# The Use of Market Research Methods in Understanding Choice Transit Riders

by

Joana Conceição Moreira

B.S.E., Civil Engineering and Operations Research (1998)
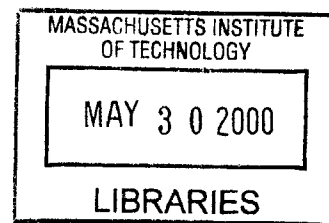
Princeton University

Submitted to the Department of Civil and Environmental Engineering in Partial Fulfillment of the Requirements for the Degree of Master of Science in Transportation

at the

Massachusetts Institute of Technology

June 2000

Signature of Author ..
Department of Civil and Environmental Engineering
May 5, 2000

Certified by ..
Nigel H.M. Wilson
Professor of Civil and Environmental Engineering
Thesis Co-Supervisor

Certified by ........
Joseph F. Coughlin
Acting Director, Center for Transportation Studies
Thesis Co-Supervisor

Accepted by .........
Daniele Veneziano
Chairman, Department Committee on Graduate Studies

The Use of Market Research Methods in
Understanding Choice Transit Riders

by

Joana Conceição Moreira

Submitted to the Department of Civil and Environmental Engineering on May 5, 2000 in partial
fulfillment of the requirements for the Degree of Master of Science in Transportation

## ABSTRACT

Three market research techniques were tested and evaluated for use by public transit agencies in
understanding choice rider priorities: conjoint analysis, the Kano method, and attitude scales. Qualitative
research was conducted to gain an initial understanding of choice riders. The qualitative research was
used to design four surveys, which were conducted at companies in Boston. The data for each survey was
analyzed and the results were compared across methods in order to recommend a market research strategy
for transit agencies to follow.

The results of the four surveys were consistent across the three market research methods tested. It was
recommended that the choice of research method by a transit agency should depend primarily on the
purpose of the study and the goals of the agency. Attitude scales were recommended for situations in
which the agency needs general information about the importance of various system attributes but is not
interested in information for marketing purposes. The Kano method was suggested for instances in which
the agency is looking for specific guidance in the development of a marketing strategy. Because conjoint
analysis is complex both methodologically and in terms of implementation, it was recommended that
agencies only use this method when at the point of making specific attribute level decisions and require
information about trade-offs between these attributes.

The survey results were used to recommend a preliminary market research strategy for Tren Urbano, the
new heavy rail system under construction in San Juan, Puerto Rico. It was recommended that the agency
begin by conducting a series of focus groups targeting specific planning, policy, and marketing decisions
of current relevance to Tren Urbano. It was then suggested that the agency consider the use of the Kano
method, which would provide both general information for use in guiding planning and policy decisions
and specific information for the development of a marketing strategy.

Thesis Supervisor: Nigel H.M. Wilson
Title: Professor of Civil and Environmental Engineering

Thesis Supervisor: Joseph F. Coughlin
Title: Acting Director, Center for Transportation Studies

# Acknowledgements

First and foremost, I must thank my two thesis advisors, Nigel Wilson and Joe Coughlin, who spent countless hours reading my work. Your recommendations helped shape this thesis into an insightful piece of work that I am truly proud of. Thank you so much for your help!

I must also thank all of the people who helped me distribute surveys at their companies: Mike Shanahan, Lucija Turcinov, Kristen Johnson, Dane Zabriskie, Chris Conklin, Hallie Dinkelspiel, Jody Sanders, Alex Snoeren, and DonnaTetrault. I would especially like to thank Erin Clarke and Kelly McHugh at the Seaport TMA for helping organize the attitude scale survey distribution.

Thanks also to the other members of the Tren Urbano research group at MIT, who have helped develop some of the ideas in this thesis through their constructive criticism and suggestions. A special thanks to Lora Blackman and Jessica Vargas for helping with survey distribution. I know you were both very busy and I appreciate that you took the time to help me! Also, thanks to Elton Lin for his moral support and encouragement.

Thanks also to the Tren Urbano office, specifically Lydia Mercado, for always offering to help with whatever information we needed. The people working on this project never minded taking time out of their busy schedules to help with student research. Your help is greatly appreciated.

I would also like to thank my mother, my father, and Cill, who have now seen me through the writing of two major academic works. Your love and support have helped to get me through the stressful times. I love you all very much.

Finally, I must give a heartfelt thank you to my soon-to-be husband Chris, whose love, support, and editing skills have been invaluable in helping me write this thesis. I have no doubt that we will make a great team for the rest of our lives and will be very happy together. Thank you for putting up with me the past few months and for helping me through this. I love you!

