies depending on the respondents being targeted and the survey method. Coverage error can be measured using primary data and/or secondary data.

### Measuring Coverage Error Using Primary Data

The ideal way to measure coverage error is with primary data (i.e., information regarding the actual survey administered) from the sampling population that is being targeted. The typical sampling frame for most transit agency researchers is their current and potential ridership; primarily people within the geographic area in which they operate. Information about web penetration rates for people in the sampling frame can help determine whether there is reason to consider using web-based research and how much of a concern coverage error should be. A major finding from this synthesis research is that, for any research the transit agency conducts, web-based or otherwise, respondents be asked the following: whether they have web access; if that access is at home, at work, or both; and the speed of their web connection (this can help to understand potential nonresponse as a result of slow connections). If they do have access, it is also critical for the transit agency to collect their e-mail addresses so that they can be put into a customer database that can easily be tapped to survey customers again in the future.

Twenty-seven of the 36 respondents who completed the survey conducted for the synthesis were transit agencies. Of those 27 agency respondents, 6 provided data on their customers' web penetration and the remaining 21 (77% of the agencies surveyed) answered "did not know" to the Internet penetration question, which asked, "Do you know what percent of your customers have Internet access?" (Another 11 nonagency transit researchers who completed the survey were not applicable to this analysis.) The average customers' web penetration reported by transit agencies in the survey was 71% (ranging from 50% to 90%), which is nearly identical to current national statistics that report web penetration at approximately 72% (*7*). It is interesting to note that some transit markets reported very high web penetration, up to 90%, and the Tri-County Transportation District of Oregon (TriMet) noted that its research found web penetration levels were *higher* for transit riders than for non-riders. Therefore, transit researchers must not assume that web-based surveys of their sample populations will necessarily result in high coverage error.

That the remaining 21 agency respondents answered "did not know" to the Internet penetration question likely represents the more important statistic of this analysis, because it shows that many agencies have not yet conducted research to determine their customers' web penetration numbers, including some large urban agencies.

### Measuring Coverage Error Using Secondary Data

If primary, or internal, data are incomplete or unavailable, potential coverage error in web-based surveys can be determined using secondary research on web penetration. This research, often national in scope, can be particularly helpful in determining web penetration of non-rider populations, a group

that most transit researchers may find more difficult to conveniently sample as opposed to sampling their own riders. A reasonable understanding of web penetration rates can be found from U.S. Census data (by state) and other secondary data, as well as from anecdotal research in the transit agency's geographic area (e.g., research by businesses that have workers with web access, etc.). Businesses targeted as potential sources of new riders will often be able to inform the transit researcher about employees' web access at work.

There are a variety of sources for web penetration data, the most comprehensive being the U.S. Census' Computer Use and Ownership from the Current Population Survey. Although comprehensive, the Census data tends to be older than other sources, making it less useful than more current data sources. Internet usage is growing at such a significant rate that even 3-year-old data may be considered out of date. Furthermore, Census data only tracks computer/Internet usage at either home or work and does not provide one number that includes total access penetration regardless of location, thereby underestimating the population's overall access rate. One very credible data source for the United States is the Pew Internet & American Life Project, which tracks total coverage wherever this usage (access) occurs (*7*). Their *September 2005 Tracking Survey* contains statistics on Internet usage (see Table 6).

As can be seen from this table, there are income, geographic, race, age, and gender factors in Internet penetration data; however, overall access penetration is relatively high at 72% and growing quickly (Figure 17).

Actual effective access penetration may be slightly higher, as potential respondents may have Internet access at

TABLE 6
U.S. INTERNET USAGE BY DEMOGRAPHICS

| Demographics of Internet Users | Use the Internet (%) | |
|---|---|---|
| Total Adults | 72 | |
| Women | 69 | |
| Men | 75 | |
| Age | | |
| 18–29 | 84 | |
| 30–49 | 83 | |
| 50–64 | 71 | |
| 65+ | 30 | |
| Race/Ethnicity | | |
| White, Non-Hispanic | 73 | |
| Black, Non-Hispanic | 60 | |
| English-speaking Hispanic | 79 | |
| Community Type | | |
| Urban | 75 | |
| Suburban | 73 | |
| Rural | 65 | |
| Household Income | | |
| Less than $30,000/yr | 54 | |
| $30,000–$49,999 | 78 | |
| $50,000–$74,999 | 87 | |
| $75,000+ | 94 | |
| Educational Attainment | | |
| Less than High School | 38 | |
| High School | 62 | |
| Some College | 82 | |
| College+ | 92 | |
| | Dial-Up | High-Speed |
| Home Internet Users | 39% | 59% |

*Source*: Pew Internet & American Life Project *September 2005 Tracking Survey* (*7*).

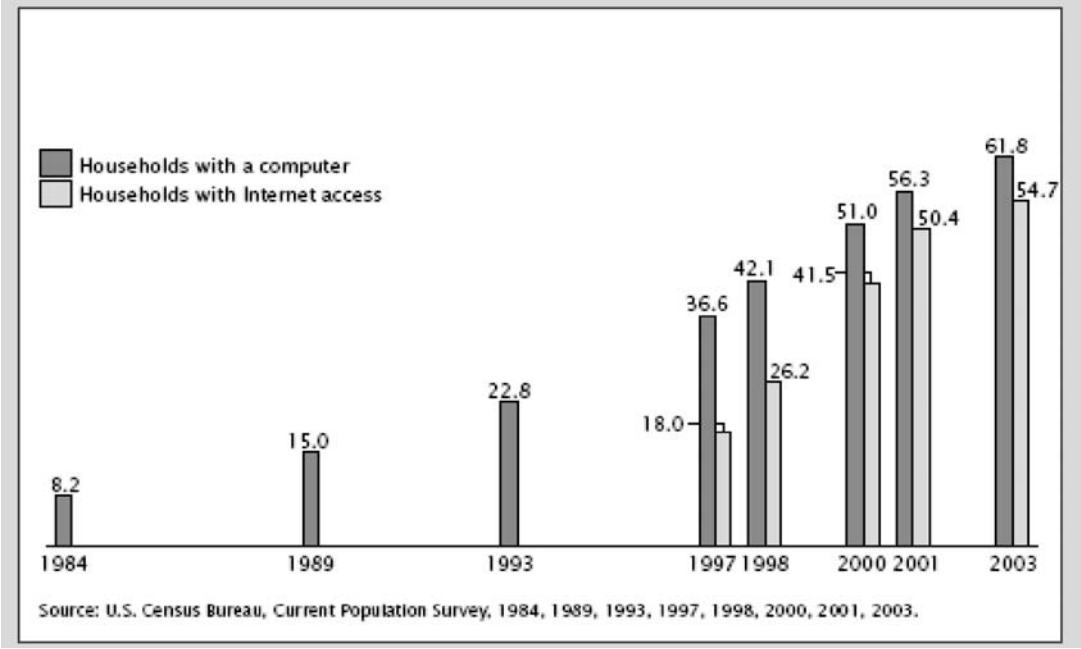



FIGURE 17 Computer and Internet access data from the U.S. Census (*8*).

schools, libraries, and other public places; however, it is unlikely that many respondents would make the extra effort to go to one of these locations explicitly for the purpose of completing a transit survey. Despite the high penetration rates, when conducting a study that will use web-based surveys, either as the only survey method or as part of a multi-method survey design, it is important to ensure that the population targeted for the study's web sampling frame is on the high side of these Internet usage statistics. For many of these populations, such as suburban and urban adults less than 64 years of age, either college educated or with incomes of more than $30,000 per year, the incidence rate of Internet access is between 75% and 94%. These incidence numbers are high and for certain subpopulations are approaching the national telephone incidence rate of 97.6% (U.S. Census). Therefore, web coverage, although not quite as good as telephone coverage, is inclusive for many populations. This synthesis will further explore and discuss coverage error in the following section, where it will be shown that coverage error, although higher for web-based surveys than telephone surveys, may be mitigated by lower nonresponse error in web-based surveys compared with telephone surveys.

## NONRESPONSE ERROR IN WEB SURVEYS

The two types of nonresponse error—unit nonresponse and item nonresponse—are also of concern to researchers.

### Unit Nonresponse in Web Surveys

Unit nonresponse error occurs when survey respondents differ from nonrespondents in a way that is significant to the study. For example, if low-income transit riders respond to a telephone survey in disproportionately higher numbers than high-income riders there would be nonresponse error for higher income riders. Often nonresponse error can be mitigated through procedures that weight up underrepresented groups and weight down overrepresented groups. Weighting may successfully mitigate nonresponse error as long as there are enough underrepresented respondents to provide reasonable statistical confidence, assuming the people who responded are similar to those who did not respond.

However, if nonresponse error results from significant underrepresentation of a particular subpopulation of the sample (e.g., high-income transit riders who only use transit in the evening, and thus were unavailable when the telephone survey was being conducted), the more serious issue arises of systematically excluding a particular subpopulation of the sample whose behavior is different in a way that is important to the study. In this example, an effort would need to be made to ensure that the high-income, evening-travel subpopulation would somehow be included in the study. One method might be for the transit agency to offer a web-based survey option in addition to the telephone option.

Web-based surveys have advantages over telephone surveys in terms of unit nonresponse. Web surveys do not suffer as much as telephone surveys from the issue of high unit nonresponse rates as a result of call-monitoring techniques such as answering machines and caller ID (*1,4,9*). This is because there is much less active screening of e-mails than of telephone calls (passive spam filtering, which is a serious problem, is described later). Therefore, if an e-mail arrives in a respondent's inbox with a subject of interest, that individual may be more likely to respond to it than to a telephone call with an unknown number.

However, spam is a very serious issue for e-mail and has become increasingly problematic over the last 5 years. As most users of e-mail understand through experience, various types of spam filters are becoming standard at most companies and organizations, as well as at home, through a variety of software products. Therefore, spam issues are a concern that must be addressed when conducting web-based surveys. The most important issue for web-based survey research regarding spam is to avoid survey invitations being tagged as spam and filtered out of a respondent's e-mail in-box before it is even seen.

There are a variety of methods to increase e-mail delivery rates and avoid false positives (i.e., a message being tagged as spam although it is legitimate). First, all bulk e-mail senders should adhere to the industry accepted, and federally mandated, e-mail practices outlined in the CAN-SPAM Act of 2003:

1. Bulk e-mail must clearly identify the sender—including a physical address.
2. Bulk e-mail must contain a valid subject line and valid routing information.
3. Bulk e-mail must contain a working opt-out mechanism.

Second, many companies offer paid white-listing services, promising increased delivery through partnerships with e-mail providers. Senders often undergo an e-mail-practice audit and, if accepted into the program, are added to a white-list used by e-mail providers to allow delivery without spam filtering. Third, avoiding certain words and phrases common to spam will decrease the likelihood that legitimate e-mail will be incorrectly marked as spam. Words and phrases such as "free," "easy money," "gamble," "money," and "rich" are commonly found in spam, and should be avoided if at all possible. Lastly, ensure that the source of the e-mail (ISP) does not tolerate or conduct business with known spammers. An ISP can have its e-mail servers blacklisted across the Internet for doing business with known spammers. Anyone sending e-mail using the same system will be subject to the blacklist rules in effect and the e-mail will never reach prospective users.

Spam filters are not the only nonresponse issue related to web-based surveys. Many respondents receive significant

legitimate e-mail as well as significant spam. This means that many potential respondents are fairly ruthless about what e-mail they read versus e-mail they discard (*6*). Therefore, the key for transit researchers is to ensure that their e-mail invitations are to the point and understand what will be of interest to respondents so that these invitations are read and acted on (e.g., "Improve your commute" or "Tired of sitting in traffic?" or "Contribute your opinion on a new transit alternative") (*1*).

Another nonresponse issue with web-based surveys is that some respondents simply do not check their e-mail very often, or at least not the e-mail address that they provided the transit researcher. Still other issues include multiple e-mail addresses, undeliverable e-mail addresses, server errors (e.g., the respondent's ISP happens to be conducting server maintenance when the e-mail is sent and therefore it bounces back).

Clearly there are a number of issues and concerns regarding nonresponse in web-based surveys. However, assuming the researcher's e-mail invitation is not tagged as spam (which as explained previously there are ways to mitigate), the e-mail address is correct, the topic is of interest to the respondent, and the invitation is concisely and clearly written, then unit nonresponse error can be significantly mitigated and respondents should at least begin the survey (whether they complete the survey is the issue of item nonresponse, discussed in the next sections).

Nonresponse can be reduced significantly if researchers are diligent in managing their customers' e-mail address lists, such that they contain only valid addresses (or at least e-mails that have not been returned to sender). If researchers' e-mail lists are valid and current, their respondents will be familiar with the organization from previous e-mail correspondence and/or web-based research and may be more inclined to open and respond to the researchers' e-mail requests. Response rates of 50% and higher are not uncommon for well-managed lists or panels. It should be noted, however, that the researcher must not create a self-selecting list of those with a greater propensity to respond by simply throwing out e-mails of those who did not respond to prior invitations.

#### Item Nonresponse in Web-Based Surveys

Item nonresponse refers to the issue of missing or incorrect data items in questionnaires. Item nonresponse occurs when respondents skip questions or fail to complete a questionnaire. Self-administered questionnaires, such as web-based and paper-based surveys, typically have more item nonresponse than questionnaires administered using interviewers (*4*). Although web-survey questions are often validated, making it hard or in some cases impossible to skip a question, item nonresponse can occur as a result of a different form of item nonresponse called "break-off," where respondents simply fail to complete the questionnaire.

There are a variety of ways to mitigate item nonresponse and a large body of literature exists on the topic (*1*, p. 529; *6*, p. 555). One method to reduce item nonresponse is to ensure a high level of interest among potential respondents to the survey (*1*). Fortunately, there is often a high level of interest in transit and other transportation surveys because respondents have a strong desire to improve their commutes and other travel.

Another way to mitigate item nonresponse is to remind respondents who have started a questionnaire that they have not finished and should continue on and complete it. This is a major strength of web-based surveys compared with telephone or mail surveys. The costs of e-mailing a reminder are very small, and there is minimal concern that the respondent is not receiving the reminder e-mail because they have already responded to the questionnaire invitation.

One of the benefits of web-based surveys (recorded by 71% of respondents to the synthesis survey) is their ability to obtain clean data through consistency checks and validation of user responses, essentially eliminating item nonresponse for those respondents who complete the questionnaire (*1*). At the same time however it is important that real-time editing and response validation in web surveys do not dissuade the respondent from continuing their questionnaire because the checking and editing become too onerous. The difficulty of balancing validation while encouraging respondents to complete questionnaires can be seen when online geocoding is used in web-based surveys.

Online geocoding is an important benefit for transit and transportation applications because it yields precise and validated address information, often critically important to transit researchers and almost impossible to collect accurately using other survey methods. However, online geocoding is still not perfect. Occasionally, a respondent may enter their home address into a survey only to find that the survey (through a real-time geocoding check) insists their home address does not exist (owing, for example, to an outdated GIS data set). The respondent checks their typing, tries to proceed, and again is told the address does not exist. This will often cause the respondent to become frustrated and abandon the survey, either because there is no way to proceed or because it is simply too onerous for them to proceed by using the alternatives presented. The fundamental challenge for any web-based survey is to guarantee a balance between validating data to reduce item nonresponse and allowing respondents a way to proceed through difficult questions without causing break-off, which is a different form of item nonresponse.

This is not an easy balance to strike, because a successful geocode may be imperative to construct a stated-preference experiment for the respondent later in the survey. Therefore, the survey must collect geographical data or it loses significant value for the researcher. One technique to resolve the geocoding issue is to ask the respondent twice for their address to ensure it is typed correctly. If the database still fails to find it, the respondent may then be automatically taken to a map screen and asked to indicate their address using the map tool that cannot fail as the result of an incomplete database. This technique has been employed in a number of transportation web-based surveys, including a significant transit study currently underway evaluating a new transit service between Lower Manhattan and JFK Airport.

The following list presents some key considerations for web-based researchers to use when designing the validation rules in their surveys (*10*):

- Type of edits (e.g., format, conditional, and consistency edits),
- Number of edits (i.e., determination of priorities),
- Optimal timing of edits (after each question or just before the questionnaire is completed) with respect to recall versus burden,
- Presentation of edit failures to respondents,
- Wording of error message (particularly ones calculated by the system),
- Design and format of the message (e.g., color and background),
- Use of hard edits (forced to fix in expected manner) or soft edits (either reconcile the error or provide comments),
- Design and management of previous or complementary external information, and
- Help facilities provided (e.g., additional instructions, telephone support, and e-mail responses).

Although there are issues with item nonresponse error in web-based surveys, real-time validation and editing remain as major benefits of conducting web-based surveys. The details of how, when, and whether to validate are important and must be considered by all web researchers (transit or otherwise).

## SUCCESSFUL PRACTICES AND CHALLENGES IN CONDUCTING WEB-BASED TRANSIT SURVEYS

The previous sections are intended to provide the researcher with an understanding of the strengths and limitations of different survey methods compared with web-based surveys and of the various issues to consider when choosing which survey method(s) to use to best serve their study. This section discusses how to proceed in conducting a web-based survey once the decision to conduct such a survey, either alone or in conjunction with other survey methods, has been made.

### Recruiting and Sampling Techniques for Transit Web-Based Surveys

There are a variety of ways to obtain web-based survey respondents once the sample population is understood and considerations regarding coverage error have been addressed. The study objective is also critical in deciding not only who, but how, to sample. The following section describes two different types of studies; one for a wide geographical coverage and the other for a more targeted sample.

#### Wide Coverage Study

Sometimes it is necessary for the transit researcher to understand how their entire geographic region feels about a transit-related research topic. This includes both riders and non-riders for all demographics across the entire transit area. For example, if the transit researcher is concerned with who uses transit and why, it may be necessary to randomly select households throughout the region using random digit dial or address-based sampling for a mail-out. Although there are a number of concerns about nonresponse error with random digit dialing and with mail surveys (*1*), these are still two of the most effective techniques to randomly sample the population of a large geographic area. One of the limitations of web surveys is that there is currently no way to generate a random list of e-mails for potential survey respondents in a particular geographic region. This limitation makes contacting random samples of wide areas difficult for web surveys.

Nevertheless, random digit dial could still be the recruitment method: the transit researcher can contact potential respondents in the study area by phone, obtain their e-mail address, and send respondents an e-mail invitation with a link to the survey. The researcher can also give the respondent the option of taking the survey over the phone at that moment. Completing the survey at that moment over the phone may be convenient for the respondent, thus increasing the overall response rate for the study; however, phone completions may reduce the number of respondents taking the survey by means of the web. Offering a web completion option can also help increase response rates to CATI surveys: an interviewer can send an e-mail invitation with a survey link to respondents who are resistant to completing the survey on the telephone. This method has been used with limited success in at least one recent study.

As part of a paper-based, mail-out/mail-back survey, a researcher can print a web address and unique password on each survey, providing the respondent with the option to take the survey by means of the web.

Although both mail and telephone survey methods are the most effective methods to ensure a random selection of respondents in a wide geographical area, both require the relatively expensive methods of contacting respondents by phone or mail. Once a respondent agrees to cooperate over the phone with a CATI operator, there is often little cost savings to having them take the survey on the web because, whereas a web response is less expensive than a CATI operator conducting the interview, there is no guarantee that the respondent will actually follow up and take the survey online. Furthermore, the greatest cost of a CATI survey is reaching a respondent and gaining their cooperation. Because this has occurred, it is logical to see the survey through to its conclusion. Offering a respondent a web survey option on a mail-out survey might increase response rates by giving respondents a more convenient method to take the survey; however, those respondents may have completed the questionnaire anyway using the mail-back method. Therefore, it can be said that respondents themselves may gain some benefit by using their preferred survey method; however, the actual response rate may or may not increase; in the meantime, the costs related to creating and administering the additional web-based survey instrument have still been incurred (*1*).

#### Targeted Sampling for Riders

A broad geographic sampling frame may not be necessary for many studies that a transit agency might be conducting. When this is the case, web-based sampling often becomes a strong survey option.

#### Riders

Most transit studies do not require a random sample of a large geographic population. For example, when transit agencies need to sample their ridership, they know how to find them: they are on board the vehicles, at the stations and terminals, and possibly in their customer database. Therefore, researchers conducting rider origin–destination and customer satisfaction surveys, for example, will be able to directly intercept riders using a paper-based, hand-out survey or a personal interview on board transit vehicles or at transit stations and facilities. With a hand-out or interview survey, it is usually very easy to ask for an e-mail address on the handout instrument or, in the case of the interview, to directly ask for an e-mail address. Although onboard paper surveys are effective because the rider is "captive" during their transit trip and has the time to fill out a survey, offering a web-based option or web-only survey can allow the transit researcher to conduct much more complicated surveys and to develop a customer database for future research needs as discussed later. That the rider will need to access the survey over the web later (and not right there on the transit vehicle) is not ideal, but as noted earlier, a self-administered web survey provides the ability for respondents to log in when it is convenient for them.

#### Customer Database

What is ideal is that once an e-mail address is obtained from the sample population, compiling a customer/potential customer database with e-mails is a powerful incentive to conducting research with riders and non-riders alike. Creating this type of database is a particularly important tool for rider research, because many riders use the transit system over a span of years, and obtaining their e-mail address allows them to be easily contacted later for any research the transit agency might require. For example, 65% of NJ TRANSIT commuter rail riders have been riding the system for two or more years (*2*). Surveying this group, which has a large rider database, becomes a matter of creating the sample objective and sending out a batch of e-mails inviting respondents to participate. Although there is some additional fieldwork involved, because an existing database should be regularly updated to ensure new riders are being included and that the list stays current with changing demographics, conducting fieldwork to update and maintain a rider database is a much less onerous task than having to obtain a large sample for every study. To obtain such a database, a transit researcher starting from scratch with no customer list can send staff into the field and collect a very large sample of customer e-mail addresses. This can be done by asking for customers' e-mail addresses using interviewers or a simple, onboard, paper-based card questionnaire (see Figure 18).

The presence of an e-mail address is a strong indication of web penetration within the transit area. Once the researcher has a list of rider e-mail addresses, web-based studies can be readily conducted. As the list matures, it will need to be regularly updated owing to respondents who opt out or indicate that they have stopped riding the transit service and to add new riders into the customer database. Finding new customers and other customers not on the list can be done with the same card and intercept methods as used to compile the original list, but targeted on specific types of riders needed to complete the sampling frame for the customer database (see chapter six for examples of two projects that collected customer lists using web surveys).

#### Non-Rider Targeted Sampling

Many surveys are project-specific, whereby certain targeted populations are needed to evaluate new service initiatives. For example, if a new light rail system is proposed, a mode choice study will be necessary to understand the ridership potential for such a system. For studies such as this, randomly intercepting respondents in the area of the proposed new service is an excellent way to sample. These respondents can either take the survey on the spot or later using the web (after providing an e-mail address to the researcher).