# Table of Contents

# CHAPTER 3: AN ASSESSMENT OF MARKET RESEARCH METHODS.................. 51

# CHAPTER 4: BOSTON SURVEY ADMINISTRATION AND DATA COLLECTION..... 79

# CHAPTER 5: SURVEY RESULTS ................................................................. 103

# List of Tables and Figures

# Chapter 1: Introduction

Maintaining mode share has been and continues to be a challenge for public transit agencies. Between 1977 and 1990, the share of overall trips in the U.S. taken on transit decreased from 2.4 to 2.0 (Pisarski, 1992). Similarly, transit's mode share for commuting trips declined from 12.6 percent in 1960 to 5.1 percent in 1990 (Pisarski, 1996). Naturally, this decline in mode share is of concern to transit agencies. In 1994, a survey of over 200 transit agencies found that 44 percent of all managers considered ridership to be one of the most critical issues for their agency (TCRP, 1994). Losses in mode share may result from a variety of factors. Over time, the transportation needs of the customer have changed due to shifting demographics, geographic population patterns, and employment trends (TCRP, 1998). The shift from transit use to use of other modes indicates that the industry has not been able to adapt to this continuously changing environment.

While transit's mode share in the U.S. has decreased over time, its primary competitor, the automobile has seen an increase in mode share. Between the years of 1980 and 1990, the share of commuters using the private automobile increased from 84.1% to 86.5%. Associated with this increase in mode share was the addition of 21 million automobiles to the roadways (30% increase from 1980). Increases in automobile ownership and use in our society have resulted in tremendous highway congestion in many major cities. As traffic congestion worsens, drivers are faced with higher travel times and increased frustration. Between 1980 and 1990, the average travel time for a commuter traveling from the suburbs to a central city in the U.S. increased by 3.6 minutes. Although this may not seem like a tremendous increase, it is actually significant considering that 15 million people in the U.S. live in the suburbs and work in a central city. These travel time increases are also expected to continue into the future. The Central Transportation Planning Staff of the state of Massachusetts has projected that by the year 2020, average travel times into Boston will increase by 9-12 minutes for suburbs that are between 25 and 40 miles from Boston. In addition to increased travel times for commuters, the increase in automobile use and traffic congestion may have environmental implications since the increases in vehicle miles traveled and idling time in traffic affect air quality. Therefore, by attracting auto

users to public transportation, agencies can potentially increase the welfare of both the travelers themselves and society as a whole.

Transit riders are often grouped into two categories: "captive" riders and "choice" riders. Captive riders are those individuals who are dependent on transit to meet their travel needs. For example, they may be individuals who do not own an automobile or have a disability that impedes their ability to drive. As their name implies, they are captive to the system since their alternative transportation options are limited. Choice riders, on the other hand, are those individuals who have access to other modes of transportation, such as the automobile, but who choose to ride transit. One way in which transit agencies can increase ridership is by attracting non-riders who are currently using other modes of transportation. By turning these non-riders into choice riders, transit mode share can be increased; therefore transit agencies can benefit tremendously by learning more about these potential customers. This thesis examines a few market research techniques that can help agencies better understand how to attract non-riders to their systems, thus increasing their choice ridership.

## 1.1 Research Purpose

In order for transit agencies to attract choice riders, it is important for them to understand choice rider needs and priorities. Market research is a set of tools that can help agencies better understand how to influence commuting choices by providing insight into the design, operation, and marketing of their systems. For example, market research might indicate that having a simple fare structure is important to choice riders. This would be an important consideration for future fare policy decisions. The agency should not assume it knows what its riders want. In order really to know what customers want in a system or service, it is necessary to ask them.

Often public transportation planning decisions are made largely on the basis of engineering design considerations without great concern for customer preferences. When a company designs a new product in the private sector, there is a great deal of interaction between the engineers who perform the design tasks and the marketing group who interacts with potential customers. Engineers may invent or design a product that is a marvel of modern technology, but if it does

not serve the customer's needs it will be a failure. Likewise, customers may request products that are technologically infeasible.

The point is that both functions are important and must work together in order to produce successful products or services. Transportation is no exception to this rule and it is essential for planners to better understand the needs of their customers. Often transportation planners may believe they know what customers or potential customers want without asking them. In reality, the planner's perception of customer needs may be incomplete, biased, or completely incorrect; therefore, it is important to use market research methods to better understand customer needs.

## 1.1.1 Thesis Objectives

This thesis deals specifically with choice riders and has three objectives which can be summarized as follows:

> ***Objective 1:*** *To test and evaluate the use of various market research methods in understanding choice riders*
>
> ***Objective 2:*** *To gain a better understanding of choice rider priorities*
>
> ***Objective 3:*** *To recommend a market research strategy for transit agencies to follow*

The first objective is the primary focus of the research and the results should be of value to many transit agencies. The second goal is a by-product of the research approach, which will be described later in this chapter. The third objective requires that the results of the research be targeted towards transit agencies embarking on a market research initiative. A specific focus is on market research for Tren Urbano, a rail system now under construction in San Juan, Puerto Rico.