When the targeted study population of a survey is non-riders of transit, web-based surveys can be very useful. Often one of the most important things for transit agencies to understand is

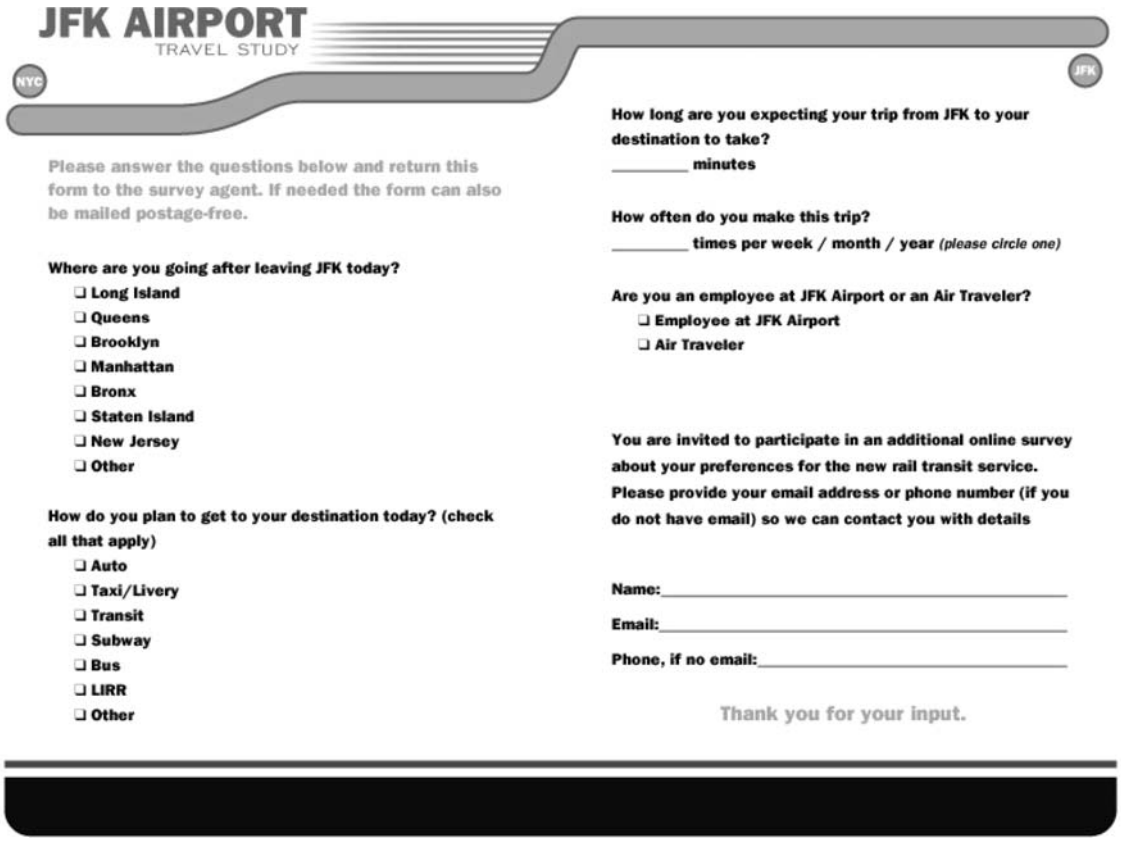



FIGURE 18 Sample handout card requesting name and e-mail address.

why people are not using transit and what the agency can do to entice non-riders to switch to transit. Although random sampling would be the best way to understand non-riders' needs in a transit agency's territory, convenience sampling can be very effective and can be done without incurring the high costs associated with random sampling by means of telephone and mail surveys. Large employers in the transit agency's area of operation can provide a good base for convenience sampling for a web-based survey on how to increase transit ridership (assuming employees have easy access to computers).

Sampling of large employers in the study area can be supplemented with intercept surveys of potential respondents at public areas such as malls, department of motor vehicles offices, highway rest stops, and high-traffic pedestrian areas that are in locations relevant to the study. E-mail addresses can be obtained directly or through a simple hand-out/hand-back instrument and added to a database of potential respondents who might be surveyed.

### MULTI-METHOD SURVEYS TO MITIGATE COVERAGE ERROR

Earlier discussion of mitigating coverage error focused on understanding whether a significant coverage issue exists within a transit research sample. Furthermore, it has been discussed that for certain subpopulations, such as current non-riders who could be surveyed to understand what actions a transit provider could take to encourage them to ride, coverage bias may not be an issue. This being said, there are often some coverage issues and these warrant the use of a variety of survey methods to take advantage of the benefits of each different survey method type.

An important method to mitigate coverage error is to develop studies that use multi-method sampling techniques. In other words, use a variety of survey methods to conduct a study and allow respondents to choose which method is most convenient, thereby increasing the study response. Many transit studies have been conducted using multi-method surveys. NJ TRANSIT's Rail Customer Satisfaction ePanel study is discussed in chapter six. This was primarily a web-based survey; however, respondents who were interested in the study but did not have web access were given a phone option. The respondent was called and, if reached, surveyed by an interviewer who used the web-based instrument as the CATI script. The interviewer therefore was reading from the exact survey that the respondent would have used had they logged onto the web and taken the survey themselves. A more typical multi-method survey in the transit context is seen when an onboard paper survey provides a web link; therefore, the respondent has the option to participate in that way.

The survey conducted for this study discovered that every type of survey in the study (origin–destination, customer satisfaction, mode choice, planning, and many of the "others") had incorporated some multi-method techniques; overall, 27% of all surveys described for this synthesis used multi-method techniques and some of these incorporated four or five different methods in one survey.

Two-thirds of transit agency researchers who currently conduct web-based surveys are including multi-method techniques. As Table 7 shows, there is no one perfect survey method that easily captures all populations.

Implementing a multi-method survey can introduce additional expense to the overall cost of the survey, and it can introduce significant measurement errors, meaning that the same question may be answered differently because of the particular survey method being used (*1*). However, web-based surveys can be combined with other methods without introducing measurement error by programming a web-based survey that can be ported directly to laptop computers and set up at central sites in public places within a given study area. The research team has implemented this technique in several recent projects (e.g., MTA–New York City Transit's JFK Airport–Lower Manhattan 2005 Study, and the NY State Thruway Authority Westchester, Rockland, & Orange County Travel Study 2003) with success. With this arrangement, the survey can be administered by intercepting respondents in person or it can be taken by respondents directly over the web, whichever is most convenient for respondents to obtain the highest possible response rates. This strategy of programming a computer-based survey is employed frequently in many mode-choice studies because these surveys require complex structures to build customized future scenarios for respondents to choose from based on the respondents' unique trips. For a mode choice study, anyone in selected public places within the study area of a potential new transit project may be a valid respondent to determine the viability of a new transit service. Respondents wishing to participate online may provide the interceptor with an e-mail address and be sent an e-mail invitation to take the survey on the web, or the respondent may be given a flyer with a web link (and preferably a unique password to ensure one survey per person) so that they can access the survey at their convenience. Again, the only difference between the computer-based, self-administered survey and the web-based survey is that the web-based survey is transmitting the data by means of the Internet, whereas the laptop intercept survey in the field is reading and writing directly to the hard drive.

TABLE 7
PERCENTAGES OF SURVEYS USING MULTI-METHOD TECHNIQUES

| Types of Surveys Using Multi-Method Techniques | Percent |
|---|---|
| Planning | 46 |
| Other | 24 |
| Origin–destination | 19 |
| Customer satisfaction | 18 |
| Mode choice | 30 |

Other examples of multi-method techniques include using a personal interview survey in combination with a web-based survey. A study to measure response to subway station rehabilitation provides an example of this combination method. New York City subway riders who preferred not to engage in a personal interview at the subway station (because their train was coming or they needed to exit the station quickly to get where they were going) were asked for their e-mail address so they could be sent an e-mail with a password-embedded link to the survey containing the same interview questions. Well over 50% of those asked willingly provided their e-mail addresses directly to the interviewer.

## CONCLUSIONS

This chapter described the research context in which web-based surveys are one of a number of survey methods. There are many ways web-based surveys can be incorporated into studies that benefit the research, often at low additional cost. Furthermore, as transit researchers become more familiar and comfortable with the tools, processes, and/or outside firms they can use to create and administer web-based surveys, more applications of web-based surveys will become apparent to the transit researcher. These applications will grow as web penetration rates grow.

Web-based surveys are appropriate in the following situations:

- Respondents have reasonable web penetration. Good examples of high web penetration situations are employer surveys and surveys of non-riders, where the incidence of web access may be higher among these special populations (i.e., students).
- The survey has complexity that is best handled by a computer-based instrument. Many surveys require significant complexity to obtain useful information. A good example is stated preference mode choice surveys, where customized future transportation scenarios need to be constructed for each respondent. Although the survey itself is simple and straightforward for the respondent, there is significant behind-the-scenes programming used to resolve this complexity. The ability to survey respondents effectively using sophisticated methods allows the researcher to obtain the critical data he or she needs while making the survey experience simple and clear for the respondent.
- Another example where survey complexity can be addressed through web-based surveys occurs when origin–destination geographical data needs to be collected, as mentioned previously in the New York MTA Bridges & Tunnels Origin–Destination Study 2004.

Geographical data are critical to transit research for a whole host of purposes, such as commuter sheds, station development, operations planning, and mode choice, to name but a few. Valid geographical data are difficult to collect and item nonresponse is a major issue for paper-based surveys and even CATI surveys where the interviewer is unfamiliar with the geography of the study area. Web-based surveys enable respondents to input geographical data that can be validated in real time and can be done in such a way as to mitigate break-off concerns as described previously.

- Quick, "pulse-taking" surveys for a variety of purposes can be accomplished using web-based surveys. An example follows as a case study in chapter six in which TriMet asked respondents for feedback on its new interactive map feature on its website.
- Information may be needed for a specific purpose such as evaluating features of regional fare cards [San Francisco Bay Area Rapid Transit (BART) and MTA NYC]. E-mail invitations may be sent to known customers of the various agencies, who will likely respond because they recognize the sender of the invitation as being their own transit provider.
- The survey continues over time. Web-based surveys are excellent for longitudinal studies (as discussed in detail in two case studies in chapter six), because web-based surveys significantly reduce the costs of contacting respondents multiple times, which is necessary for longitudinal studies. Once a web-based survey is programmed and designed, there is a very low marginal cost for obtaining additional surveys. This is especially true if the recruitment is conducted using an e-mail list of respondents. To conduct a new survey, the researcher simply has to send an invitation to the appropriate respondents at the appropriate time. This can be done using automated tools; therefore, obtaining a new wave of respondent data requires very little time and expense on the researcher's part.

  Additional benefits of longitudinal studies include the ability to know what a respondent answered in their previous survey and to then ask them if anything has changed since they last took the survey. This function allows the researcher to "drill down" by noting changes from prior surveys and then asking respondents in real time the reason for the change.
- Web-based surveys are an excellent option as part of a multi-method survey approach. As described earlier, web-based surveys are often very good parallel or supplemental survey instruments to other methods being used directly in the field (e.g., paper-based surveys or field intercepting to a central site with computers).

CHAPTER FIVE

# TECHNOLOGY

This chapter explains the basic technologies and technology issues researchers must address when implementing a web-based survey instrument.

Transit researchers typically use one of the following three methods to implement and conduct web-based surveys:

1. Use a survey service and/or software—This method is inexpensive, but only allows predetermined question types and is therefore very limited in its flexibility. It is a viable choice for creating simple surveys, but service from the provider is minimal and one must be aware of hidden costs.
2. Create and conduct the entire survey in-house using information technology skills and resources within the researcher's agency or organization—This requires technical expertise, but gives the researcher complete control. Depending on the skills of the researcher and the resources available, this option can range from being inexpensive to very costly.
3. Hire a consultant—This can be expensive, but provides experience, expertise, and the ability to conduct complex and highly customized questionnaires. Other aspects of a survey, such as sampling plans and non-web survey instruments, recruiting, and reporting may also be addressed by a consultant.

Responses to the synthesis survey indicated that most researchers contract out their web-based survey work to consultants, but that online survey tools and in-house development are often used as well (Figure 19). Researchers using a consultant for survey development also had those surveys hosted by the consultant. The same is true for those who developed surveys using online tools. Researchers electing to develop the survey in-house also hosted the survey in-house.

All three options might be used by the same transit researcher or agency for different reasons, depending on the needs of the study. For example, a survey-service questionnaire from a provider could easily be created to supplement a simple paper-based instrument. For the annual cost of approximately $200 (plus other charges), a transit researcher can use such a provider to create simple web-based questionnaires that are analogous to their paper questionnaires. They can then invite respondents to the survey by means of an e-mail list or a web link.

Using a survey service means that researchers must direct the survey creation themselves. This includes creating all questions, selecting how to display the questions, and determining all the logic and validation rules. Researchers are also directly responsible for all respondent recruiting and customer support. There is likely no direct help for the researcher using such services; therefore, any questions or problems are usually answered by e-mail on the time frame of the service provider (not necessarily the time frame of the survey researcher).

For many transit researchers, survey services are a very good solution to develop a survey at low cost and to learn first hand about web-based surveys and how the process works. However, researchers often find that online services and generic survey software do not meet their needs. For example, longitudinal surveys cannot be created that track one respondent over time using such tools. Nor can stated preference surveys for mode choice studies be produced effectively using less expensive online survey services, although there is much more expensive software that does allow for advanced online mode choice surveys to be created. Features such as online geocoding and linking transit schedules are typically not incorporated into these surveys. Advanced validation cannot be accomplished, as these tools are not capable of, for example, comparing a zip code with a data table of zip codes to confirm if a respondent's answer is an existing zip code or not.

In the case of more advanced needs and sophisticated surveys, a consultant is often hired to conduct the survey unless there is significant expertise in-house, although as mentioned earlier there is software available that allows transit researchers to do more of this themselves. Although some advanced software is very good, it does not mean that the process is simple; therefore, a consultant is hired to help implement or guide a study using third-party software. Table 8 lists some of the strengths and limitations found with different survey providers.

The following list addresses various technologies that are important to consider when conducting a web-based survey.

- The web-based technology itself—is it server driven? Server-driven technology for web-based surveys is important, because it means that most of the logic and technology reside on the survey provider's server as

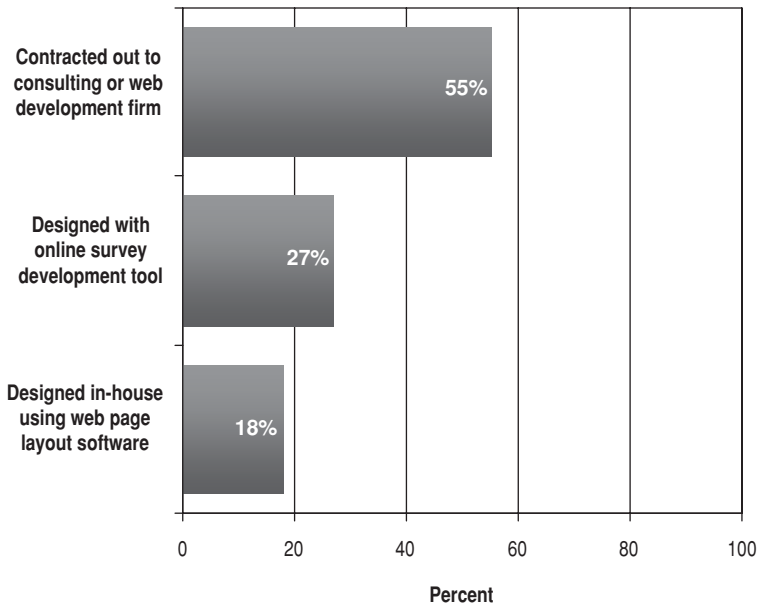



FIGURE 19 Web-based survey development methods.

TABLE 8
ADVANTAGES AND DISADVANTAGES OF VARIOUS WEB-BASED SURVEY DEVELOPMENT METHODS

| Approach | Strengths | Limitations |
|---|---|---|
| Contract out to consulting or web development firm | Provides experience and expertise<br>Can develop complex, highly customized questionnaires<br>Ability to display any desired graphics/logos on survey pages<br>Allows recruit by any method<br>Can develop sampling plans<br>Can develop non-web survey instruments to accompany web-based survey<br>Can develop complex (e.g., multi-dimensional) weighting schemes as part of the study<br>May provide advanced data validation; i.e., trip lengths in time and distance<br>May provide online geocoding<br>Provides advanced longitudinal survey capabilities, such as presenting respondents with the option to simply confirm previous answers from previous waves of a longitudinal survey<br>May provide ability to search open-end answers in database in real time<br>May provide ability to link transit schedules and maps of systems<br>Hosts survey on its own servers<br>Can develop password scheme to screen out multiple answers per respondent<br>Can see results live<br>Provides clean, validated dataset<br>Will provide data in format require by agency | Expensive<br>Not many available consultants with high degree of expertise |

*(continued on next page)*

TABLE 8
ADVANTAGES AND DISADVANTAGES OF VARIOUS WEB-BASED SURVEY DEVELOPMENT METHODS (*continued*)

| | | |
|---|---|---|
| Use online survey development tool<br><br>*Some examples include:<br><br>SurveyMonkey<br>Zoomerang<br>Infopoll<br>SurveyCrafter<br>SuperSurvey<br>Perseus | Inexpensive, although costs can be hidden<br><br>Easy to use for simple questionnaires<br><br>Allows recruit by e-mail or web link<br>Agency can "get their feet wet" and try out new technology<br>Can see results live<br>May provide managed list of opt-in survey respondents<br>No need to involve information technology (IT) department<br><br>Hosts survey on its own servers | Requires predetermined question types<br>Limited flexibility in questionnaires by templates used to create them<br>Limited ability to display graphics/logos on survey pages<br>May require software downloads<br>Must program survey oneself<br>Must devise own data validation<br>Must create own logic scheme<br>Must create own survey screens<br>Cannot create stated preference surveys<br>Cannot longitudinally track respondents over time<br>Cannot provide advanced data validation |
| Develop/program/host in-house | Dependent on in-house expertise<br><br>Complete control<br>Can develop complex, highly customized questionnaires<br><br>Can integrate directly to other in-house systems (such as agency website, database, etc.)<br>Can develop sampling plans<br>Can develop non-web survey instruments to accompany web-based survey<br>Can develop complex (e.g. multi-dimensional) weighting schemes as part of the study<br>May provide ability to search open-end answers in database in real time<br>Hosts survey on its own servers<br>Can develop password scheme to screen out multiple answers per respondent<br>Can see results live<br>Provides clean, validated dataset<br>Will provide data in format require by agency | Dependent on in-house expertise<br>Significant work to produce complex surveys<br>May require a high learning curve<br>Requires time and effort of IT department, which is often already busy with many other priorities |

*These include those known to the research team at the time the research was conducted. Any omissions were inadvertent. TCRP does not endorse specific products and services.

opposed to requiring this technology to reside on the respondent's computer through a late-version browser with sophisticated technologies. The objective is for the survey provider to be responsible for as much technology as possible on their end, thereby enabling older computers and software to still easily run the survey and to benefit from its advanced features.

- Recruiting—are you able to recruit using e-mail? Can you use your own e-mail system? Will you be sending reminders, or merging fields into the e-mail?
- Security—does the survey use an authentication system so that each respondent can take the survey only once? This is often very important for transit studies, as there are frequently proponents and opponents to many of the projects that a transit agency is attempting to implement. A web-based survey that allows the same user to repeat the survey again and again can create a serious bias in the survey. This problem is easily taken care of if each respondent is provided a single, unique password that allows him or her to take the survey only once.
- Can the survey be made multi-method? As discussed in chapter four, multi-method surveys are often an excellent way to conduct a transit survey. Can the web-based

survey be used on stand-alone computers without Internet access in a field environment for intercepting respondents?
- Hosting—it is almost always easiest to host the data with the same provider as the entity developing and implementing the survey. Although it is certainly possible for a consultant to implement a survey somewhere else (e.g., on a transit agency's servers), this often adds significant costs without much gain. It is important that the hosting entity has been through a security audit and, if necessary, has been approved by the agency's legal department.
- Data—most survey service providers will provide data in export formats. It is important to ensure that providers give all data over to the client and that data such as how many respondents started the questionnaire but did not finish it, the date of the survey, the sample size, the response rate, etc., are all included in the data set.
- Real-time data access and reporting—to what extent are up-to-date results required to check the progress and distribute interim results?
- Repeatability—once a transit agency has invested in developing a survey can it be reused or repeated?
- Technical support—will respondents be able to call or e-mail with questions as they take the survey?
- Data validation—does the software allow for error checking and answer inconsistencies?

Internet technology has been a hot topic over the last decade, and often the very small details of technology are the focus when discussing any web-based technologies. When implementing, these small details are critical, and each web application requires making a large number of technical decisions. This chapter intentionally focuses on the broader considerations of technology in web-based surveys. It is important for the transit researcher to understand the benefits and costs of different broad technology decisions first. Transit researchers need to understand what they want out of their research plans and this understanding will drive their decisions about which of the three types of technology methods described earlier they should be pursuing. Many researchers might pursue them all. Other researchers might pursue them in varying degrees (e.g., a consultant helping them using third-party software).

CHAPTER SIX

# CASE STUDIES

This chapter details three case studies describing projects conducted by NJ TRANSIT, Metrolink, and TriMet. These case studies show what can and are currently being done with web-based research by transit agencies. Various themes described in earlier chapters are repeated and can be understood in a real-world context.

## NJ TRANSIT RAIL ePANEL

The benefits of using web-based longitudinal panels for customer satisfaction studies can be clearly seen based on the experience of such a study for NJ TRANSIT's rail customers. The study revealed numerous benefits of this method over cross-sectional studies, including more robust statistics, better understanding of customer satisfaction, and the ability to analyze customer satisfaction trends. A variety of innovative Internet technologies was implemented, adding value to the study by ensuring data quality, timeliness, reductions in respondent burden, less random error in respondent answers, and techniques to pair qualitative data to quantitative analysis. Online geocoding of respondents' origins and destinations was also described as another aspect of the survey, which provided NJ TRANSIT more value from the study.

Customer satisfaction studies are conducted by many major organizations, including those who provide transportation services. Typically, customer satisfaction studies are carried out using repeated cross-sectional sampling of customers. Satisfaction scores are compared across these repeated cross sections. Differences in satisfaction scores resulting from perceived changes in service are measured; however, the measurement is confounded in part by differences between the cross-sectional samples. Demographic differences can be accounted for by weighting the samples so that they are equivalent; however, there are significant differences in satisfaction scores between individuals that are not explained by demographic or other easily measured characteristics. The result is that relatively large samples are required to measure changes in customer satisfaction over time.

Longitudinal panels offer a potentially attractive alternative to repeated cross sections for measuring customer satisfaction. Measuring changes in satisfaction of the same individuals from one period of time to another eliminates the confounding caused by variations between the different individuals in repeated cross-sectional samples. The result is that the sample sizes required to measure differences in customer satisfaction can be much lower in panel surveys. In addition, panels provide opportunities to directly determine the reasons for those changes.

Longitudinal panels can be administered using a variety of methods. For transportation studies, intercept recruiting is an efficient approach to assembling panels. Although telephone and mail-out/mail-back instruments are commonly used, web-based instruments can be a highly cost-effective alternative for many applications. Web access has increased significantly across the population and it is possible to construct demographically representative panels from among those who have web access. In addition to their cost-effectiveness, an important advantage of using web instruments with panels is that the time required to complete and analyze data from a survey wave can be dramatically reduced.

NJ TRANSIT's Rail Customer Satisfaction ePanel was designed to be a continuous survey, providing monthly data on customer satisfaction. It used web-based technologies to invite respondents from one of three panels each month and to administer a customer satisfaction survey. The resulting survey data monitor customers' concerns on a monthly and even daily basis, as study data were continually being received from respondents throughout each month.

Web-based survey technology allowed for great flexibility in obtaining both quantitative customer satisfaction responses, such as typical satisfaction scores, and qualitative responses, such as written answers to open-ended questions that are used to explain why quantitative scores have changed. This was a critical part of the study, because the reasons for change in satisfaction scores can be quickly understood when they are paired directly to responses from open-ended questions (see Drill Down Questions section and Figure 24).

Advanced web-based survey technologies also allowed for a number of innovative features that improved data integrity and currency. These features included online geocoding of origin and destination data, automatic updating and querying of train schedule data so that respondents could select only valid trains in their surveys, and full validation of responses to questions. Web-based longitudinal panel survey instruments can be designed in ways that minimize respondent fatigue. This was accomplished using a number of techniques that required respondents only to confirm that various aspects of their travel have not changed since their previous survey.

### Background

The NJ TRANSIT ePanel Customer Satisfaction Study was conducted to provide continuous monthly and quarterly tracking of NJ TRANSIT commuter rail riders' satisfaction along 65 satisfaction measures. These measures had previously been tracked in surveys conducted less than annually, using cross-sectional sampling with handout/handback paper questionnaires.

The ePanel study measured rail customers' satisfaction scores in what NJ TRANSIT calls "functional areas," which included questions related to parking, boarding stations, destination stations, train scheduling, and customer service. The survey also measured "key-driver areas," which include on-time performance, personal security, employee performance, fares, and mechanical reliability. The study provided the ability to segment the customer satisfaction measures based on different train lines, destination markets, customer demographics, stations, etc.

NJ TRANSIT's ePanel was designed to answer the following specific questions about commuter rail customers on a continuing basis:

- What are the trends in customer satisfaction and what factors influence these trends?
- On which train lines within the NJ TRANSIT system is customer satisfaction changing? In what direction are these changes, how big are the changes, and why are they occurring?
- What are customers' main concerns? Where does NJ TRANSIT need to improve?
- Where are customers satisfied? What performance does NJ TRANSIT need to maintain?

To address these questions, a longitudinal panel study plan was developed in July 2002 that was driven by a monthly survey that began in September 2002. This survey collected customer satisfaction data every month from one of three separate customer panels, which were each comprised of approximately 4,000 participants. Each panel respondent was surveyed four times a year at three-month intervals, giving NJ TRANSIT new monthly customer satisfaction data throughout the year and allowing them to track customer satisfaction trends and customer origin and destination patterns. Respondents were asked to take a survey only once every quarter, reducing respondent fatigue and also giving respondents enough time between survey waves to notice service changes.

### Web-Based Survey Instrument

The survey used a web-based, multi-paneled, multi-waved customer satisfaction questionnaire that had a number of sections. The questionnaire first obtained background information about respondents' current NJ TRANSIT travel, then the survey presented 65 customer satisfaction attributes for respondents to rate. It continued by asking general customer satisfaction questions (e.g., would you recommend NJ TRANSIT to a friend?, etc.) and also determined respondents' origin and destination locations, and ended by asking additional background questions and demographics.

The 65 customer satisfaction ratings were crucial to determining where NJ TRANSIT was performing well and where improvements would be needed on its rail system. Ratings were on a scale of 0 to 10, with the option to answer not applicable. Data validation was used for many questions, such as the customer satisfaction questions, to ensure quality data and complete responses. Wording was customized for each respondent on many of the survey screens as well. For example, in the screen shot below, the question asks about "parking at Woodcliff Lake Station" instead of simply saying "your boarding station" (Figure 20). Wording customization makes the questionnaire clearer for respondents and by extension improves data quality.

### Origin–Destination Data Collection

An important part of the study for NJ TRANSIT was to obtain origin and destination data. To accomplish this, respondents were asked to geolocate their origin and destination addresses by using a point-and-click map, a street address, a business name, or an intersection search. A screen shot of the map search is shown as Figure 21. Regardless of the type of geolocation search used (map, address, business, or intersection), a latitude and longitude for each origin and destination was determined. These were then automatically coded into the proper NJ TRANSIT transportation analysis zones using an online, point-in-polygon routine. Therefore, NJ TRANSIT received immediate real-time access to fully coded origin–destination data with transportation analysis zones already attached to the data.

Another important function of the survey was determining what train the respondent rode. Respondents were asked the appropriate questions to classify them into four categories: frequent weekday rider, frequent weekend rider, infrequent weekday rider, and infrequent weekend rider. Once the respondent type was known, the survey then asked the respondent what train they used and then displayed only the relevant trains for their station and day of week (Figure 22).

### Anchoring

The differences between a respondent's first survey and their subsequent surveys could be subtle, but important, and served three main purposes: (1) to deliver respondents more efficient second, third, and fourth surveys by asking them only to confirm answers from their previous surveys when the answers are unchanged; (2) to use "anchoring" so that respondents knew how they rated satisfaction measures in the previous survey wave, which helped them make new judgments based

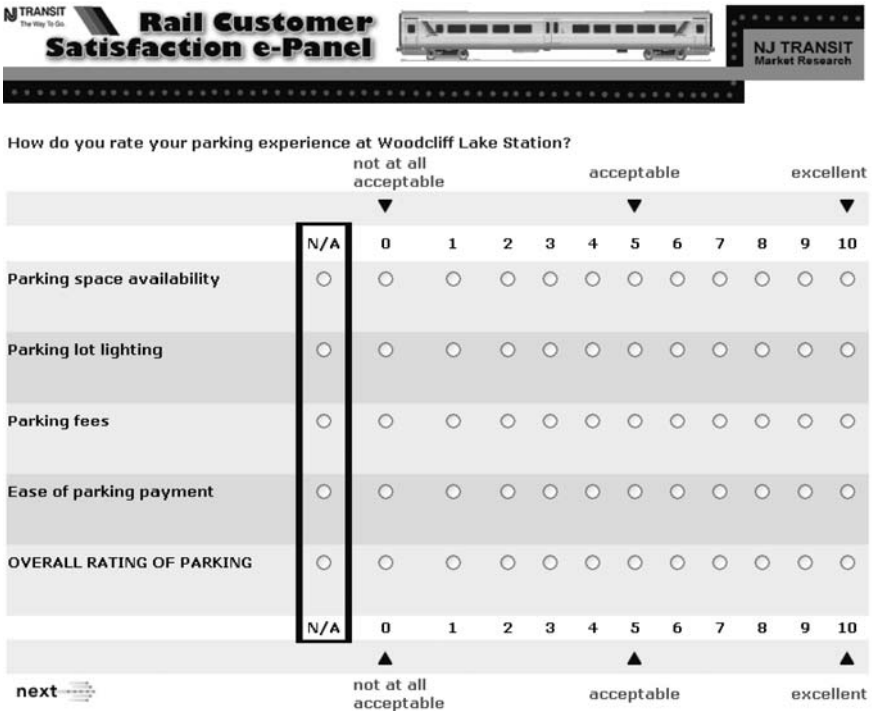
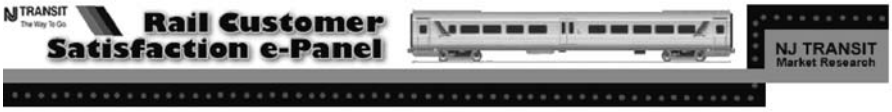



FIGURE 20 Example screen showing customer satisfaction attributes rating (NJ TRANSIT).



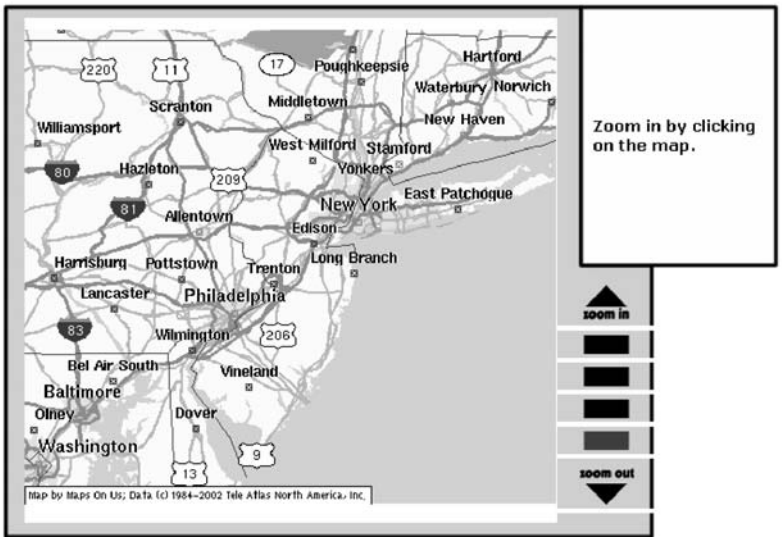




FIGURE 21 Map search screen in NJ TRANSIT Rail ePanel survey.

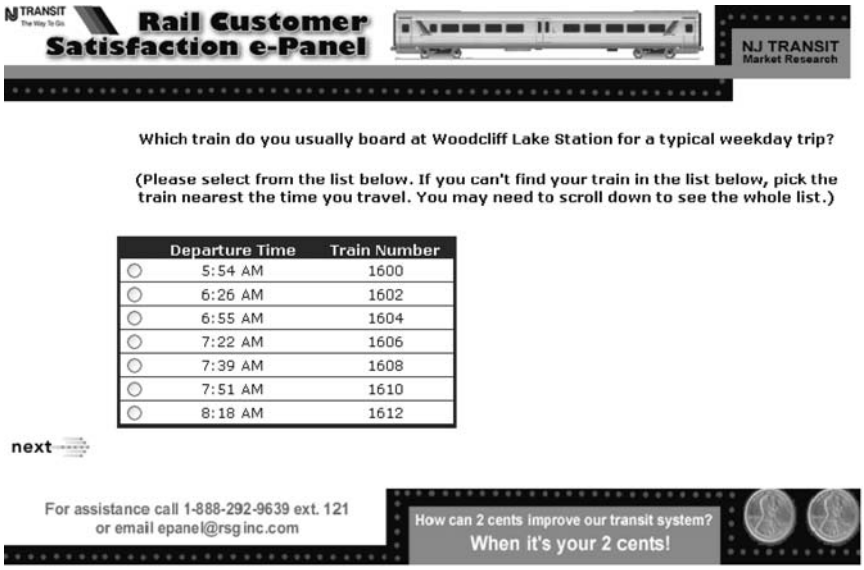



FIGURE 22 Schedule page in NJ TRANSIT Rail ePanel survey.

on their previous answers; and (3) to ask respondents "drill down" questions that requested a written explanation of rating differences between the previous and current survey.

Anchoring was a technique used in the second, third, and fourth survey waves to enable respondents to see how they previously rated their customer satisfaction attributes (Figure 23). Anchoring was used to ensure that a changed answer was in response to a change in service, and not because the respondent had forgotten how they had previously rated the service. Respondents were focused on the change in service, reducing the random error in the measurement of this change.

### Drill Down Questions

"Drill downs" are open-ended questions that were asked to determine the reasons for a respondent's change in

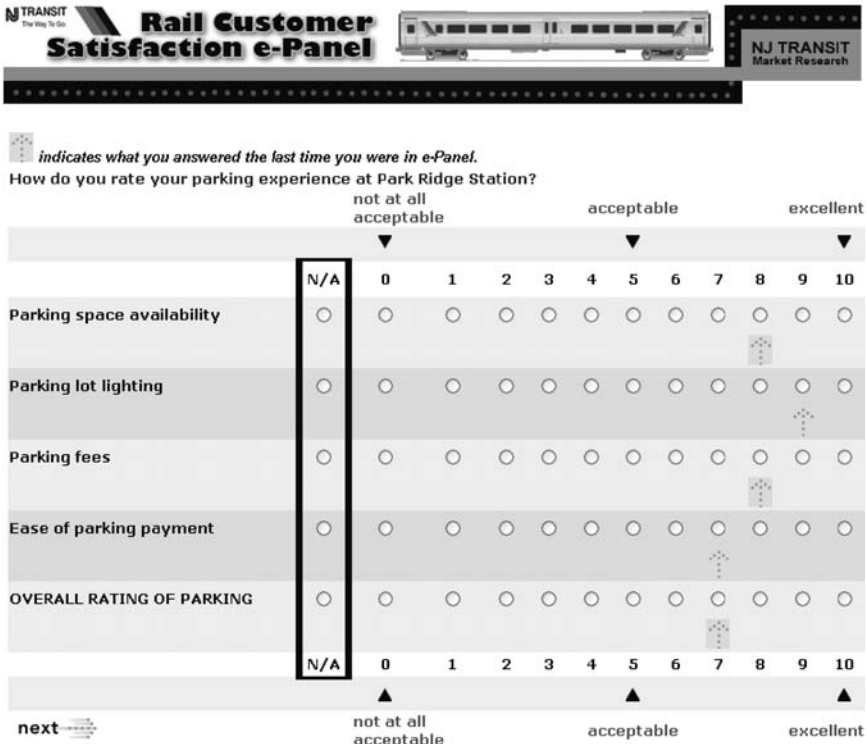



FIGURE 23 Example screen showing "anchoring" functionality: Dotted arrows indicate rating given in previous survey wave (NJ TRANSIT).

satisfaction ratings. Drill downs provided the unique longitudinal ability to ask respondents a qualitative question that is directly related to a changed rating score. The differences between the 65 satisfaction scores from each respondent's previous survey and their current survey were calculated and the 10 largest differences in satisfaction scores were determined (differences could be both positive and negative; therefore, absolute value was used). If there were ties, then enough satisfaction questions to obtain up to 10 were randomly selected. If there were fewer than 10 differences (i.e., if the respondent did not change their answer in 10 or more questions from their previous survey), then only those differences that did exist for that respondent were shown. Once the 10 questions with the highest absolute differences were determined, respondents were asked why they had changed their answers to these questions using open-ended comment boxes (Figure 24). Again, changes could be either positive or negative, as NJ TRANSIT wanted to understand both what is performing and what needs improvement.

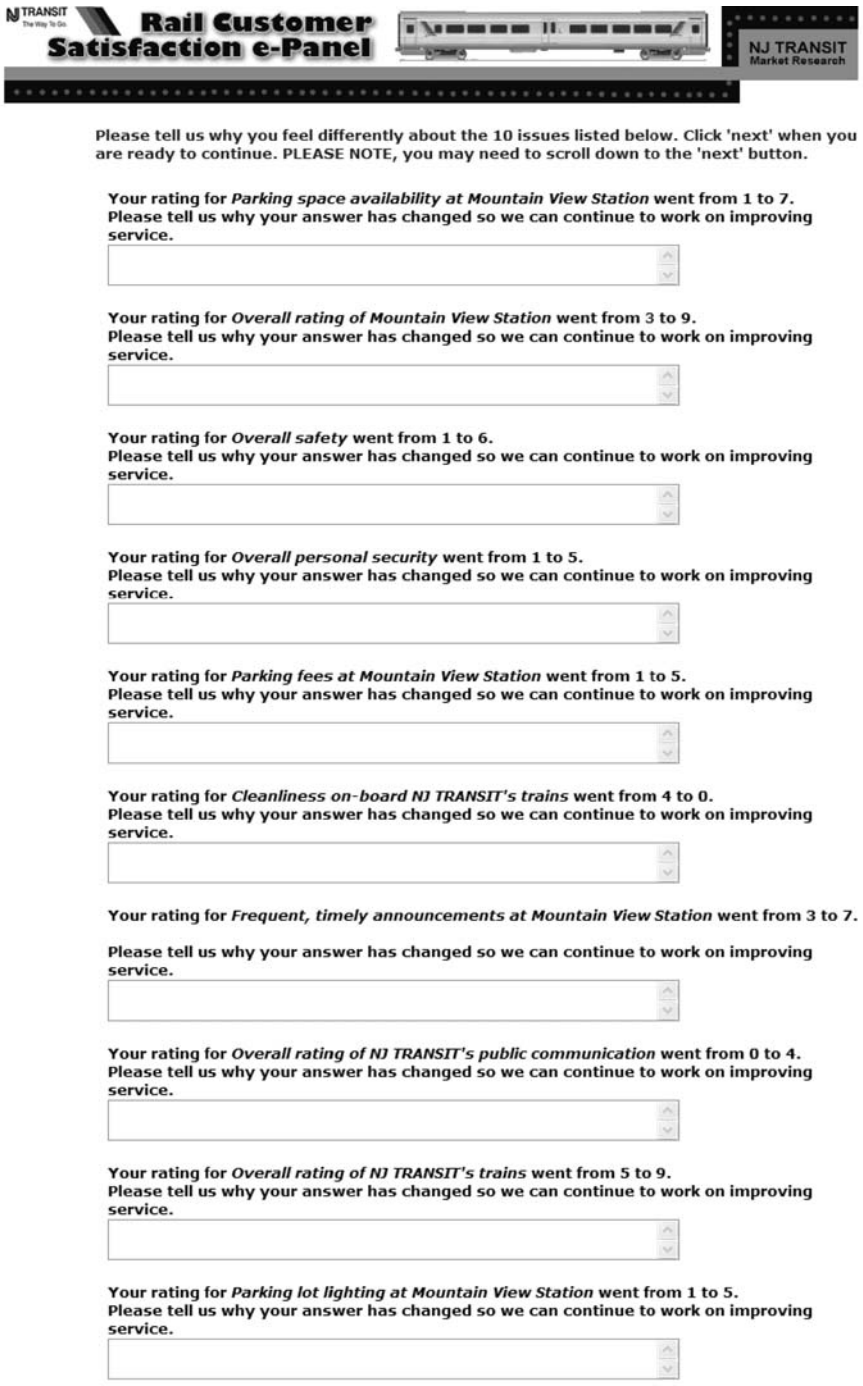



FIGURE 24 Drill down questions screen in rail ePanel Survey (NJ TRANSIT).

### Conclusion

Web-based longitudinal panel studies provide timely, statistically robust, and relevant data for customer satisfaction studies. They can use innovative techniques to minimize respondent fatigue and attrition and can provide valuable data to customer-oriented transportation service organizations. NJ TRANSIT was able to implement actions directly in response to the results of the feedback from the ePanel study. Specific actions included impetus for the "back to basics" campaign and ensuring seating availability for overcrowded trains.

## METROLINK RIDER POLL, LOS ANGELES, CALIFORNIA

The Southern California Regional Rail Authority's Metrolink Rider Poll is comprised of Metrolink riders who have volunteered to participate in a longitudinal research panel. The Metrolink Rider Poll, which was created in 2001, tracks Metrolink customer satisfaction and travel behavior through several survey waves over time, utilizing both web-based and telephone methods of data collection. Participants are recruited through the Metrolink website. To ensure that the panel composition is proportionally representative of Metrolink ridership, onboard survey and customer data are sometimes used to target new and infrequent riders for recruitment.

The purpose of this rider panel was not to replace, but to supplement other ongoing research programs, such as the biennial onboard survey. Specifically, Metrolink wanted to utilize several distinct advantages the web-based research panel design offers.

First, the online, longitudinal panel affords Metrolink the opportunity to survey riders who have stopped using their service. Metrolink can therefore examine reasons why riders decrease or stop using the service and the factors that may contribute to the decision. Additionally, the online panel gives Metrolink access to a constant group of participants to include in focus groups and studies of specific ridership segments and niche markets. The online panel also ensures rapid data collection and analysis. This is reflected in Metrolink's decision to conduct a fifth wave of the survey in Spring 2005 following the January 2005 derailment and the Spring 2005 on-time performance problems to help determine the impact on ridership decisions. Metrolink also takes advantage of web-based surveys as an efficient way to collect natural language data: comments and opinions expressed in the respondents' own words can be valuable for understanding changes in rider behavior. The anonymity associated with filling out a web-based survey also reduces the social desirability bias and allows text analysis to identify underlying factors and associations. Open-ended questions and comment boxes have become a part of all Metrolink web-based surveys and help improve the design of future surveys. Finally, Metrolink uses its longitudinal research panel for the cost-effective implementation of split sample research designs to test different versions of the survey instrument. Metrolink uses this method to test new wording or the format of survey questions, or to reduce the length of the survey each respondent is asked to complete.

Each wave of the Metrolink Rider Poll consists of a set of tracking questions that monitor changes in usage characteristics and perception over time. Question topics include:

- Frequency of usage,
- Fare media usage,
- Satisfaction ratings (both overall and item satisfaction),
- Loyalty measures, and
- Safety awareness.

Sample screenshots showing survey questions on the Metrolink line used, satisfaction with the service, and a follow-up question comparing the respondent's impression of Metrolink's current service with that of a year ago can be seen in Figure 25.

Each survey wave also contains one or more sections with questions related to current issues and areas of interest to other departments within the agency. The 2003 survey wave featured a range of psychographic and attitudinal questions about commuting to support market segmentation and mode choice analysis. The same questions were also used in a survey of non-riders, which allowed Metrolink to better understand motivations behind mode choice and to contrast riders and non-riders based on their perceptions of commute modes.

Another example of special issues studied in Metrolink's web-based panel surveys is a study of rider preferences for electronic signage. That survey took advantage of the web-based survey's capabilities to display photographs and illustrations to help the respondent evaluate proposed concepts.

## TRI-COUNTY METROPOLITAN TRANSPORTATION DISTRICT OF OREGON INTERACTIVE MAP STUDY

TriMet, the municipal corporation that provides public transportation to the three counties in the Portland, Oregon, metropolitan area (Figure 26), conducted a "pulse-taking" study in July and August of 2005 on the functionality of the TriMet website's Interactive Map. The TriMet Interactive Map first went live in August 2003 and is considered an integral part of trip planning on the TriMet website. TriMet's Interactive Map study in 2005 was intentionally designed to be offered to a small population to acquire voluntary feedback from customers on the Interactive Map for planning and directional purposes. The results from the survey were not intended to direct a complete website or Interactive Map redesign.

The purpose of the TriMet survey was to gain customer feedback regarding the TriMet Interactive Map and to determine if the map contained any severe flaws that required immediate correction. Consequently, TriMet sought to gather

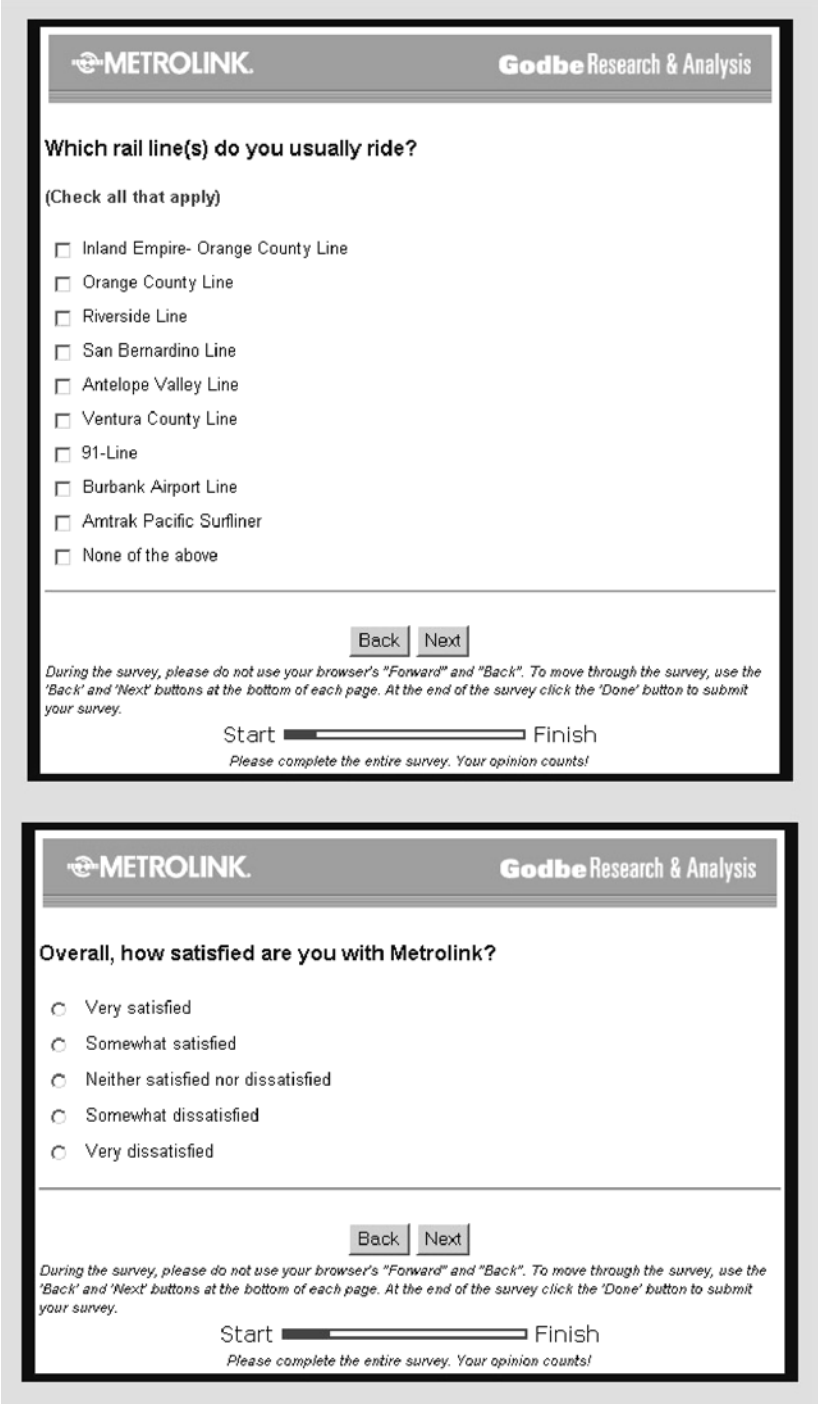



FIGURE 25 Sample screenshots from the Metrolink rider poll online survey (Southern California Regional Rail Authority) (*continued on next page*).

from survey respondents their purpose for visiting the TriMet website, their success in finding what they were looking for, their ease or difficulty in doing so, any problems encountered on the website, their use of the Interactive Map, and their loyalty and use of TriMet.

The Interactive Map survey was hosted by SurveyMonkey.com, and 210 respondents completed the voluntary survey for TriMet covering the period from July 25, 2005, through August 29, 2005 (Figure 27). The survey respondents were recruited by displaying a static web link at the top of the Interactive Map webpage, which led to a pop-up survey for respondents to complete. TriMet originally intended to have the survey appear or pop up automatically when a user of the website exited the Interactive Map page, but was unable to implement this owing to the additional technological and logistical constraints. For future surveys, TriMet will maintain the static web link, which leads

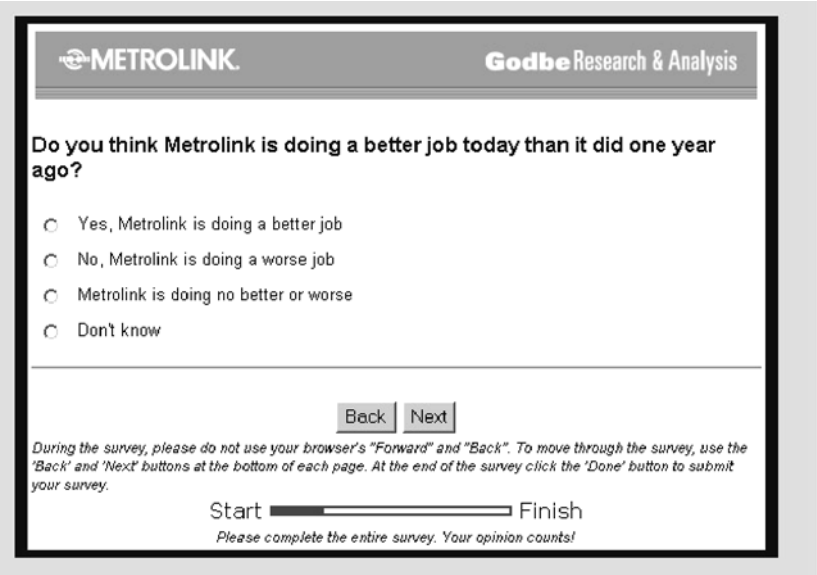



FIGURE 25 Sample screenshots from the Metrolink rider poll online survey (Southern California Regional Rail Authority) (*continued*).

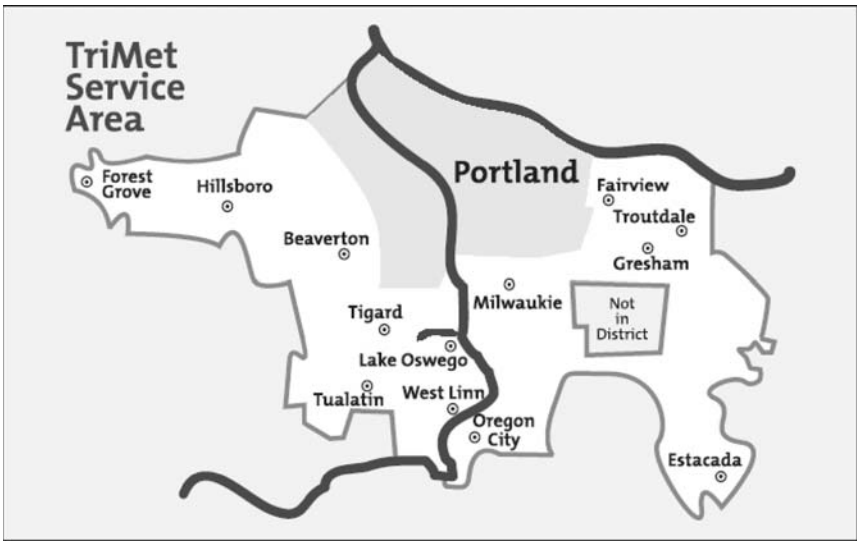



FIGURE 26 TriMet service area, Portland, Oregon.

to a pop-up survey to ensure comparable results between studies.

More than half of the study respondents (58%) indicated that they wanted additional features available on the Interactive Map. Of these, approximately two-thirds (62%) were respondents who did not find the information they were seeking while using the Interactive Map. Many respondents requested specific additional features, some of which were unavailable and some of which were present but were missed.

The TriMet Interactive Map study results indicated that, although not perfect, the map meets the information needs of many visitors to the TriMet website. Despite this, customers have not hesitated in suggesting improvements to the Interactive Map, some of which are possible, some of which are not, within the current system and technology.

Of the improvements to the Interactive Map where changes are feasible, TriMet aims to create a simplified map with greater clarity, less color, and more detail. Additionally, TriMet proposes to have clear help indicators to guide website users to the information they seek. Lastly, although the TriMet Interactive Map study did result in an initial look at customers' experience using the Interactive Map, it was recommended that TriMet undertake an in-depth study.

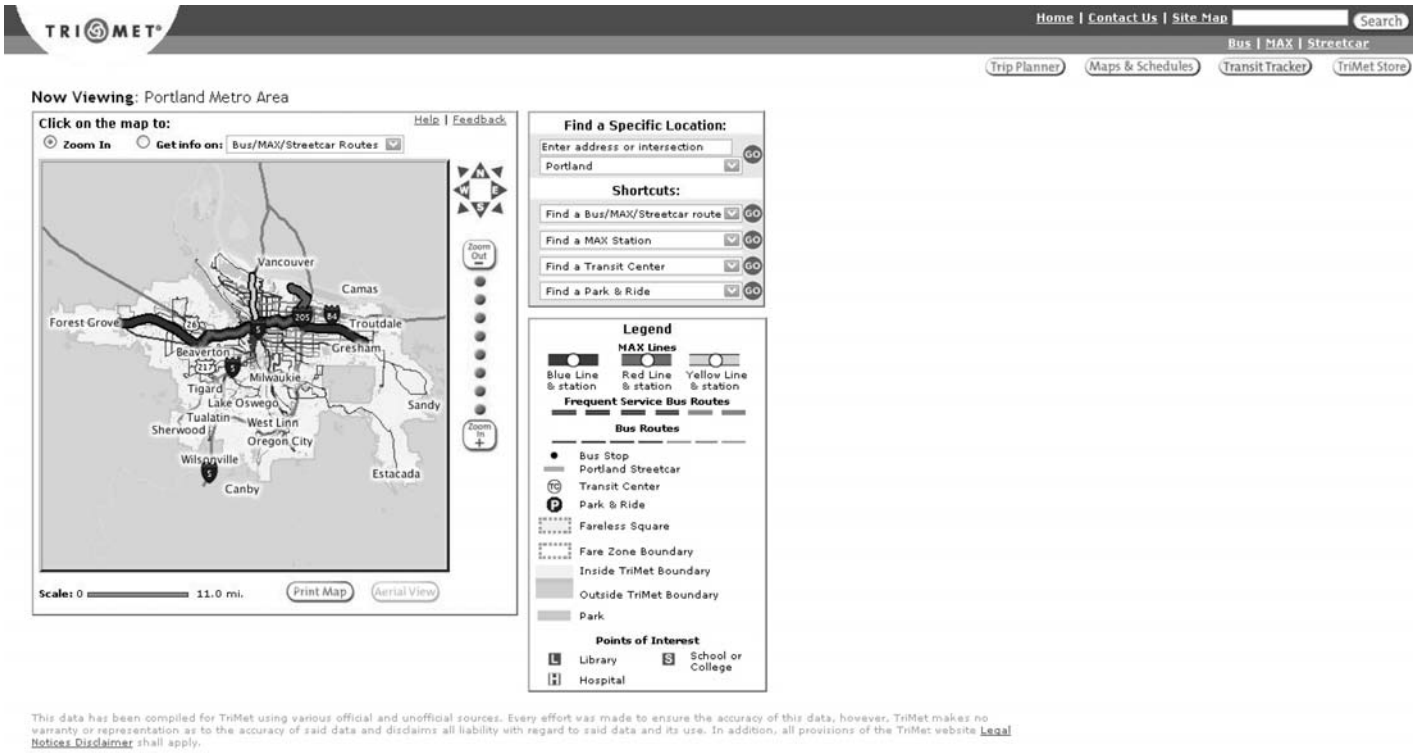



FIGURE 27 TriMet Interactive Map screen shot.

CHAPTER SEVEN

# CONCLUSIONS

A number of conclusions and findings were derived from the writing of this synthesis. First, transit researchers are conducting their research in ways that indicate foresight and thoughtfulness. Specifically, transit researchers are already implementing many of the successful practices described in this report, such as:

- Starting simply with web-based surveys to learn the differences between such surveys and other survey methods.
- Attempting to compile databases of e-mails from customers and potential customers to use as a sampling source for research.
- Applying web-based survey methods in a multi-method survey environment to improve response rates by providing response alternatives and to enable transit researchers to gain the benefits of web-based survey data and techniques.
- Researching the issue of coverage error and trying to minimize sampling bias in their studies.
- Remaining cautious but optimistic about including web-based surveys in their research programs as web-based survey methods and the Internet mature.

Although web-based surveys have already made some inroads into the culture of transit research, it appears that use of web-based surveys will become more significant in transit research in the next few years. Based on the survey conducted for this synthesis, only 39% of researchers indicated they are conducting web-based research. However, as noted in the report, 70% of those who are *not* conducting research believed that they probably would be doing so within the next two years. Therefore, it is still early for web-based surveys in transit; however, in the near future, it appears web-based survey methods will both be used by a significantly larger proportion of transit researchers and likely be used more often and more prominently by researchers who are currently using web-based surveys.

Owing to the likely increase in the use of web-based surveys, a major conclusion from this synthesis is that transit researchers should be measuring the Internet penetration among their target populations so that coverage error can be understood and mitigated.

Another conclusion, along with coverage measurement, is that transit agencies and other transit researchers should be collecting databases of target population e-mail addresses, particularly those of current riders. Developing a representative sample database of riders and potential riders in the transit agency's geographical area combined with the strengths of web-based survey methods can give transit researchers powerful options to conduct effective research quickly and inexpensively.

Web-based surveys have limitations as well as strengths, as do all survey methods. Therefore, the strengths and limitations of all applicable survey methods should be weighed together when undertaking transit research. For example, although web-based surveys have more coverage error compared with telephone surveys, they generally have better nonresponse error than telephone surveys. Both types of errors should be considered when conducting research. Furthermore, survey methods can be used in conjunction with each other to ensure the best research possible. For example, using targeted web-based surveys for certain hard-to-reach populations such as high-income, busy professionals, while using other survey methods to reach other populations in the sampling frame, is often beneficial to the study and still cost-effective.

Ideas for further research that have been generated through this synthesis effort include understanding clearly how much more effective it is to add an additional survey method to a study and under what conditions. Whereas adding an additional survey method can be more convenient for respondents of paper surveys, the additional cost of adding other survey methods to a study may or may not be worthwhile; therefore, research in this area could be quite interesting.

Another issue that has been difficult to quantify is the effect of spam filters on survey invitations. It would be helpful to research how to avoid spam filters and to understand what types of populations are likely to block survey invitations and whether this generates a problematic nonresponse bias.

The issue of establishing credibility using web surveys is another topic worthy of future research. Research into how to protect potential respondents' information so that they are assured that their data will be transmitted securely, kept confidential, and not sold to third parties is very important to enhance the credibility of web-based research. The ability to prove to respondents that the survey agency requesting their participation is a legitimate organization and not a front for some sort of scam is also critical. Some of these credibility

issues were raised in this synthesis; however, further research could be helpful to cover this topic more comprehensively.

Finally, the topic of web-based surveys in transit contains many issues that this synthesis has been able to identify and define, but only to a certain level. If there is interest in the transit community, developing a very detailed and comprehensive tool kit for exactly how to develop a web-based research program could be undertaken as a future research endeavor.

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# GLOSSARY

Anchoring—technique used to enable respondents to see how they previously responded to the same question.

Branching—technique used to direct respondents to specific subsequent questions depending on how they responded to an initial question.

Cascading style sheets—language to describe the presentation of a web-based document (i.e., colors, fonts, layout) enabling the separation of the document content from the presentation, thereby improving accessibility and flexibility while reducing complexity and repetition in structural content.

Commuter sheds—patterns (often in the form of geographic information system plots) of home originations for the journey to work to a particular location.

Convenience sampling—sample where the respondents are selected based on the convenience of access and availability for the researcher.

Coverage error—error that results when every unit in the population does not have a known, non-zero chance of being included in the sample.*

Cross-sectional panel—panel comprised of a subset of the population at one point in time.

E-mail blacklist—list of e-mail addresses that have been identified by a blacklist organization as sending unwanted or otherwise abusive e-mail.

E-mail sender authentication—tool to help verify the Internet domain in an e-mail sender's address, and thereby verify the sender's identity.

Fare media—non-cash transit fare payment products.

Geocoding—process of assigning geographic coordinates such as longitude and latitude to street addresses and other points and features. With geographic coordinates, the features can then be mapped and entered into geographic information systems.

Geographic information systems (GIS)—systems for creating and managing spatial data and associated attributes.

Geo-location—science of determining geographic location.

Heuristic—technique designed to solve a problem, providing a good solution to a simpler problem intersecting with the solution to a more complex problem.

Intercept surveys—surveys conducted in person to randomly selected respondents at a site-specific location.

Item nonresponse—error caused by respondents skipping questions or failing to complete a questionnaire.

Longitudinal panel—panel observed at intervals over long periods of time.

Multi-method administration—survey approach incorporating multiple methods, such as surveys administered through the web, telephone, on paper, or through in-person interviews.

Multi-method recruitment—survey respondent recruitment strategy incorporating multiple recruitment sources such as e-mail, telephone, in-person, mail, etc.

Panel—already collected sample source.

Panel survey—group of individuals or businesses that are surveyed repeatedly.

Point-in-polygon—determination whether a given point in the plane, such as a respondent's address, lies inside, outside, or on the boundary of a polygon, such as a transportation analysis zone.

Psychographic questions—questions designed to characterize respondents based on attitudes, interest, behavior, and preferences to create detailed portraits of the respondents.

Sample—all units of the population that are drawn for inclusion in the survey.*

Sample bias—error that arises where data are skewed when the sample is not representative of the target population.

Sample frame—list from which a sample is to be drawn to represent the survey population.*

Sample population—all of the units (individuals, households, and organizations) to which one desires to generalize survey results.*

Sampling error—result of collecting data from only a subset, rather than all, of the members of the sample frame.*

Screener—part of a survey that establishes the criteria for respondents.

Sender authentication—program similar to a bonded sender program whereby one applies for approval, and once e-mail practices have been audited and accepted, applicant is added to a whitelist, allowing e-mail messages to pass by spam filters.

Split sample—sample split into two independent groups for purposes of comparison.

Stated preference survey—survey designed to measure the relative importance of different attributes to understand consumer preferences.

Survey nonresponse error—error that represents a failure to obtain information from elements of the population that were selected.

Target population—population that the researcher wants to survey.

Total population sampling—survey of all the respondents in the sample frame.

Unit nonresponse—error caused by over- or under-representation of groups in the survey sample.

* Definitions adapted from Dillman, *Mail and Internet Surveys: The Tailored Design Method* (*1*).

# APPENDIX A

# Synthesis Survey

**Survey Introduction**

Welcome to this survey about how transit agencies are conducting customer survey research. TCRP has commissioned this study to understand how transit agencies are conducting survey research and whether or not they are using web-based surveys in their research.

This questionnaire will take approximately 30–50 minutes to complete.

Your answers will be confidential and will be used only for this study. Any sections of this survey that ask about your organization that are then used in the TCRP Synthesis Report will be submitted to you for your approval prior to publication.

Please click "NEXT" in the lower left corner of the screen to continue. If you need to return to a previous screen, use your browser's "Back" button.

If you fail to finish the survey in one sitting and need to come back to it later, simply click on the same e-mail link that brought you into this survey and you will be able to pick up right where you left off.

**Screener Questions**

1) What type of organization do you work for?
   Public transit agency ___
   Consultancy ___
   University ___
   Metropolitan planning organization ___
   Transportation management association ___
   Vanpool/carpool provider ___
   State administrators of FTA programs (elderly and disabled, JARC, rural) ___
   Other, please specify: _____

2) Does your organization conduct surveys related to transit use and/or transit planning?
   Yes ___
   No (terminate) ___

**Survey Inventory Questions**

3) How often does your organization conduct the following types of customer research surveys?

| | More than 4 times per year | Two to four times per year | Once per year | Less than once per year but more than every 5 years | Less than every 5 years | Never | Don't know |
|---|---|---|---|---|---|---|---|
| Origin–destination surveys | | | | | | | |
| Customer satisfaction surveys | | | | | | | |
| Mode choice (demand forecasting) surveys | | | | | | | |
| Other planning surveys | | | | | | | |
| Other, please specify: | | | | | | | |

4) Does your organization have customer panel surveys that you survey repeatedly?
Yes ___
No ___

5) (If yes to Question 4.) Does your organization conduct *longitudinal* panel surveys; that is, the *same* survey *with the same people* conducted more than once?
Yes ___
No ___

6) Does your organization conduct *repeated cross-sectional* surveys; that is, the same survey conducted more than once *but with a different sample each time*?
Yes ___
No ___

7) (Cycle through all selected survey types from Question 3 up to a maximum of three types.)

For your most recent <insert survey type> survey:

| Select All That Apply | What riders/users of the following modes were recruited for this survey? | Were there any questions in the survey about the following modes? |
|---|---|---|
| Bus | | |
| Subway/rapid rail | | |
| Commuter rail | | |
| Light rail | | |
| Auto | | |
| Survey did not address mode issues | | |
| Other, please specify: | | |

8) How were respondents recruited for your most recent <insert study type>? Please select all that apply.
In person recruit via intercept at stations and/or stops ___
In person recruit via intercept on board transit vehicles ___
Telephone recruit ___
Intercept at public locations other than transit-related ___

E-mail recruit ___
Mail recruit ___
In person recruit via intercept on roadways, rest stops, intersections, or toll plazas (*if selected auto in Question 7*) ___
Other, please specify: _____

9) How was sampling conducted for your most recent <insert study type>?
No sampling, the whole population was surveyed (i.e., every bus trip during the course of the day was sampled and every transit rider was asked to take the survey on those buses). _____
Random sampling was conducted. ___
Systematic sampling was conducted (i.e., sampling every *n*th customer). ___
Convenience sampling was conducted (i.e., sampling anyone who could easily participate in the study). ___
Other sampling was conducted. Please specify: _____

10) Were any incentives provided to respondents for your most recent <insert study type>?
No incentives
Yes, a lottery was conducted and prizes were: _____
Yes, each respondent received an incentive of: _____
Other, please specify: _____

11) (If incentives provided) How effective were incentives for your most recent <insert study type>?
Incentives increased our response rate 1–25% ___
Incentives increased our response rate 25–50% ___
Incentives increased our response rate 50–75% ___
Incentives increased our response rate more than 75% ___
Incentives don't help ___
I don't know ___

12) How was your most recent <insert study type> administered? Please select all that apply.
Telephone ___
Paper (e.g., in-person, hand out, by mail, etc.) ___
Computer-based, but not on Interent (e.g., in-person or via disk-by-mail) ___
Online web survey ___
Other, please specify: _____

13) What was the response rate of your most recent <insert study type>?

| What was the response rate? | % | Don't know |
|---|---|---|
| | Open end | |
| Please describe how the response rate was calculated or why it could not be calculated | | |

14) Please rate the data set that resulted from your most recent <insert study type>.

| | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree |
|---|---|---|---|---|---|
| The survey data set was "clean" (free of internal inconsistencies and miscoded responses) | | | | | |
| Most respondents who completed the survey did so with nearly every question answered | | | | | |

15) Did you weight the data for your most recent <insert study type> administered? If yes, select all that apply.
No ___
Yes, based on ridership and/or traffic ___
Yes, based on demographics ___
Yes, based on other factors, please specify: _____

16) How successful was your <insert study type> survey?
Very successful ___
Somewhat successful ___
Neither successful nor unsuccessful ___
Somewhat unsuccessful ___
Very unsuccessful ___

17)

| If Bottom 3 box on success question: | Open end |
|---|---|
| Were there any problems or issues with your <insert survey type> survey? | |

18)

| If used multi-method: | Open end |
|---|---|
| Why did you choose to administer using more than one method? | |

19)

| | Open end |
|---|---|
| How did your organization use the research it conducted on this survey? | |

20) Who were your most recent <insert study type> survey results presented back to?
General public ___
Customers ___
Constitituents ___
Internal clients/management ___
Faculty/staff/students ___
Other, please specify: _____
Research results were not presented ___

**General Web Survey Debrief**

21) (If no web surveys but does conduct other surveys.)

| | Open end |
|---|---|
| Based on your answers so far in this survey, it appears that your organization does not conduct web-based surveys. What do you feel are the reasons your organization does NOT conduct web-based surveys? | Primary reason |
| | Other reasons |

22) (If no web surveys but does conduct other surveys.) How likely do you feel your organization is to begin using web-based customer research within the next two years?
Very likely ____
Somewhat likely ____
Neither likely nor unlikely ____
Somewhat unlikely ____
Very unlikely ____

23) (If conducts web surveys.)

| | Open end |
|---|---|
| What are the reasons your organization conducts web-based surveys? | Primary reason |
| | Other reasons |

24) (If conducts web surveys)

| | Open end |
|---|---|
| What do you think are the disadvantages of web-based surveys? | Primary disadvantages |
| | Other disadvantages |

25) (If conducts web surveys.)

| | Open end |
|---|---|
| What advice would you offer other transit or transit-related organizations who are considering web-based customer surveys? | Primary advice |
| | Other advice |

**Specific Web Survey Drilldown**

26) (If conducts web surveys, select one of the web-based surveys from the first exercise. Ensure a good mix of survey types across respondents.) For the next set of questions, please focus now on <insert survey type> that you mentioned earlier was administered via the web <insert other methods if any from the selected survey>.

27) (If conducts web surveys and if consultant from Question 3.)

| | Open end |
|---|---|
| For whom did you conduct the research for your web survey? | |

28) (If conducts web surveys.)

| | Open end |
|---|---|
| For what region was the web survey administered and where was the study located? | Region |
| | Study location |

29) (If conducts web surveys.)

| | Open-end |
|---|---|
| What were your objectives in administering the web survey? | Primary objective |
| | Other objectives |

30) (For web survey selected from first exercise.) How was the web survey designed?
Designed in-house using web page layout software ___
Designed with an online survey development tool (e.g., SurveyMonkey) ___
Contracted out to a consulting or web development firm ___
Other, please specify: _____

31) (For web survey selected from first exercise.) How and where was the web survey hosted? Please select all that apply.
Hosted on your own organization's computers ___
Hosted with a consulting or web development firm involved in developing the survey ___
Hosted with a web-hosting firm (e.g., Rackspace.com) ___
Hosted with a survey provider (e.g., SurveyMonkey.com) ___

Other, please specify: _____

32) (For web survey selected from first exercise.) What technologies were used to create and conduct the web questionnaire? Please select all that apply.
ASP ___
ASP.net ___
PHP ___
Perl ___
MS SQL ___
MySQL ___
Oracle ___
MS Access ___
Java ___
JSP ___
Cold Fusion ___
Third party website (e.g., SurveyMonkey) ___
Other, please specify: _____

33) (For web survey selected from first exercise and if that survey is not just web-based.) How did the web version of this questionnaire compare with other versions of the questionnaire?

| | Very Similar | Similar | Neither Similar nor Different | Different | Very Different |
|---|---|---|---|---|---|
| Question ordering | | | | | |
| Question wording | | | | | |
| Page format | | | | | |
| Use of skip patterns | | | | | |
| Other: | | | | | |

34) Please provide the following for just the web portion of this survey:

| | | |
|---|---|---|
| How long was the survey in field? | | Don't know |
| How many respondents were invited/recruited? | | Don't know |
| How many surveys were completed? | | Don't know |
| How many surveys were incomplete? | | Don't know |
| What percentage of your total responses were web-based? | | Don't know |

35) (For web survey selected from first exercise.) What support, if any, did you provide your web respondents? Select all that apply.

Toll-free number to talk with a support person ___
Support via e-mail ___
Link with FAQs (frequently asked questions) ___
Links with context-specific help directly on the web page ___
Other, please specify: _____
None of the above ___

36) (For web survey selected from first exercise.) Do you follow a certain survey protocol when conducting your customer research? For example, do you use Dillman's Total Design Method or a different protocol?
Yes, please explain: _____
No ___

37) (For web survey selected from first exercise.) How did you invite potential respondents to take the web survey? Select all that apply.
E-mail with a live web link ___
E-mail with a web address to paste into a web browser ___
Web link on website ___
Mail piece ___
Telephone call ___
Other, please specify: _____

38) (For web survey selected from first exercise.) If known, what percentage of your e-mail invitations was undeliverable for this study?
_____%
Don't Know ___

39) (For web survey selected from first exercise.) Did you use online geocoding in the web survey?
Yes, the data were coded by latitude and longitude ___
Yes, the data were coded by zip code ___
Yes, the data were coded by county ___
Yes, the data were coded in another manner. Please describe: _____
_____
No ___

40) (For any web survey they may have done.) Have you used online geocoding in any other web surveys you have conducted?
Yes, please describe: _____
No ___

41) (If e-mail used.)

| | Open end |
|---|---|
| What, if anything, are you doing to ensure your e-mail invitations are not considered spam? | |

42) (For web survey selected from first exercise.) Did you remind potential respondents to take your web survey?
Yes, please specify the number of reminders: ___
No ___

43) (For web survey selected from first exercise and if yes to reminders.) What types of reminders did you use? Please select all that apply.
E-mail ___
Telephone ___
Mailed pieces ___
Other, please specify: _____

44) (For web survey selected from first exercise and if yes to reminders.) Do you know the increase in response rate after each reminder?
Yes, ____% increase in response rate due to reminders
No, I don't know ___
Other general comments: _____

45) (For web survey selected from first exercise and if survey was weighted.) You said that you used weighting on your final data set. Please explain how and why you weighted these data.

| | Open end |
|---|---|
| Why used weighting | |
| How weighting was done | |

46) (For web survey selected from first exercise.) How much did this survey cost, in total, to conduct including in-house and third party costs?

| | $ | Don't know |
|---|---|---|
| Total cost | | |
| In-house costs (FTE or $) | | |
| Third party costs ($) if applicable | | |

47) (For web survey selected from first exercise.) For the costs above, please indicate those that were part of the study. Select all that apply:
Hosting costs
Recruitment costs
Incentive costs
Other costs, please specify: _____

48)

| If conducts web surveys | Open end |
|---|---|
| What do you consider the three most important "best practices" for conducting web-based research? | Most important best practice |
| | Second most important best practice |
| | Third most important best practice |

49)

| If web-based survey and conducts panel studies | Open end |
|---|---|
| Please describe your web-based panel study. If known, please discuss your attrition rates, whether you replenished your sample, and anything else you might want to describe about this study. | |

**Organization's Web Experience/Knowledge/Willingness**

50) Do you know what percent of your customers have Internet access?
Yes, ____% of customers have Internet access (both at home and at work)
Yes, ____% of customers have Internet access at home
Yes, ____% of customers have Internet access at work
No, I don't know ___

51) How else does your organization use the web? Select all that apply.
Intranet ___
Website ___
Trip planner ___
E-commerce ___
Internal research (e.g., human resources surveys) ___
Other, please specify: _____

52) How would you rate your organization on the following topics? (These ratings will *not* be tied to your organization, but will only be tabulated in general.)

| | Very Good | Good | Neutral | Poor | Very Poor |
|---|---|---|---|---|---|
| Promotes web-based customer research | | | | | |
| Promotes web/Internet initiatives (other than web-based customer research) | | | | | |
| Promotes customer research | | | | | |
| Promotes communication of research results to customers | | | | | |

**Other Contacts**

53) Have you been involved with or benefited from customer web-based surveys that were conducted by other organizations that affect your transit research (e.g., surveys by Metropolitan Planning Organizations, Regional Planning Commissions, sister agencies, Departments of Transportation, etc.)?

Yes ___
No ___

54) (If yes to Question 53.) Can you provide a brief description of that research, how your agency was involved or benefited, and contact information for someone responsible for that study?
Description: _____
Name: _____
Title: _____
Organization: _____
Address: _____
Phone: _____
E-mail: _____

55) Was a consultant or some other third party an integral part of any survey research effort you just described in this survey?
Yes ___
No ___

56) (If yes to Question 55.) Can you provide the contact information for the person/organization who/that helped you with your research so that we can see if they would also like to be part of this study?
Role played by this person on your research:
Name: _____
Title: _____
Organization: _____
Address: _____
Phone: _____
E-mail: _____

57) Thank you for your input on this survey. We may want to follow up with you on some of the issues presented in the survey. May we please have your full and up-to-date contact information?
Name: _____
Title: _____
Organization: _____
Address: _____
Phone: _____
E-mail: _____

58) If you have any reports from your web survey work described here (or other web surveys that were not asked about), please e-mail: tcrpwebsynth@surveycafe.com with the report or the report description.

**This concludes our survey. Thank you very much for participating**.

# APPENDIX B

## Agencies Responding to Survey

Ann Arbor Transportation Authority, Service Development
Atlanta Regional Commission, Modeling Management
Center for Urban Transportation Research (University of South Florida, Tampa), Transit Program
Champaign–Urbana Mass Transit District
Chicago Department of Transportation, Planning Department
Chicago Transit Authority, Market Research Group
City Link (Peoria, Illinois)
Eastern Contra Costa Transit Agency (Antioch, California)
Fairfax Connector (Fairfax County, Virginia), Transportation Marketing Section
FHWA (Seattle Washington), Community Planning
Fresno Area Express (Fresno, California), Planning Division
Geostats (Atlanta, Georgia)
Los Angeles Metropolitan Transit Authority, Market Research
METRO Transit (Oklahoma City, Oklahoma), Marketing Department
Metrolink (Orange County, California), Market Research Department
Metro–North Railroad (New York, New York), Market Research Department
Metropolitan Transit Authority (New York, New York), Market Research
Milwaukee County Transit System
New Jersey Transit, Market Research Department
New York City Transit, Market Research Department
North Jersey Transportation Planning Authority, Inc., Corridor Studies and Project Planning
Pierce Transit (Lakewood, Washington), Marketing Department
Ride On Montgomery County (Montgomery County, Maryland), Marketing Department
San Francisco Bay Area Rapid Transit, Market Research Department
South Florida Regional Transportation Authority, Marketing and Customer Service
Southeastern Pennsylvania Transportation Authority, Technical Analysis and Research
SR Concepts (Charleston, South Carolina)
TranSystems Corporation (Boston, Massachusetts)
Triangle Transit Authority (Raleigh, Cary, Durham, North Carolina)
TriMet (Portland, Oregon), Marketing Information Department
URS Corporation
Washington Metropolitan Area Transit Authority (Washington, DC), Market Research

# APPENDIX C

# Tabulations for Synthesis Survey

## Screener Section

### Type of organization

| | | Frequency | Percent |
|---|---|---|---|
| | **Public transit agency** | 24 | 68.6 |
| | **Consultancy** | 4 | 11.4 |
| | **University** | 2 | 5.7 |
| | **Metropolitan planning organization** | 3 | 8.6 |
| | **Other** | 2 | 5.7 |
| | **Total** | 35 | 100 |

### Other types of organizations

| | | Frequency | Percent |
|---|---|---|---|
| | **Federal government** | 1 | 50 |
| | **Transportation department city government** | 1 | 50 |
| | **Total** | 2 | 100 |

## General Survey Inventory Section

### Frequency of conducting customer research studies

| | More than 4 times per year | | 2 to 4 times per year | |
|---|---|---|---|---|
| | **Count** | **%** | **Count** | **%** |
| **Origin–destination surveys** | 3 | 8.60 | 4 | 11.40 |
| **Customer satisfaction surveys** | 4 | 11.40 | 7 | 20.00 |
| **Mode choice surveys** | 2 | 5.70 | 3 | 8.60 |
| **Planning surveys** | 5 | 14.30 | 7 | 20.00 |
| **Other, please specify** | 5 | 31.30 | 2 | 12.50 |

### Frequency of conducting customer research studies (*continued*)

| | Once per year | | Less than once per year, but more than every 5 years | |
|---|---|---|---|---|
| | **Count** | **%** | **Count** | **%** |
| **Origin–destination surveys** | 4 | 11.40 | 6 | 17.10 |
| **Customer satisfaction surveys** | 5 | 14.30 | 11 | 31.40 |
| **Mode choice surveys** | 3 | 8.60 | 9 | 25.70 |
| **Planning surveys** | 11 | 31.40 | 4 | 11.40 |
| **Other, please specify** | 1 | 6.30 | 1 | 6.30 |

### Frequency of conducting customer research studies (*continued*)

| | Less than every 5 years | | Never | |
|---|---|---|---|---|
| | Count | % | Count | % |
| Origin–destination surveys | 11 | 31.40 | 7 | 20.00 |
| Customer satisfaction surveys | | | 7 | 20.00 |
| Mode choice surveys | 5 | 14.30 | 12 | 34.30 |
| Planning surveys | 4 | 11.40 | 4 | 11.40 |
| Other, please specify | 1 | 6.30 | 3 | 18.80 |

### Frequency of conducting customer research studies (*continued*)

| | Don't know | | Total | |
|---|---|---|---|---|
| | Count | % | Count | % |
| Origin–destination surveys | | | 35 | 100.00 |
| Customer satisfaction surveys | 1 | 2.90 | 35 | 100.00 |
| Mode choice surveys | 1 | 2.90 | 35 | 100.00 |
| Planning surveys | | | 35 | 100.00 |
| Other, please specify | 3 | 18.80 | 16 | 100.00 |

### Other types of surveys

| | | Frequency | Percent |
|---|---|---|---|
| | Employers, employees, product tests, marketing, etc. | 1 | 10.0 |
| | Household travel surveys, transit on-board surveys | 1 | 10.0 |
| | Interactive map studies | 1 | 10.0 |
| | Marketing evaluation | 1 | 10.0 |
| | New technology | 1 | 10.0 |
| | Policy and issue analysis | 1 | 10.0 |
| | Station evaluation, special issues, new offers/programs related to fares, metrocard, etc., panel survey, safety/security issues, communication materials copy testing, etc. | 1 | 10.0 |
| | Tracking, market share | 1 | 10.0 |
| | Various | 1 | 10.0 |
| | Various transportation issues | 1 | 10.0 |
| | Total | 10 | 100 |

### Organization conducts customer panel surveys repeatedly

| | | Frequency | Percent |
|---|---|---|---|
| | Yes | 8 | 22.9 |
| | No | 27 | 77.1 |
| | Total | 35 | 100 |

### Organization conducts longitudinal panel surveys

| | | Frequency | Percent |
|---|---|---|---|
| | Yes | 4 | 50 |
| | No | 4 | 50 |
| | Total | 8 | 100 |

### Organization conducts cross-sectional surveys

| | | Frequency | Percent |
|---|---|---|---|
| | Yes | 22 | 62.9 |
| | No | 13 | 37.1 |
| | Total | 35 | 100 |

## Origin–Destination (OD) Surveys

### Recruited riders/users for OD survey

| | | Count | Column (%) |
|---|---|---|---|
| Recruited riders/users for OD survey | Bus | 11 | 68.8 |
| | Subway/rapid rail | 2 | 12.5 |
| | Commuter rail | | |
| | Light rail | 1 | 6.3 |
| | Auto | 1 | 6.3 |
| | No mode issues in survey | 1 | 6.3 |
| | Recruitment not based on mode | 2 | 12.5 |
| | Other, please specify | 2 | 12.5 |

### Other modes recruited

| | | Frequency | Percent |
|---|---|---|---|
| | Airline | 1 | 50 |
| | All modes | 1 | 50 |
| | Total | 2 | 100 |

### Questions in OD survey about modes

| | | Count | Column (%) |
|---|---|---|---|
| Questions in OD survey about modes | Bus | 13 | 81.3 |
| | Subway/rapid rail | 2 | 12.5 |
| | Commuter rail | 2 | 12.5 |
| | Light rail | 1 | 6.3 |
| | Auto | 4 | 25 |
| | No mode issues in survey | 1 | 6.3 |
| | Recruitment not based on mode | | |
| | Other, please specify | 1 | 6.3 |

### Questions about other modes

| | | Frequency | Percent |
|---|---|---|---|
| | All modes | 1 | 100 |

### Recruited respondents for OD survey

| | | Count | Column (%) |
|---|---|---|---|
| Recruited respondents for OD survey | In person, via intercept at stations/stops | 5 | 31.3 |
| | In person, via intercept on board transit vehicles | 10 | 62.5 |
| | Telephone recruit | 4 | 25 |
| | Intercept at public locations other than transit-related | | |
| | E-mail recruit with clickable link | 1 | 6.3 |
| | E-mail recruit with web address to paste | | |
| | Web link recruit from website | | |
| | Mail recruit | 2 | 12.5 |
| | In person, via intercept at roadways/toll plazas | 2 | 12.5 |
| | Other, please specify | 1 | 6.3 |

### Other recruit method

| | | Frequency | Percent |
|---|---|---|---|
| | Variable message signs, press release, TMA newsletters | 1 | 100 |

### Sampling method

| | | Frequency | Percent |
|---|---|---|---|
| | No sampling, total population surveyed | 3 | 18.8 |
| | Random sampling | 9 | 56.3 |
| | Systematic sampling (every *n*th) | 2 | 12.5 |
| | Convenience sampling (anyone who would participate) | 1 | 6.3 |
| | Other sampling method | 1 | 6.3 |
| | Total | 16 | 100 |

### Other sampling method

| | | Frequency | Percent |
|---|---|---|---|
| | No sampling | 1 | 100 |

### Type of incentives

| | | Frequency | Percent |
|---|---|---|---|
| | No incentives | 12 | 75 |
| | Incentive for each respondent | 3 | 18.8 |
| | Other incentives | 1 | 6.3 |
| | Total | 16 | 100 |

### Incentive for each respondent

| | | Frequency | Percent |
|---|---|---|---|
| | $2 in advance letter and $5 per person with diary | 1 | 33.3 |
| | Free ride | 1 | 33.3 |
| | Promotional item | 1 | 33.3 |
| | Total | 3 | 100 |

### Other incentives

| | | Frequency | Percent |
|---|---|---|---|
| | A pen | 1 | 100 |

### Effectiveness of incentives

| | | Frequency | Percent |
|---|---|---|---|
| | Increased response rate 1–25% | 2 | 50 |
| | Don't know | 2 | 50 |
| | Total | 4 | 100 |

### Administered most recent OD survey

| | | Count | Column (%) |
|---|---|---|---|
| Administered most recent OD survey | Telephone | 3 | 23.1 |
| | Paper | 9 | 69.2 |
| | Computer-based, but not on Internet | | |
| | Online web survey | 1 | 7.7 |
| | Personal | 3 | 23.1 |
| | Other, please specify | | |

### Response rate percentage

| | | Frequency | Percent |
|---|---|---|---|
| | Don't know/not applicable | 9 | 56.3 |
| | 17 | 1 | 6.3 |
| | 20 | 1 | 6.3 |
| | 30 | 1 | 6.3 |
| | 40 | 1 | 6.3 |
| | 41 | 1 | 6.3 |
| | 60 | 1 | 6.3 |
| | 75 | 1 | 6.3 |
| | Total | 16 | 100 |

### Reason for no response rate

| | | Frequency | Percent |
|---|---|---|---|
| | % returned of a 100% sample | 1 | 20.0 |
| | 205,000 riders were offered surveys, 81,100 surveys were completed and returned. Refusals are included in base number. | 1 | 20.0 |
| | It depends on how the survey is conducted. If it is on-board paper O–D survey, the usual response rate is around 60%. If it is a personal/intercept interview the response rate is around 90%. | 1 | 20.0 |
| | Multiply recruitment rate by final completion rate to get total response rate. See documentation at: http://nhts.ornl.gov/2001/usersguide/chapter_4.pdf | 1 | 20.0 |
| | Nonresponders not counted | 1 | 20.0 |
| | Total | 5 | 100 |

**Survey data set was clean**

| | | Frequency | Percent |
|---|---|---|---|
| | Agree | 7 | 43.8 |
| | Neutral | 7 | 43.8 |
| | Disagree | 2 | 12.5 |
| | Total | 16 | 100 |

**Respondents completed nearly every question of survey**

| | | Frequency | Percent |
|---|---|---|---|
| | Strongly agree | 2 | 12.5 |
| | Agree | 7 | 43.8 |
| | Neutral | 6 | 37.5 |
| | Disagree | 1 | 6.3 |
| | Total | 16 | 100 |

**Weighted data for most recent OD survey**

| | | Count | Column (%) |
|---|---|---|---|
| Weighted data for most recent OD survey | Did not weight data | 6 | 46.2 |
| | Weighted based on ridership/traffic | 6 | 46.2 |
| | Weighted based on demographics | 1 | 7.7 |
| | Weighted based on other factors | | |

**Other factors**

| | | Frequency | Percent |
|---|---|---|---|
| | Ridership, by route, direction, time of day, day of week | 1 | 100 |
| | Total | 1 | 100 |

**Success of survey**

| | | Frequency | Percent |
|---|---|---|---|
| | Very successful | 4 | 25 |
| | Successful | 11 | 68.8 |
| | Neither successful nor unsuccessful | 1 | 6.3 |
| | Total | 16 | 100 |

**Types of problems/issues**

| | | Frequency | Percent |
|---|---|---|---|
| | Technical problems: The text overlapped for some browsers | 1 | 1 |
| | Total | 1 | 100 |

### Reason for administering survey with more than one method

| | | Frequency | Percent |
|---|---|---|---|
| | To encourage better interaction with customers | 1 | 33.3 |
| | To improve our response rate and targets covered | 1 | 33.3 |
| | We selected paper method in our last large O–D study since it included 24 different bus routes and doing personal interviews required more labor and time. When we do O–D surveys in 1 or 2 routes, we usually do personal interviews that require fewer persons. | 1 | 33.3 |
| | Total | 3 | 100 |

### How research from OD survey was used

| | | Count | Column (%) |
|---|---|---|---|
| How research from OD survey was used | Update origin–destination trip tables | 5 | 31.3 |
| | Define traveler markets by geography | 10 | 62.5 |
| | Determine trip purpose | 9 | 56.3 |
| | Determine trip frequency | 9 | 56.3 |
| | Determine distribution of station/stops used | 4 | 25 |
| | Determine distribution time-of-day facilities/system used | 6 | 37.5 |
| | Generate demographic profile of travelers | 3 | 18.8 |
| | Determine toll plazas/ramps used | | |
| | Determine proportion through vs. external to internal trips | 1 | 6.3 |
| | Other, please specify | 2 | 12.5 |

### Other purposes

| | | Frequency | Percent |
|---|---|---|---|
| | Fare analysis | 1 | 50.0 |
| | Survey still being conducted. The results will be used to understand primarily bus transit riders' park and ride needs, other transit issues along the I-78 Corridor. | 1 | 50.0 |
| | Total | 2 | 100 |

### Results of OD survey presented to

| | | Count | Column (%) |
|---|---|---|---|
| Results of OD survey presented to | General public | 5 | 31.3 |
| | Customers | 1 | 6.3 |
| | Constituents | 3 | 18.8 |
| | Internal clients/management | 14 | 87.5 |
| | External clients | 6 | 37.5 |
| | Faculty/staff/students | 2 | 12.5 |
| | Other, please specify | 1 | 6.3 |
| | Research results were not presented | | |

## Customer Satisfaction (CD) Surveys

### Recruited riders/users for CS survey

| | | Count | Column (%) |
|---|---|---|---|
| Recruited riders/users for CS survey | Bus | 9 | 64.3 |
| | Subway/rapid rail | 1 | 7.1 |
| | Commuter rail | 3 | 21.4 |
| | Light rail | | |
| | Auto | 1 | 7.1 |
| | No mode issues in survey | | |
| | Recruitment not based on mode | 2 | 14.3 |
| | Other, please specify | 1 | 7.1 |

### Other modes recruited

| | | Frequency | Percent |
|---|---|---|---|
| | Paratransit | 1 | 100 |

### Questions in CS survey about modes

| | | Count | Column (%) |
|---|---|---|---|
| Questions in CS survey about modes | Bus | 15 | 75 |
| | Subway/rapid rail | 3 | 15 |
| | Commuter rail | 2 | 10 |
| | Light rail | 2 | 10 |
| | Auto | 4 | 20 |
| | No mode issues in survey | 1 | 5 |
| | Recruitment not based on mode | | |
| | Other, please specify | 1 | 5 |

### Questions about other modes

| | | Frequency | Percent |
|---|---|---|---|
| | Paratransit vehicles | 1 | 100 |

### Sampling method

| | | Frequency | Percent |
|---|---|---|---|
| | No sampling, total population surveyed | 1 | 6.3 |
| | Random sampling | 9 | 56.3 |
| | Convenience sampling (anyone who would participate) | 4 | 25 |
| | Other sampling method | 2 | 12.5 |
| | Total | 16 | 100 |

### Other sampling method

| | | Frequency | Percent |
|---|---|---|---|
| | Every rider on a stratified sample of trips | 1 | 50 |
| | Random sample of paratransit program enrollees, active in the 3 months prior to the survey | 1 | 50 |
| | Total | 2 | 100 |

### Type of incentives

| | | Frequency | Percent |
|---|---|---|---|
| | No incentives | 11 | 68.8 |
| | Lottery conducted with prizes | 3 | 18.8 |
| | Incentive for each respondent | 1 | 6.3 |
| | Other incentives | 1 | 6.3 |
| | Total | 16 | 100 |

### Lottery prizes

| | | Frequency | Percent |
|---|---|---|---|
| | Digital music player | 1 | 33.3 |
| | Free 30-day pass | 1 | 33.3 |
| | Monthly pass | 1 | 33.3 |
| | Total | 3 | 100 |

### Incentive for each respondent

| | | Frequency | Percent |
|---|---|---|---|
| | Promotional item | 1 | 100 |

### Other incentives

| | | Frequency | Percent |
|---|---|---|---|
| | A pen | 1 | 100 |

### Effectiveness of incentives

| | | Frequency | Percent |
|---|---|---|---|
| | Do not know | 5 | 100 |

### Administered most recent CS survey

| | | Count | Column (%) |
|---|---|---|---|
| Administered most recent CS survey | Telephone | 8 | 50 |
| | Paper | 9 | 56.3 |
| | Computer-based, but not on Internet | | |
| | Online web survey | | |
| | Personal | 2 | 12.5 |
| | Other, please specify | | |

### Response rate percentage

| | | Frequency | Percent |
|---|---|---|---|
| | Don't know/not applicable | 9 | 56.3 |
| | 14 | 1 | 6.3 |
| | 30 | 1 | 6.3 |
| | 40 | 1 | 6.3 |
| | 50 | 1 | 6.3 |
| | 55 | 1 | 6.3 |
| | 75 | 1 | 6.3 |
| | 90 | 1 | 6.3 |
| | Total | 16 | 100 |

### Reason for no response rate

| | | Frequency | Percent |
|---|---|---|---|
| | % returned of a 100% sample | 1 | 25.0 |
| | All surveys have a unique sequential ID number. We know how many we hand out and we know how many we got back. | 1 | 25.0 |
| | Estimate based on observation. We ask riders to only complete one survey during survey period, which makes this estimate more difficult. This estimate may be high, but the response rate is very high; most riders are eager to complete a survey. | 1 | 25.0 |
| | We required a minimum sample size from the consultant. | 1 | 25.0 |
| | Total | 4 | 100 |

### Survey data set was clean

| | | Frequency | Percent |
|---|---|---|---|
| | Strongly agree | 3 | 18.8 |
| | Agree | 9 | 56.3 |
| | Neutral | 3 | 18.8 |
| | Disagree | 1 | 6.3 |
| | Total | 16 | 100 |

### Respondents completed nearly every question of survey

| | | Frequency | Percent |
|---|---|---|---|
| | Strongly agree | 6 | 37.5 |
| | Agree | 9 | 56.3 |
| | Neutral | 1 | 6.3 |
| | Total | 16 | 100 |

### Weighted data for most recent CS survey

| | | Count | Column (%) |
|---|---|---|---|
| Weighted data for most recent CS survey | Did not weight data | 10 | 62.5 |
| | Weighted based on ridership/traffic | 6 | 37.5 |
| | Weighted based on demographics | | |
| | Weighted based on other factors | | |

### Success of survey

| | | Frequency | Percent |
|---|---|---|---|
| | Very successful | 8 | 50 |
| | Successful | 6 | 37.5 |
| | Somewhat unsuccessful | 2 | 12.5 |
| | Total | 16 | 100 |

### Types of problems/issues

| | | Frequency | Percent |
|---|---|---|---|
| | I do not respect the methodology used and I think that the analysis is mediocre at best. The supplier is paid by our service provider. | 1 | 50.0 |
| | We did not state, one per person | 1 | 50.0 |
| | Total | 2 | 100 |

### Reason for administering survey with more than one method

| | | Frequency | Percent |
|---|---|---|---|
| | Annually a paper self-administered survey is conducted which is more detailed. Later in the year a telephone survey is done with a smaller sample and fewer questions. | 1 | 33.3 |
| | Intercepts via paper; actual survey via telephone because of length | 1 | 33.3 |
| | To cover all target audiences | 1 | 33.3 |
| | Total | 3 | 100 |

### How research from CS survey was used

| | | Count | Column (%) |
|---|---|---|---|
| How research from CS survey was used | Update origin–destination trip tables | 14 | 87.5 |
| | Define traveler markets by geography | 2 | 12.5 |
| | Determine trip purpose | 11 | 68.8 |
| | Determine trip frequency | 9 | 56.3 |
| | Determine distribution of station/stops used | 5 | 31.3 |
| | Determine distribution time-of-day facilities/system used | 12 | 75 |
| | Generate demographic profile of travelers | 10 | 62.5 |
| | Determine toll plazas/ramps used | 5 | 31.3 |
| | Determine proportion through vs. external to internal trips | | |

### Results of CS survey presented to

| | | Count | Column (%) |
|---|---|---|---|
| Results of CS survey presented to | General public | 8 | 50 |
| | Customers | 4 | 25 |
| | Constituents | 3 | 18.8 |
| | Internal clients/management | 15 | 93.8 |
| | External clients | 2 | 12.5 |
| | Faculty/staff/students | 2 | 12.5 |
| | Other, please specify | | |
| | Research results were not presented | | |

## Mode Choice (MC) Surveys

| | | Count | Column (%) |
|---|---|---|---|
| Recruited riders/users for MC survey | Bus | 10 | 55.6 |
| | Subway/rapid rail | 5 | 27.8 |
| | Commuter rail | 5 | 27.8 |
| | Light rail | 1 | 5.6 |
| | Auto | 7 | 38.9 |
| | No mode issues in survey | 1 | 5.6 |
| | Recruitment not based on mode | 3 | 16.7 |
| | Other, please specify | 3 | 16.7 |

### Other modes recruited

| | | Frequency | Percent |
|---|---|---|---|
| | Airline | 1 | 33.3 |
| | Carpool, vanpool, telecommute, bike, walk | 1 | 33.3 |
| | Household survey | 1 | 33.3 |
| | Total | 3 | 100 |

### Questions in MC survey about modes

| | | Count | Column (%) |
|---|---|---|---|
| Questions in MC survey about modes | Bus | 17 | 85 |
| | Subway/rapid rail | 11 | 55 |
| | Commuter rail | 2 | 10 |
| | Light rail | 5 | 25 |
| | Auto | 4 | 20 |
| | No mode issues in survey | 1 | 5 |
| | Recruitment not based on mode | | |
| | Other, please specify | 2 | 10 |

### Questions about other modes

| | | Frequency | Percent |
|---|---|---|---|
| | Airline | 1 | 50 |
| | Commuter bus | 1 | 50 |
| | Total | 2 | 100 |

### Recruited respondents for MC survey

| | | Count | Column (%) |
|---|---|---|---|
| Recruited respondents for MC survey | In person, via intercept at stations/stops | 6 | 31.6 |
| | In person, via intercept on board transit vehicles | 8 | 42.1 |
| | Telephone recruit | 5 | 26.3 |
| | Intercept at public locations other than transit-related | 2 | 10.5 |
| | E-mail recruit with clickable link | 3 | 15.8 |
| | E-mail recruit with web address to paste | 1 | 5.3 |
| | Web link recruit from website | 3 | 15.8 |
| | Mail recruit | 3 | 15.8 |
| | In person, via intercept at roadways/toll plazas | 2 | 10.5 |
| | Other, please specify | 4 | 21.1 |

### Other recruit method

| | | Frequency | Percent |
|---|---|---|---|
| | Distribute at buildings | 1 | 25 |
| | Employer-assisted recruitment | 1 | 25 |
| | Variable message signs, press release, TMA newsletters, postcards on windshields at every park and ride lot in corridor | 1 | 25 |
| | We have not done a mode choice survey in years. | 1 | 25 |
| | Total | 4 | 100 |

### Sampling method

| | | Frequency | Percent |
|---|---|---|---|
| | No sampling, total population surveyed | 2 | 9.5 |
| | Random sampling | 9 | 42.9 |
| | Systematic sampling (every *n*th) | 3 | 14.3 |
| | Convenience sampling (anyone who would participate) | 5 | 23.8 |
| | Other sampling method | 2 | 9.5 |
| | Total | 21 | 100 |

### Other sampling method

| | | Frequency | Percent |
|---|---|---|---|
| | A two-stage sampling approach was used for the on-board survey | 1 | 50 |
| | We have not done a mode choice survey in years. | 1 | 50 |
| | Total | 2 | 100 |

### Type of incentives

| | | Frequency | Percent |
|---|---|---|---|
| | No incentives | 12 | 57.1 |
| | Lottery conducted with prizes | 4 | 19 |
| | Incentive for each respondent | 2 | 9.5 |
| | Other incentives | 3 | 14.3 |
| | Total | 21 | 100 |

### Lottery

| | | Frequency | Percent |
|---|---|---|---|
| | $25 gift certificates | 1 | 25 |
| | Digital music player | 1 | 25 |
| | Gift basket | 1 | 25 |
| | Transit passes | 1 | 25 |
| | Total | 4 | 100 |

### Incentive for each respondent

| | | Frequency | Percent |
|---|---|---|---|
| | $2 advance, and $5 with diary | 1 | 50 |
| | Free week on transit | 1 | 50 |
| | Total | 2 | 100 |

### Other incentives

| | | Frequency | Percent |
|---|---|---|---|
| | Do not know | 1 | 33.3 |
| | Some incentives/others not | 1 | 33.3 |
| | We have not done a mode choice survey in years. | 1 | 33.3 |
| | Total | 3 | 100 |

### Effectiveness of incentives

| | | Frequency | Percent |
|---|---|---|---|
| | Increased response rate 1–25% | 4 | 44.4 |
| | Increased response rate 25–50% | 1 | 11.1 |
| | Do not know | 4 | 44.4 |
| | Total | 9 | 100 |

### Administered most recent MC survey

| | | Count | Column (%) |
|---|---|---|---|
| Administered most recent MC survey | Telephone | 7 | 35 |
| | Paper | 8 | 40 |
| | Computer-based, but not on Internet | 2 | 10 |
| | Online web survey | 6 | 30 |
| | Personal | 4 | 20 |
| | Other, please specify | 1 | 5 |

### Other method administered survey

| | | Frequency | Percent |
|---|---|---|---|
| | We have not done such a survey in years. | 1 | 100 |

### Response rate percentage

| | | Frequency | Percent |
|---|---|---|---|
| | Don't know/not applicable | 10 | 47.6 |
| | 10 | 1 | 4.8 |
| | 19 | 1 | 4.8 |
| | 33 | 2 | 9.5 |
| | 34 | 1 | 4.8 |
| | 35 | 1 | 4.8 |
| | 41 | 1 | 4.8 |
| | 60 | 3 | 14.3 |
| | 65 | 1 | 4.8 |
| | Total | 21 | 100 |

### Reason for no response rate

| | | Frequency | Percent |
|---|---|---|---|
| | Incidence rate (respondents who passed the screening questions) | 1 | 25.0 |
| | Interviewer had hand held calculator | 1 | 25.0 |
| | See response to question on O–D survey | 1 | 25.0 |
| | Using AAPOR* Formula 3 | 1 | 25.0 |
| | Total | 4 | 100 |

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### Survey data set was clean

| | | Frequency | Percent |
|---|---|---|---|
| | Strongly agree | 4 | 19 |
| | Agree | 9 | 42.9 |
| | Neutral | 5 | 23.8 |
| | Disagree | 3 | 14.3 |
| | Total | 21 | 100 |

### Respondents completed nearly every question of survey

| | | Frequency | Percent |
|---|---|---|---|
| | Strongly agree | 4 | 19 |
| | Agree | 11 | 52.4 |
| | Neutral | 3 | 14.3 |
| | Disagree | 3 | 14.3 |
| | Total | 21 | 100 |

### Weighted data for most recent MC survey

| | | Frequency | Percent |
|---|---|---|---|
| Weighted data for most recent MC survey | Did not weight data | 10 | 47.6 |
| | Weighted based on ridership/traffic | 5 | 23.8 |
| | Weighted based on demographics | 4 | 19 |
| | Weighted based on other factors | 2 | 9.5 |

### Other factors

| | | Frequency | Percent |
|---|---|---|---|
| | The weighting and expansion process was conducted at the day-time-route level—each survey was weighted and expanded based on the day of the week (i.e., weekday or weekend), time-of-day (a.m. peak, mid-day, p.m. peak, and evening) and route. | 1 | 50.0 |
| | We weighted based upon the size (no. of employees) of the employer. | 1 | 50.0 |
| | Total | 2 | 100 |

### Success of survey

| | | Frequency | Percent |
|---|---|---|---|
| | Very successful | 10 | 47.6 |
| | Successful | 9 | 42.9 |
| | Neither successful nor unsuccessful | 2 | 9.5 |
| | Total | 21 | 100 |

### Reason for administering survey with more than one method

| | | Frequency | Percent |
|---|---|---|---|
| | Gave people who were in a hurry an alternative to taking time on the spot | 1 | 16.6 |
| | N/A | 1 | 16.6 |
| | To increase response | 1 | 16.6 |
| | To sample a larger population | 1 | 16.6 |
| | We participated in a mode choice survey conducted by our regional transportation planning agency. I believe they used an existing survey methodology that would yield results for their model that are consistent with past work. | 1 | 16.6 |
| | We use the online survey because it is so easy to disseminate and no data entry is required. We use paper because some employers that we survey have large populations of employees without access to computers. | 1 | 16.6 |
| | Total | 6 | 100 |

### How research from MC survey was used

| | | Count | Column (%) |
|---|---|---|---|
| How research from MC survey was used | Update origin–destination trip tables | 8 | 38.1 |
| | Define traveler markets by geography | 4 | 19 |
| | Determine trip purpose | 8 | 38.1 |
| | Determine trip frequency | 5 | 23.8 |
| | Determine distribution of station/stops used | 4 | 19 |
| | Determine distribution time-of-day facilities/system used | 5 | 23.8 |
| | Generate demographic profile of travelers | 6 | 28.6 |

### Other purposes

| | | Frequency | Percent |
|---|---|---|---|
| | Evaluate effectiveness of Transportation Demand Management programs, identify new markets for services | 1 | 16.6 |
| | Evaluate TravelSmart Policy | 1 | 16.6 |
| | Legislative information | 1 | 16.6 |
| | Measure attitudes | 1 | 16.6 |
| | We have not done such a survey in years. | 1 | 16.6 |
| | We will use it as input to recommend new park and ride locations along the corridor. | 1 | 16.6 |
| | Total | 6 | 100 |

### Results of MC survey presented to

| | | Count | Column (%) |
|---|---|---|---|
| Results of MC survey presented to | General public | 5 | 23.8 |
| | Customers | 2 | 9.5 |
| | Constituents | 7 | 33.3 |
| | Internal clients/management | 16 | 76.2 |
| | External clients | 6 | 28.6 |
| | Faculty/staff/students | 6 | 28.6 |
| | Other, please specify | 6 | 28.6 |
| | Research results were not presented | | |

## Planning Surveys (PS)

### Recruited riders/users for PS survey

| | | Count | Column (%) |
|---|---|---|---|
| Recruited riders/users for PS survey | Bus | 16 | 76.2 |
| | Subway/rapid rail | 5 | 23.8 |
| | Commuter rail | 3 | 14.3 |
| | Light rail | 1 | 4.8 |
| | Auto | 5 | 23.8 |
| | No mode issues in survey | 1 | 4.8 |
| | Recruitment not based on mode | 3 | 14.3 |
| | Other, please specify | 1 | 4.8 |

### Other modes recruited

| | | Frequency | Percent |
|---|---|---|---|
| | Vanpool and paratransit | 1 | 100 |

### Questions in PS survey about modes

| | | Count | Column (%) |
|---|---|---|---|
| Questions in PS survey about modes | Bus | 17 | 70.8 |
| | Subway/rapid rail | 7 | 29.2 |
| | Commuter rail | 2 | 8.3 |
| | Light rail | 3 | 12.5 |
| | Auto | 4 | 16.7 |
| | No mode issues in survey | 4 | 16.7 |
| | Recruitment not based on mode | | |
| | Other, please specify | 2 | 8.3 |

### Questions about other modes

| | | Frequency | Percent |
|---|---|---|---|
| | Parking/development | 1 | 50 |
| | Vanpool, paratransit | 1 | 50 |
| | Total | 2 | 100 |

### Recruited respondents for PS survey

| | | Count | Column (%) |
|---|---|---|---|
| Recruited respondents for PS survey | In person, via intercept at stations/stops | 12 | 50 |
| | In person, via intercept on board transit vehicles | 11 | 45.8 |
| | Telephone recruit | 9 | 37.5 |
| | Intercept at public locations other than transit-related | 1 | 4.2 |
| | E-mail recruit with clickable link | 2 | 8.3 |
| | E-mail recruit with web address to paste | 1 | 4.2 |
| | Web link recruit from website | 1 | 4.2 |
| | Mail recruit | 3 | 12.5 |
| | In person, via intercept at roadways/toll plazas | | |
| | Other, please specify | 1 | 4.2 |

### Other recruit method

| | | Frequency | Percent |
|---|---|---|---|
| | Press release | 1 | 100 |

### Sampling method

| | | Frequency | Percent |
|---|---|---|---|
| | No sampling, total population surveyed | 7 | 29.2 |
| | Random sampling | 5 | 20.8 |
| | Systematic sampling (every *n*th) | 3 | 12.5 |
| | Convenience sampling (anyone who would participate) | 7 | 29.2 |
| | Other sampling method | 2 | 8.3 |
| | Total | 24 | 100 |

### Other sampling method

| | | Frequency | Percent |
|---|---|---|---|
| | Geographic | 1 | 50 |
| | Random selection of bus runs, segmented by route | 1 | 50 |
| | Total | 2 | 100 |

### Type of incentives

| | | Frequency | Percent |
|---|---|---|---|
| | No incentives | 19 | 79.2 |
| | Lottery conducted with prizes | 4 | 16.7 |
| | Incentive for each respondent | 1 | 4.2 |
| | Total | 24 | 100 |

### Lottery prizes

| | | Frequency | Percent |
|---|---|---|---|
| | Airline tickets | 1 | 25 |
| | Free monthly pass | 1 | 25 |
| | Free transit rides | 1 | 25 |
| | Trip to Hawaii, watches, fare tickets | 1 | 25 |
| | Total | 4 | 100 |

### Incentive for each respondent

| | | Frequency | Percent |
|---|---|---|---|
| | A small amount of cash with an introductory mailing notifying person that they would be contacted by phone for survey | 1 | 100 |

### Effectiveness of incentives

| | | Frequency | Percent |
|---|---|---|---|
| | Increased response rate 1–25% | 2 | 40 |
| | Increased response rate 25–50% | 1 | 20 |
| | Don't know | 2 | 40 |
| | Total | 5 | 100 |

### Administered most recent PS survey

| | | Count | Column (%) |
|---|---|---|---|
| Administered most recent PS survey | Telephone | 11 | 45.8 |
| | Paper | 16 | 66.7 |
| | Computer-based, but not on Internet | 2 | 8.3 |
| | Online web survey | 5 | 20.8 |
| | Personal | 9 | 37.5 |
| | Other, please specify | | |

### Response rate percentage

| | | Frequency | Percent |
|---|---|---|---|
| | Don’t know/not applicable | 12 | 50 |
| | 10 | 1 | 4.2 |
| | 15 | 1 | 4.2 |
| | 20 | 1 | 4.2 |
| | 30.4 | 1 | 4.2 |
| | 35 | 1 | 4.2 |
| | 37 | 1 | 4.2 |
| | 40 | 1 | 4.2 |
| | 42 | 1 | 4.2 |
| | 50 | 1 | 4.2 |
| | 58 | 1 | 4.2 |
| | 74 | 1 | 4.2 |
| | 75 | 1 | 4.2 |
| | Total | 24 | 100 |

### Reason for no response rate

| | | Frequency | Percent |
|---|---|---|---|
| | 1,111 households contacted; 822 interviews completed | 1 | 20.0 |
| | AAPOR* Formula 3 | 1 | 20.0 |
| | Completed over attempts | 1 | 20.0 |
| | Return rate based on the number of useable questionnaire returns as a percentage of the number distributed | 1 | 20.0 |
| | This is conservative. Ones at the stops = 1,153 for all times of day. Completed surveys = 860 for 7 a.m.–10 p.m. | 1 | 20.0 |
| | Total | 5 | 100 |

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### Survey data set was clean

| | | Frequency | Percent |
|---|---|---|---|
| | Strongly agree | 5 | 20.8 |
| | Agree | 11 | 45.8 |
| | Neutral | 6 | 25 |
| | Disagree | 2 | 8.3 |
| | Total | 24 | 100 |

### Respondents completed nearly every question of survey

| | | Frequency | Percent |
|---|---|---|---|
| | Strongly agree | 5 | 20.8 |
| | Agree | 13 | 54.2 |
| | Neutral | 5 | 20.8 |
| | Disagree | 1 | 4.2 |
| | Total | 24 | 100 |

### Weighted data for most recent PS survey

| | | Count | Column (%) |
|---|---|---|---|
| Weighted data for most recent PS survey | Did not weight data | 14 | 58.3 |
| | Weighted based on ridership/traffic | 6 | 25 |
| | Weighted based on demographics | 2 | 8.3 |
| | Weighted based on other factors | 2 | 8.3 |

### Other factors

| | | Frequency | Percent |
|---|---|---|---|
| | Household Travel Survey utilizes both weighting and expansion factors to (1) adjust the sample data to match population parameters and (2) expand trip information to all households in the survey area. | 1 | 50.0 |
| | Willingness to be interviewed | 1 | 50.0 |
| | Total | 2 | 100 |

**Success of survey**

| | | Frequency | Percent |
|---|---|---|---|
| | Very successful | 11 | 45.8 |
| | Successful | 11 | 45.8 |
| | Neither successful nor unsuccessful | 2 | 8.3 |
| | Total | 24 | 100 |

**Types of problems/issues**

| | | Frequency | Percent |
|---|---|---|---|
| | Lots of no response | 1 | 100 |
| | Total | 1 | 100 |

**Reason for administering survey with more than one method**

| | | Frequency | Percent |
|---|---|---|---|
| | Attempting to get more and better responses | 1 | 10.0 |
| | Because this was very significant survey that required input from customers, leaders, potential customers and we used different methods to reach them | 1 | 10.0 |
| | Convenience | 1 | 10.0 |
| | Maximize response rates | 1 | 10.0 |
| | Paper was used for on-board bus survey because surveyors could administer it directly. Telephone was used for vanpool survey. | 1 | 10.0 |
| | The online web survey was a different type of planning survey. It was focused on planning for a new regional transit ticket. The paper survey is our basic planning survey. The goal of this survey was to achieve a statistically projectable sample at each of our stations | 1 | 10.0 |
| | To cover all target audiences | 1 | 10.0 |
| | To get a bigger sample | 1 | 10.0 |
| | To increase response rates | 1 | 10.0 |
| | We included commuter rail users and non-users. We used the phone to contact non-users and an on-board paper survey for users. | 1 | 10.0 |
| | Total | 10 | 100 |

**How research from PS survey was used**

| | | Frequency | Percent |
|---|---|---|---|
| | Determine operation planning | 1 | 4.2 |
| | Forecasting, planning, marketing of services | 1 | 4.2 |
| | It was a survey asking the public about travel safety — what behaviors they felt were most dangerous, most promising solutions, and if there were particular places they avoided because of traffic safety issues. It was good input into our Regional Safety study, which identified regional safety priorities. It also recieved quite a bit of attention from the press. | 1 | 4.2 |
| | It was used to help plan future schedule changes to satisfy users and attract non-users. | 1 | 4.2 |
| | Parking demand estimation | 1 | 4.2 |
| | Plan new service | 1 | 4.2 |
| | Plan route revisions | 1 | 4.2 |
| | Planning projects | 1 | 4.2 |
| | Provide information to local government for potential commercial development | 1 | 4.2 |
| | Provided an evaluation of home interview surveys for an external client | 1 | 4.2 |
| | Route planning | 1 | 4.2 |
| | Route planning | 1 | 4.2 |
| | Service changes, location of amenities, marketing | 1 | 4.2 |
| | Service evaluation and planning | 1 | 4.2 |
| | Service planning | 1 | 4.2 |
| | The basic planning survey is the reference source for evaluating the impact of regional and station level improvements and possible changes in service. | 1 | 4.2 |
| | The objective of the household travel survey is to collect information on work and non-work travel behavior. This includes trip generation, trip distribution, and modal choice. This study is an essential element in the transportation planning and models. | 1 | 4.2 |
| | This survey of the public forms the basis for both service and political decisions. | 1 | 4.2 |
| | To determine rider profiles, trip types, and perception of service | 1 | 4.2 |
| | To determine if customers would be adversely affected by potential bus rerouting and the potential impacts on elderly and disabled passengers. Determined customers would tolerate the changes. | 1 | 4.2 |
| | To make recommendations for the future of public transportation options | 1 | 4.2 |
| | To support funding for major projects | 1 | 4.2 |
| | We conducted the survey for the transit agency. | 1 | 4.2 |
| | Total | 23 | 100 |

### Results of PS survey presented to

| | | Count | Column (%) |
|---|---|---|---|
| Results of PS survey presented to | General public | 9 | 37.5 |
| | Customers | 5 | 20.8 |
| | Constituents | 6 | 25 |
| | Internal clients/management | 21 | 87.5 |
| | External clients | 7 | 29.2 |
| | Faculty/staff/students | 4 | 16.7 |
| | Other, please specify | 5 | 20.8 |
| | Research results were not presented | | |

## Other Surveys (OS)

### Recruited riders/users for OS survey

| | | Count | Column (%) |
|---|---|---|---|
| Recruited riders/users for OS survey | Bus | 6 | 35.3 |
| | Subway/rapid rail | 6 | 35.3 |
| | Commuter rail | 4 | 23.5 |
| | Light rail | 2 | 11.8 |
| | Auto | 4 | 23.5 |
| | No mode issues in survey | | |
| | Recruitment not based on mode | 5 | 29.4 |
| | Other, please specify | | |

### Questions in OS survey about modes

| | | Count | Column (%) |
|---|---|---|---|
| Questions in OS survey about modes | Bus | 11 | 68.8 |
| | Subway/rapid rail | 7 | 43.8 |
| | Commuter rail | 2 | 12.5 |
| | Light rail | 1 | 6.3 |
| | Auto | 4 | 25 |
| | No mode issues in survey | 1 | 6.3 |
| | Recruitment not based on mode | | |
| | Other, please specify | 1 | 6.3 |

### Questions about other modes

| | | Frequency | Percent |
|---|---|---|---|
| | Vanpool, carpool, biking, telecommuting | 1 | 100 |

### Recruited respondents for OS survey

| | | Count | Column (%) |
|---|---|---|---|
| Recruited respondents for OS survey | In person, via intercept at stations/stops | 4 | 23.5 |
| | In person, via intercept on board transit vehicles | 6 | 35.3 |
| | Telephone recruit | 7 | 41.2 |
| | Intercept at public locations other than transit-related | | |
| | E-mail recruit with clickable link | 2 | 11.8 |
| | E-mail recruit with web address to paste | | |
| | Web link recruit from website | 1 | 5.9 |
| | Mail recruit | | |
| | In person, via intercept at roadways/toll plazas | | |
| | Other, please specify | 1 | 5.9 |

### Other recruit method

| | | Frequency | Percent |
|---|---|---|---|
| | All respondents to marketing campaign were surveyed | 1 | 100 |

### Sampling method

| | | Frequency | Percent |
|---|---|---|---|
| | No sampling, total population surveyed | 3 | 17.6 |
| | Random sampling | 7 | 41.2 |
| | Systematic sampling (every *n*th) | 3 | 17.6 |
| | Convenience sampling (anyone who would participate) | 3 | 17.6 |
| | Other sampling method | 1 | 5.9 |
| | Total | 17 | 100 |

### Other sampling method

| | | Frequency | Percent |
|---|---|---|---|
| | A static link was at the top of the web page for interested visitors to click on if they wanted to participate. | 1 | 100 |

### Type of incentives

| | | Frequency | Percent |
|---|---|---|---|
| | No incentives | 14 | 82.4 |
| | Lottery conducted with prizes | 3 | 17.6 |
| | Total | 17 | 100 |

### Lottery prizes

| | | Frequency | Percent |
|---|---|---|---|
| | Free monthly pass | 1 | 33.3 |
| | Gift cards | 1 | 33.3 |
| | Trip to Hawaii, other gifts, and fare tickets | 1 | 33.3 |
| | Total | 3 | 100 |

### Effectiveness of incentives

| | | Frequency | Percent |
|---|---|---|---|
| | Increased response rate 1–25% | 1 | 33.3 |
| | Do not know | 2 | 66.7 |
| | Total | 3 | 100 |

### Administered most recent OS survey

| | | Count | Column (%) |
|---|---|---|---|
| Administered most recent OS survey | Telephone | 7 | 41.2 |
| | Paper | 6 | 35.3 |
| | Computer-based, but not on Internet | | |
| | Online web survey | 4 | 23.5 |
| | Personal | 4 | 23.5 |
| | Other, please specify | | |

### Response rate percentage

| | | Frequency | Percent |
|---|---|---|---|
| | Don't know/not applicable | 9 | 52.9 |
| | 16 | 1 | 5.9 |
| | 28 | 1 | 5.9 |
| | 30 | 2 | 11.8 |
| | 45 | 1 | 5.9 |
| | 65.7 | 1 | 5.9 |
| | 70 | 1 | 5.9 |
| | 80 | 1 | 5.9 |
| | Total | 17 | 100 |

### Reason for no response rate

| | | Frequency | Percent |
|---|---|---|---|
| | 28% of the people contacted did complete the survey. | 1 | 14.3 |
| | Completed questionnaires divided by potential respondents | 1 | 14.3 |
| | Response rate was calculated based on distributed paper surveys and collected on-board paper surveys. For personal interviews, based on number of people on the bus and number of people actually interviewed. | 1 | 14.3 |
| | Same as before | 1 | 14.3 |
| | This was a follow-up survey to a marketing campaign where individuals pledged to use a non-driving mode of travel to work. 1,957 of the 12,071 pledgers responded to the follow-up survey. | 1 | 14.3 |
| | We have no way of judging how many different people had come to the web page while the survey link was available. | 1 | 14.3 |
| | We only wanted 33 interviews for a quick assessment of vehicle design appearance. | 1 | 14.3 |
| | Total | 7 | 100 |

### Survey data set was clean

| | | Frequency | Percent |
|---|---|---|---|
| | Strongly agree | 6 | 35.3 |
| | Agree | 9 | 52.9 |
| | Neutral | 2 | 11.8 |
| | Total | 17 | 100 |

### Respondents completed nearly every question of survey

| | | Frequency | Percent |
|---|---|---|---|
| | Strongly agree | 7 | 41.2 |
| | Agree | 10 | 58.8 |
| | Total | 17 | 100 |

### Weighted data for most recent OS survey

| | | Count | Column (%) |
|---|---|---|---|
| Weighted data for most recent OS survey | Did not weight data | 11 | 64.7 |
| | Weighted based on ridership/traffic | 5 | 29.4 |
| | Weighted based on demographics | 2 | 11.8 |
| | Weighted based on other factors | | |

### Success of survey

| | | Frequency | Percent |
|---|---|---|---|
| | Very successful | 7 | 41.2 |
| | Successful | 9 | 52.9 |
| | Neither successful nor unsuccessful | 1 | 5.9 |
| | Total | 17 | 100 |

### Reason for administering survey with more than one method

| | | Frequency | Percent |
|---|---|---|---|
| | Same answer as previous question | 1 | 25.0 |
| | The paper-based survey is a tightly controlled, stratified sample based on a random selection of cars on a sample of trains. The phone survey is a follow-up with these customers. | 1 | 25.0 |
| | To appeal to the broadest base of our constituency | 1 | 25.0 |
| | To include the population that did not provide an e-mail address | 1 | 25.0 |
| | Total | 4 | 100 |

### How research from OS survey was used

| | | Frequency | Percent |
|---|---|---|---|
| | Attempt to get more budget in the next year | 1 | 5.9 |
| | Calculate ROI | 1 | 5.9 |
| | Evaluate service changes | 1 | 5.9 |
| | For modeling purposes | 1 | 5.9 |
| | Improve services, communicate clearly, evaluate success of new programs/initiatives | 1 | 5.9 |
| | Performance measurement | 1 | 5.9 |
| | Planning service and schedule improvements, marketing | 1 | 5.9 |
| | This research was on our automated fare collection media, MetroCard. Management uses the information from the survey to measure customer awareness, attitudes, and use of the fare media, and its different sales outlets. | 1 | 5.9 |
| | This survey provides a regular measure of customer satisfaction with regard to some 50 service factors. The information is presented to our agency's Board of Directors and to the public. It is used internally to apprise staff of critical issues that need attention. | 1 | 5.9 |
| | To determine demographics of passengers. Also to serve as a means to evaluate our contract operator's fulfillment of their obligations | 1 | 5.9 |
| | To develop marketing projects | 1 | 5.9 |
| | To evaluate possible new services | 1 | 5.9 |
| | To get a feel for how strongly people felt about noses on commuter rail cars. We determined they overwhelmingly like noses, and so rethink our position on purchasing snub-nosed vehicles. | 1 | 5.9 |
| | To get a profile of infrequent customers so as to target programs to increase ridership | 1 | 5.9 |
| | Topline report released internally. Full report still being put together. | 1 | 5.9 |
| | We are using it in planning next year's campaign. It provides us information about stated motivators, information sources, and demographics of participants useful in targeting. | 1 | 5.9 |
| | We are using the results to determine which improvements to make to the interactive map. | 1 | 5.9 |
| | Total | 17 | 100 |

### Results of OS survey presented to

| | | Count | Column (%) |
|---|---|---|---|
| Results of OS survey presented to | General public | 4 | 23.5 |
| | Customers | 4 | 23.5 |
| | Constituents | 5 | 29.4 |
| | Internal clients/management | 16 | 94.1 |
| | External clients | 4 | 23.5 |
| | Faculty/staff/students | 2 | 11.8 |
| | Other, please specify | 1 | 5.9 |
| | Research results were not presented | | |

## Web-Based Survey Specifics

### Primary reason for not conducting web-based surveys

| | | Frequency | Percent |
|---|---|---|---|
| | Ability to get a broad sample | 1 | 4.2 |
| | Biased against customers who have no access to Internet | 1 | 4.2 |
| | Captive market of user onboard the vehicle; agency wanted data on users. | 1 | 4.2 |
| | Have not had the opportunity to try to do them or taken the time to explore this possibility. The agency has done some but it has been outside consultants, not our Market Research group. | 1 | 4.2 |
| | I do not like self-selected samples. | 1 | 4.2 |
| | Inability to guarantee one response per respondent | 1 | 4.2 |
| | Inherent bias built into a strictly web-based survey is the primary reason | 1 | 4.2 |
| | No experience in web-based surveys; no money for research | 1 | 4.2 |
| | No expertise | 1 | 4.2 |
| | No in-house experts | 1 | 4.2 |
| | No resources to do so | 1 | 4.2 |
| | None | 1 | 4.2 |
| | Oh but we do! Our latest was an interactive map study using SurveyMonkey. Web-based surveys are primarily used to test our website. | 1 | 4.2 |
| | Organization is slow to make dramatic changes in survey methods. | 1 | 4.2 |
| | Response limited to those who use computers frequently; may not be representative of overall target population. | 1 | 4.2 |
| | Still not everyone has access to the Internet | 1 | 4.2 |
| | Survey opportunities are limited | 1 | 4.2 |
| | Suspected low internet accessibility by transit users | 1 | 4.2 |
| | The use of the web is not yet sufficiently pervasive in our target markets. | 1 | 4.2 |
| | They are not as effective in reaching our targets. | 1 | 4.2 |
| | We have conducted a couple of small, web-based surveys to test the concept. The primary limitation is obtaining a sample that is representative of the population if a large percentage of the population doesn't have web access. We will be doing more web-based surveys. | 1 | 4.2 |
| | We have just started to conduct them as they relate to marketing promotions. There is also a survey now attached to renewals of membership in our Employer Discount Program, but we have just started collecting that data. | 1 | 4.2 |

**Primary reason for not conducting web-based surveys (*continued*)**

| | | | |
|---|---|---|---|
| | **We recently completed a web-based survey to university/college students. However, we typically conduct on-board surveys because we have a captive audience on our trains, buses, and light-rail services.** | 1 | 4.2 |
| | **Web-based surveys are not random. Not everyone in the universe has an equal chance of being selected because they either do not have an e-mail address or choose not to give it to us.** | 1 | 4.2 |
| | **Total** | 24 | 100 |

**Other reason for not conducting web-based surveys**

| | | **Frequency** | **Percent** |
|---|---|---|---|
| | **It would build-in response biases, based upon accessibility to the Internet.** | 1 | 12.5 |
| | **Low interest by client** | 1 | 12.5 |
| | **Management not too comfortable with results of this kind of studies** | 1 | 12.5 |
| | **None** | 1 | 12.5 |
| | **Not confident in the representativeness of the responses** | 1 | 12.5 |
| | **Skeptical about assuming results will reflect our riders** | 1 | 12.5 |
| | **Some tests in early had low web-based response; e.g., 5%. Organization feels that web-based response will *bias* the results because of differences in demographic characteristics of those *with* and *without* Internet accessibility, so more interested in methods that will *combine* response methods.** | 1 | 12.5 |
| | **We are waiting for our customer base of smart card customers to grow, because when they register their cards they have to give an e-mail address. Therefore, we have the opportunity to e-mail them a survey, but we need to create the questionnaire online, something we have not done yet.** | 1 | 12.5 |
| | **Total** | 8 | 100 |

**Likelihood of beginning to use web-based surveys within two years**

| | | **Frequency** | **Percent** |
|---|---|---|---|
| | **Very likely** | 6 | 25 |
| | **Somewhat likely** | 11 | 45.8 |
| | **Neither likely nor unlikely** | 4 | 16.7 |
| | **Unlikely** | 2 | 8.3 |
| | **Very unlikely** | 1 | 4.2 |
| | **Total** | 24 | 100 |

**Primary reason for conducting web-based surveys**

| | | Frequency | Percent |
|---|---|---|---|
| | Ability to present complicated subject matter, question design, and graphics | 1 | 9.1 |
| | As a way to gather public input on our planning studies, in addition to holding public meetings, which are usually poorly attended. So far we've conducted two web-based surveys, and are still learning how best to use them. | 1 | 9.1 |
| | Cost | 1 | 9.1 |
| | Ease of access to downtown workforce | 1 | 9.1 |
| | Efficiency | 1 | 9.1 |
| | High-quality database/complete answers | 1 | 9.1 |
| | They are a convenient means of collecting information. | 1 | 9.1 |
| | To find out how well our website is meeting the needs of the website visitors. Because it reaches our target audience, it is somewhat effective. | 1 | 9.1 |
| | To provide an option for those who wish to use it | 1 | 9.1 |
| | To reach a certain group of people. | 1 | 9.1 |
| | Website is popular, give more options | 1 | 9.1 |
| | Total | 11 | 100 |

**Other reason for conducting web-based surveys**

| | | Frequency | Percent |
|---|---|---|---|
| | Cost and timing | 1 | 25.0 |
| | Superior data quality and the ability to collect customer comments that are more unbiased than from other survey methods | 1 | 25.0 |
| | Timely, data consistency | 1 | 25.0 |
| | We have a regional requirement for employers to conduct employee commute surveys. We have set these up on the web, also. This works well because it is used by employers with employees who have web access, it simplifies data entry and process and allows for immediate results. | 1 | 25.0 |
| | Total | 4 | 100 |

**Primary disadvantages of web-based surveys**

| | | Frequency | Percent |
|---|---|---|---|
| | Bias in respondents. We are limited to those with high access to web. This limits its usefulness for surveying many of our current customers. | 1 | 9.1 |
| | Can only be used for specific, somewhat focused research | 1 | 9.1 |
| | Difficult to do random sampling | 1 | 9.1 |
| | Hard to control for multiple responses. Only one portion of our population | 1 | 9.1 |
| | Lack of randomized selection of respondents | 1 | 9.1 |
| | Many people do not have access, do not know how to use it, or do not have a high-speed connection. | 1 | 9.1 |
| | Not everyone has e-mail | 1 | 9.1 |
| | Sampling is biased in that self-selection bias is very high and participation very low. | 1 | 9.1 |
| | Some user groups under- or overrepresented | 1 | 9.1 |
| | The two surveys we have conducted (one on safety and one on transit preferences in the I-78 Corridor) were not based on random samples. This makes our results difficult to generalize to the public. As we move forward, we will look to have some kind of sampling plans so that the results can be valid. | 1 | 9.1 |
| | Web access is not available for all workers. | 1 | 9.1 |
| | Total | 11 | 100 |

**Other disadvantages of web-based surveys**

| | | Frequency | Percent |
|---|---|---|---|
| | Can only be used as an optional response mechanism because of limited penetration | 1 | 14.3 |
| | Do not know who did not participate. Cannot tell who is not represented from survey data. | 1 | 14.3 |
| | Fairly low response rates compared with other modes | 1 | 14.3 |
| | May not represent a cross section of our ridership | 1 | 14.3 |
| | Not tangible | 1 | 14.3 |
| | Survey takes a lot of time; lots of technical glitches | 1 | 14.3 |
| | You cannot calculate statistical precision from nonrandom samples. | 1 | 14.3 |
| | Total | 7 | 100 |

**Primary advice offered to transit organizations considering web-based surveys**

| | | Frequency | Percent |
|---|---|---|---|
| | Always give them an out if it does not apply | 1 | 9.1 |
| | Be aware of the survey population vis-à-vis your target population. | 1 | 9.1 |
| | Combine it with other data collection techniques that are a good fit with the audience. | 1 | 9.1 |
| | Consider the target market segment and assess Internet availability among these people. | 1 | 9.1 |
| | Do not consider web-based surveys as a cost-saving strategy to substitute existing random sampling surveys. Use it better to complement your existing research tools. | 1 | 9.1 |
| | Excellent way to go | 1 | 9.1 |
| | However long you think it will take to implement the survey, double it! | 1 | 9.1 |
| | It is good for many purposes, but not all. | 1 | 9.1 |
| | Make certain to incorporate with other methods, complementary methods to get greater response. | 1 | 9.1 |
| | None | 1 | 9.1 |
| | None to offer | 1 | 9.1 |
| | Total | 11 | 100 |

**Other advice offered to transit organizations considering web-based surveys**

| | | Frequency | Percent |
|---|---|---|---|
| | Check out the latest web survey services. They are becoming less expensive and more user friendly—especially if you are doing the survey yourself. | 1 | 16.6 |
| | Know the population you are surveying and be extra alert if respondents differ from what you know to be true for your population. | 1 | 16.6 |
| | Make sure the data format is what you are looking for. Many packages are very hard to use with software such as SPSS for additional analysis. | 1 | 16.6 |
| | Need supplementary surveys, on board, etc., to establish web responder share of population. | 1 | 16.6 |
| | Provide incentives for participants | 1 | 16.6 |
| | Web-based surveys will not reach less literate people, or people without computers. If that is your primary ridership, then web-based surveys may not capture the attitudes or behavior of these customers. Also, be creative with outreach. For example, we sent postcards to the libraries in our region, asking them to post the card in their Internet access area. We have also used variable message signs with the simple website address to capture motorists. | 1 | 16.6 |
| | Total | 6 | 100 |

### Primary objective of web survey

| | | Frequency | Percent |
|---|---|---|---|
| | Collect data from those who would not respond in other ways | 1 | 9.1 |
| | Determine attitude toward proposed new service | 1 | 9.1 |
| | Evaluate features of a cross-agency regional fare card | 1 | 9.1 |
| | Learn about attitudes; test a model | 1 | 9.1 |
| | Not sure | 1 | 9.1 |
| | Obtain comments in the customers' own words. Conduct low-cost, automated program evaluation. | 1 | 9.1 |
| | Solicit customer feedback on their experiences with the interactive map. Determine if there are any fatal design flaws that need immediate attention. | 1 | 9.1 |
| | To gain a greater understanding of what it takes to get people to ride the express buses from Pennsylvania and western New Jersey to Newark and NYC | 1 | 9.1 |
| | To gather a large sample | 1 | 9.1 |
| | To give options; for example, if someone was not on bus when survey was administered, they can still contribute. | 1 | 9.1 |
| | To provide an easy tool for the end user and our staff to gather data on work trips for employees at large employers in the county. | 1 | 9.1 |
| | Total | 11 | 100 |

### Other objective of web survey

| | | Frequency | Percent |
|---|---|---|---|
| | Stated preference sensitivity factors | 1 | 50.0 |
| | Test messaging | 1 | 50.0 |
| | Total | 2 | 100 |

### How web survey was designed

| | | Frequency | Percent |
|---|---|---|---|
| | Designed in-house using web page layout software | 2 | 18.2 |
| | Designed with an online survey development tool | 3 | 27.3 |
| | Contracted out to a consulting or web development firm | 6 | 54.5 |
| | Total | 11 | 100 |

### How and where web survey was hosted

| | | Frequency | Percent |
|---|---|---|---|
| | Hosted on your own organization's computers | 3 | 27.3 |
| | Hosted by a consulting or web development firm | 5 | 45.5 |
| | Hosted by a survey provider | 3 | 27.3 |
| | Total | 11 | 100 |

### Technologies used to create/conduct web questionnaire

| | | Count | Column (%) |
|---|---|---|---|
| Technologies used to create/conduct web questionnaire | ASP | 1 | 9.1 |
| | ASP.net | | |
| | PHP | | |
| | Perl | | |
| | MS SQL | | |
| | MySQL | | |
| | Oracle | | |
| | MS Access | | |
| | Java | 1 | 9.1 |
| | JSP | | |
| | ColdFusion | | |
| | Third-party website | 1 | 9.1 |
| | Other, please specify | 1 | 9.1 |
| | Do not know | 9 | 81.8 |

### Other means used to create survey

| | | Frequency | Percent |
|---|---|---|---|
| | SurveyTracker software | 1 | 100 |

### How survey questionnaire differs from other web versions

| | Very similar | | Similar | |
|---|---|---|---|---|
| | Count | Percent | Count | Percent |
| Question ordering | 6 | 54.50 | 2 | 18.20 |
| Question wording | 7 | 63.60 | 1 | 9.10 |
| Page format | 3 | 27.30 | 3 | 27.30 |
| Use of skip patterns | 5 | 45.50 | 2 | 18.20 |
| Other comparison of web questionnaire to other versions | | | 1 | 25.00 |

### How survey questionnaire differs from other web versions (*continued*)

| | Neither similar nor different | | Different | |
|---|---|---|---|---|
| | Count | Percent | Count | Percent |
| Question ordering | 3 | 27.30 | | |
| Question wording | 3 | 27.30 | | |
| Page format | 3 | 27.30 | 2 | 18.20 |
| Use of skip patterns | 3 | 27.30 | 1 | 9.10 |
| Other comparison of web questionnaire to other versions | 2 | 50.00 | | |

### How survey questionnaire differs from other web versions (*continued*)

| | Very different | | Total | |
|---|---|---|---|---|
| | Count | Percent | Count | Percent |
| Question ordering | | | 11 | 100.00 |
| Question wording | | | 11 | 100.00 |
| Page format | | | 11 | 100.00 |
| Use of skip patterns | | | 11 | 100.00 |
| Other comparison of web questionnaire to other versions | 1 | 25.00 | 4 | 100.00 |

### Other comparison of web questionnaire to other versions

| | | Frequency | Percent |
|---|---|---|---|
| | **Internal error checking** | 1 | 25.0 |
| | **Not applicable; the survey was only web-based** | 1 | 25.0 |
| | **There were no other questionnaires** | 1 | 25.0 |
| | **Void** | 1 | 25.0 |
| | **Total** | 4 | 100 |

### Days in field

| | | Frequency | Percent |
|---|---|---|---|
| | **Do not know** | 3 | 27.3 |
| | **7** | 1 | 9.1 |
| | **21** | 1 | 9.1 |
| | **30** | 1 | 9.1 |
| | **35** | 1 | 9.1 |
| | **45** | 1 | 9.1 |
| | **60** | 1 | 9.1 |
| | **90** | 2 | 18.2 |
| | **Total** | 11 | 100 |

### Number of recruits

| | | Frequency | Percent |
|---|---|---|---|
| | **Do not know** | 9 | 81.8 |
| | **1,000** | 1 | 9.1 |
| | **No sample** | 1 | 9.1 |
| | **Total** | 11 | 100 |

### Number of completes

| | | Frequency | Percent |
|---|---|---|---|
| | **Don't know** | 3 | 27.3 |
| | **20** | 1 | 9.1 |
| | **210** | 1 | 9.1 |
| | **250** | 1 | 9.1 |
| | **501** | 1 | 9.1 |
| | **1,000** | 1 | 9.1 |
| | **2,809** | 1 | 9.1 |
| | **4,000** | 1 | 9.1 |
| | **10,460** | 1 | 9.1 |
| | **Total** | 11 | 100 |

### Number of incompletes

| | | Frequency | Percent |
|---|---|---|---|
| | **Do not know** | 8 | 72.7 |
| | **0** | 2 | 18.2 |
| | **5** | 1 | 9.1 |
| | **Total** | 11 | 100 |

### Web-based percentage of completes

| | | Frequency | Percent |
|---|---|---|---|
| | Don't know | 2 | 18.2 |
| | 5 | 1 | 9.1 |
| | 10 | 1 | 9.1 |
| | 80 | 1 | 9.1 |
| | 90 | 1 | 9.1 |
| | 100 | 5 | 45.5 |
| | Total | 11 | 100 |

### Support provided to web respondents

| | | Count | Column (%) |
|---|---|---|---|
| | Toll-free telephone number | 2 | 20 |
| | E-mail support | 3 | 30 |
| | Link with FAQs | | |
| | Links with context-specific help on web page | 1 | 10 |
| | Other, please specify | | |
| | None of above | 5 | 50 |

### Survey design plan followed to conduct research

| | | Frequency | Percent |
|---|---|---|---|
| | In-house expertise | 5 | 45.5 |
| | Survey design software instructions | 1 | 9.1 |
| | Other, please specify | 1 | 9.1 |
| | Did not follow a survey design plan | 1 | 9.1 |
| | Do not know | 3 | 27.3 |
| | Total | 11 | 100 |

### Other survey design plan

| | | Frequency | Percent |
|---|---|---|---|
| | E-mails sent by individual agencies to their own lists of customers | 1 | 100 |

### Collect geographical information in web survey

| | | Frequency | Percent |
|---|---|---|---|
| | Yes, data coded by latitude and longitude | 7 | 63.6 |
| | Yes, data coded by zip code | 4 | 36.4 |
| | Total | 11 | 100 |

### Have used online geocoding in any web surveys conducted

| | | Frequency | Percent |
|---|---|---|---|
| | No | 11 | 100 |

### Ways to ensure e-mail invitations not considered spam

| | | Count | Column (%) |
|---|---|---|---|
| Ways to ensure e-mail invitations not considered spam | Third party or hosted e-mail solution | | |
| | E-mail sender reputation monitor | 1 | 9.1 |
| | Sender policy framework (SPF) or sender authentication | | |
| | Tools to identify common phrases used in spam | 1 | 9.1 |
| | Other, please specify | 3 | 27.3 |
| | Don't know | 3 | 27.3 |
| | Nothing | 3 | 27.3 |

### Other methods used to ensure e-mail not considered spam

| | | Frequency | Percent |
|---|---|---|---|
| | Did not solicit via e-mail, and if I checked this off earlier, I was wrong. | 1 | 33.3 |
| | Did not use e-mail invitations | 1 | 33.3 |
| | Use e-mail from transit agencies to existing customers | 1 | 33.3 |
| | Total | 3 | 100 |

### Reminded respondents to take survey

| | | Frequency | Percent |
|---|---|---|---|
| | Yes | 4 | 36.4 |
| | No | 7 | 63.6 |
| | Total | 11 | 100 |

### Number of times reminded respondents

| | | Frequency | Percent |
|---|---|---|---|
| | 1 | 2 | 50 |
| | 2 | 1 | 25 |
| | 3 | 1 | 25 |
| | Total | 4 | 100 |

### Types of reminders used for web survey

| | | Count | Column (%) |
|---|---|---|---|
| Types of reminders used for web survey | E-mail | 3 | 75 |
| | Telephone | 1 | 25 |
| | Mailed pieces | 1 | 25 |
| | Other, please specify | | |

### Increased response rate after first reminder

| | | Frequency | Percent |
|---|---|---|---|
| | No | 4 | 100 |

### Increased response rate after second reminder

| | | Frequency | Percent |
|---|---|---|---|
| | No | 2 | 100 |
| | Total | 2 | 100 |

**Increased response rate after third reminder**

| | | Frequency | Percent |
|---|---|---|---|
| | No | 1 | 100 |
| | Total | 1 | 100 |

**Total cost of web survey (dollars)**

| | | Frequency | Percent |
|---|---|---|---|
| | Do not know | 9 | 81.8 |
| | 100 | 1 | 9.1 |
| | 3,000 | 1 | 9.1 |
| | Total | 11 | 100 |

**In-house costs for web survey (dollars)**

| | | Frequency | Percent |
|---|---|---|---|
| | Do not know | 10 | 90.9 |
| | 0 | 1 | 9.1 |
| | Total | 11 | 100 |

**Third-party costs for web survey (dollars)**

| | | Frequency | Percent |
|---|---|---|---|
| | Do not know | 7 | 63.6 |
| | 0 | 1 | 9.1 |
| | 100 | 1 | 9.1 |
| | 500 | 1 | 9.1 |
| | 3,000 | 1 | 9.1 |
| | Total | 11 | 100 |

**Types of costs associated with web survey**

| | | Count | Column (%) |
|---|---|---|---|
| Types of costs associated with web survey | Hosting costs | 8 | 72.7 |
| | Recruitment costs | 4 | 36.4 |
| | Incentive costs | 3 | 27.3 |
| | Other, please specify | 3 | 27.3 |

**Other costs associated with web survey**

| | | Frequency | Percent |
|---|---|---|---|
| | Programming | 1 | 33.3 |
| | Staff costs | 1 | 33.3 |
| | Survey was part of overall study | 1 | 33.3 |
| | Total | 3 | 100 |

**Most important Best Practice for conducting web-based research**

| | | Frequency | Percent |
|---|---|---|---|
| | Careful selection of representative sample for population/market being surveyed | 1 | 9.1 |
| | Clearly identify sender and purpose of the e-mail invitations | 1 | 9.1 |
| | Develop a willing database of respondents with interest in transit | 1 | 9.1 |
| | Do not use e-mail or the web to recruit | 1 | 9.1 |
| | Keep it simple; if it is too long and too detailed, you'll lose your respondents. | 1 | 9.1 |
| | Make sure sources are reliable, reputable | 1 | 9.1 |
| | Make survey consistent with other methods | 1 | 9.1 |
| | None | 1 | 9.1 |
| | Sample size large enough to support inferences | 1 | 9.1 |
| | Thorough testing of the survey tool | 1 | 9.1 |
| | Understanding and accounting for all of the sampling biases | 1 | 9.1 |
| | Total | 11 | 100 |

**Second most important Best Practice for conducting web-based research**

| | | Frequency | Percent |
|---|---|---|---|
| | Budget enough time and resources. It will take more than you initially think. | 1 | 9.1 |
| | Clear, concise wording of questions | 1 | 9.1 |
| | Ease of use (intuitive tool) | 1 | 9.1 |
| | Easily accessible on website | 1 | 9.1 |
| | Ensuring that the respondent can go "back" without erasing data | 1 | 9.1 |
| | Get a contact in case all the information is not there. | 1 | 9.1 |
| | Make sure that respondents can leave the survey and rejoin later at the point they left off. | 1 | 9.1 |
| | None | 1 | 9.1 |
| | Provide an incentive | 1 | 9.1 |
| | Provide feedback options to respondents | 1 | 9.1 |
| | Yes | 1 | 9.1 |
| | Total | 11 | 100 |

### Third most important Best Practice for conducting web-based research

| | | Frequency | Percent |
|---|---|---|---|
| | Allowing a respondent to save a long survey and return to it later, or print it out to be filled out ahead of time | 1 | 9.1 |
| | Approach it with creativity and a sense of humor | 1 | 9.1 |
| | Convenient access for target audience | 1 | 9.1 |
| | Do not force responses | 1 | 9.1 |
| | Do not know | 1 | 9.1 |
| | Don't spend 90% gathering | 1 | 9.1 |
| | Logical progression of screens/questions | 1 | 9.1 |
| | Make sure survey is not too long or repetitive as this will reduce data quality. | 1 | 9.1 |
| | None | 1 | 9.1 |
| | Remind people | 1 | 9.1 |
| | Yes | 1 | 9.1 |
| | Total | 11 | 100 |

### Information about current web-based research

| | | Frequency | Percent |
|---|---|---|---|
| | It was not a panel survey so much as it was a longitudinal telephone survey | 1 | 33.3 |
| | The Metrolink rider panel is in existence since 2001. We are periodically replenishing the sample with new riders (< one year tenure) to maintain proportional representation and to be able to survey new-rider sub-populations. There are different ways to calculate attrition rates (i.e., non-respondents or non-opts). The most recent panel update had the following results: Final count of panel members who did not respond—of the 3,520 members with e-mail addresses as of 11/02/05, 1,458 responded, 386 e-mails were undeliverable, and 1,676 did not respond. | 1 | 33.3 |
| | We didn't do a panel study, and if I indicated this earlier, I was wrong. | 1 | 33.3 |
| | Total | 3 | 100 |

### Percent of customers with Internet access at home and work

| | | Frequency | Percent |
|---|---|---|---|
| | 60 | 2 | 5.7 |
| | 75 | 2 | 5.7 |
| | 85 | 1 | 2.9 |
| | 90 | 1 | 2.9 |
| | Total | 6 | 17.1 |
| | Not reported | 29 | 82.9 |
| Total | | 35 | 100 |

### Percent of customers with Internet access only at home

| | | Frequency | Percent |
|---|---|---|---|
| | 40 | 1 | 2.9 |
| | 50 | 1 | 2.9 |
| | 90 | 1 | 2.9 |
| | Total | 3 | 8.6 |
| | Not reported | 32 | 91.4 |
| Total | | 35 | 100 |

### Percent of customers with Internet access only at work

| | | Frequency | Percent |
|---|---|---|---|
| | **20** | 1 | 2.9 |
| | **30** | 1 | 2.9 |
| | **63** | 1 | 2.9 |
| | **75** | 1 | 2.9 |
| | **Total** | 4 | 11.4 |
| | **Not reported** | 31 | 88.6 |
| **Total** | | 35 | 100 |

### Do not know percentages of Internet access

| | | Frequency | Percent |
|---|---|---|---|
| | **Selected** | 26 | 74.3 |
| | **Not reported** | 9 | 25.7 |
| | **Total** | 35 | 100 |

### Other ways organization uses web

| | | Count | Column (%) |
|---|---|---|---|
| **Other ways organization uses web** | **Intranet** | 29 | 82.9 |
| | **Website** | 33 | 94.3 |
| | **Trip planner** | 17 | 48.6 |
| | **E-commerce** | 11 | 31.4 |
| | **Internal research** | 10 | 28.6 |
| | **Other, please specify** | 2 | 5.7 |

### Other ways organization uses the web

| | | Frequency | Percent |
|---|---|---|---|
| | **Real-time vehicle arrivals at the stop level** | 1 | 50 |
| | **Varies** | 1 | 50 |
| | **Total** | 2 | 100 |

### Rating organization on research and presentation of research

| | Very good | | Good | |
|---|---|---|---|---|
| | **Count** | **Percent** | **Count** | **Percent** |
| **Rate organization: Promotes web-based customer research** | 1 | 2.90 | 12 | 34.30 |
| **Rate organization: Promotes web/Internet initiatives (other than web-based customer research)** | 11 | 31.40 | 13 | 37.10 |
| **Rate organization: Promotes customer research** | 9 | 26.50 | 16 | 47.10 |
| **Rate organization: Promotes communication of research results to customers** | 5 | 14.30 | 8 | 22.90 |

### Rating organization on research and presentation of research (*continued*)

| | Neutral | | Poor | |
|---|---|---|---|---|
| | Count | Percent | Count | Percent |
| Rate organization: Promotes web-based customer research | 13 | 37.10 | 6 | 17.10 |
| Rate organization: Promotes web/Internet initiatives (other than web-based customer research) | 7 | 20.00 | 3 | 8.60 |
| Rate organization: Promotes customer research | 5 | 14.70 | 3 | 8.80 |
| Rate organization: Promotes communication of research results to customers | 14 | 40.00 | 5 | 14.30 |
| Rate organization: Promotes web-based customer research | 3 | 8.60 | 35 | 100.00 |
| Rate organization: Promotes web/Internet initiatives (other than web-based customer research) | 1 | 2.90 | 35 | 100.00 |
| Rate organization: Promotes customer research | 1 | 2.90 | 34 | 100.00 |
| Rate organization: Promotes communication of research results to customers | 3 | 8.60 | 35 | 100.00 |

### Involved with web-based surveys that affected transit research

| | | Frequency | Percent |
|---|---|---|---|
| | Yes | 10 | 28.6 |
| | No | 25 | 71.4 |
| | Total | 35 | 100 |

### Description of research

| | | Frequency | Percent |
|---|---|---|---|
| | No answer | 8 | 80 |
| | Research to determine community attitudes about a local referendum | 1 | 10 |
| | Research using web-based survey combining geographic information systems (GIS) for household travel/activity survey. Small Business Innovation Research (SBIR) project/U.S.DOT. | 1 | 10 |
| | Total | 10 | 100 |

Abbreviations used without definitions in TRB publications:

| | |
|---|---|
| AASHO | American Association of State Highway Officials |
| AASHTO | American Association of State Highway and Transportation Officials |
| ACRP | Airport Cooperative Research Program |
| ADA | Americans with Disabilities Act |
| APTA | American Public Transportation Association |
| ASCE | American Society of Civil Engineers |
| ASME | American Society of Mechanical Engineers |
| ASTM | American Society for Testing and Materials |
| ATA | American Trucking Associations |
| CTAA | Community Transportation Association of America |
| CTBSSP | Commercial Truck and Bus Safety Synthesis Program |
| DHS | Department of Homeland Security |
| DOE | Department of Energy |
| EPA | Environmental Protection Agency |
| FAA | Federal Aviation Administration |
| FHWA | Federal Highway Administration |
| FMCSA | Federal Motor Carrier Safety Administration |
| FRA | Federal Railroad Administration |
| FTA | Federal Transit Administration |
| IEEE | Institute of Electrical and Electronics Engineers |
| ISTEA | Intermodal Surface Transportation Efficiency Act of 1991 |
| ITE | Institute of Transportation Engineers |
| NASA | National Aeronautics and Space Administration |
| NCFRP | National Cooperative Freight Research Program |
| NCHRP | National Cooperative Highway Research Program |
| NHTSA | National Highway Traffic Safety Administration |
| NTSB | National Transportation Safety Board |
| SAE | Society of Automotive Engineers |
| SAFETEA-LU | Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (2005) |
| TCRP | Transit Cooperative Research Program |
| TEA-21 | Transportation Equity Act for the 21st Century (1998) |
| TRB | Transportation Research Board |
| TSA | Transportation Security Administration |
| U.S.DOT | United States Department of Transportation |