## 1.1.2 Previous Tren Urbano Work

Little work has been done to date for Tren Urbano with respect to marketing and market research. In the coming months, this will be an area of increasing interest since it will be crucial for the success of the new system. Although little marketing has been implemented for the system to date, a couple of theses have been written at MIT as part of the Tren Urbano

technology transfer program and undoubtedly warrant mention since the thesis builds upon this previous work.

Hoffman's thesis, Toward a Positioning Strategy for Transit Services in Metropolitan San Juan, uses qualitative research methods to provide an initial typology of public perception of transit options in San Juan. With the use of focus groups, Hoffman is able to provide a general understanding of possible marketing strategies for Tren Urbano. This research is exploratory in nature, and although it provides an excellent starting point for understanding important attributes of transit, it is necessary to expand this research with the use of quantitative methods in order to ensure more global applicability.

Planck's thesis, Transit Marketing: Strategies for San Juan, Puerto Rico, looks at the marketing plan in general with little focus on market research. It provides a good overview of marketing practices, presents examples of innovative marketing strategies at transit agencies, and recommends a possible marketing plan for Tren Urbano. However, it does not provide information about how research should be conducted in San Juan in order to support marketing decisions. This more in-depth treatment of market research methods will be dealt with in the current work.

Blackman's thesis, Older Adult Perceptions of Transit Security and Their Utilization of Public Transportation: Ridership Strategies for the Elderly on Tren Urbano, deals specifically with elderly perception of transit. This study surveyed 182 seniors age 60 and over at eleven transit-accessible senior centers in the Boston Metropolitan Area and the results are applied to the Tren Urbano context. The objectives of the survey were to find out the frequency with which seniors take public transit; what they use it for; how they make mode choice decisions; the extent and causes of their public transit fear; and if their fear impacts their ridership patterns. The study found that the vast majority of seniors have regular access to a private automobile either as a driver or a passenger. Nonetheless, many of the seniors take transit at least a few times a week, more frequently by bus than by train. The elderly appear to value the convenience aspects of public transportation over security, including the schedule and where the service goes. Overall, the seniors are not very afraid of crime in general or on public transportation, however they are

more fearful of riding the train than the bus due to the lack of interaction with the driver and the speed of the train. They are most afraid of quality of life crimes, particularly pushing and shoving and teenager rowdiness.

The research presented in this thesis extends the previous Tren Urbano work and other published work on transit market research in a couple of ways:

- Unlike previous studies, which tend to provide a more general look at market research issues, this research explores and tests specific market research methods for implementation in a public transportation context. At least one of these methods has not yet been implemented in a public transportation context.

- The research compares the market research methods in order to make recommendations about which is appropriate for implementation in different transit situations.

- The thesis focuses specifically on understanding choice riders, whereas previous research has focused on existing or captive transit riders. The importance of understanding and attracting choice riders is described below.

## *1.2 The Importance of Attracting Choice Riders*

Attracting new riders has been an important priority for many public transit agencies for a number of years. There are three ways in which transit agencies can address the problem of ridership growth:

- Attract new riders
- Increase the frequency of use among current riders
- Focus intently on rider retention

Many transit agencies that have focused on attracting new riders have had notable success in increasing their overall system ridership. For example, in the past few years the Lynx system in Orlando, Florida has focused on expansion of its service targeted at attracting new riders. The result has been a double-digit ridership increase annually since 1990 (TCRP Report 37, 1998). Similarly, the Riverside Transit Agency in California has implemented a number of customer-based strategies, such as headway reductions, addition of service, and expanded marketing. These initiatives resulted in ridership increases of 21.8 percent in 1991, 7.6 percent in 1992, and 12.8 percent in 1993.

Some of the larger transit agencies in the U.S. have also had notable success in increasing system ridership by focusing on customer satisfaction and attracting new riders. With programs like "Transit Choices for Livability", Portland Tri-Met has maintained a customer-oriented focus and has tried to cater to the needs and expectations of its current and potential riders. As a result, Tri-Met was able to increase its ridership by 31% between 1993 and 1998 (National Transit Database). Another system that has seen a steady increase in ridership is New York City Transit, whose "ridership figures for the subway and bus are rising steadily" (NYCT web page, 2000). In fact, between 1993 and 1998, NYCT ridership increased by almost 25%. The agency attributes this ridership increase to customer-driven improvements, such as the implementation of its MetroCard system.

In terms of attracting new riders, the choice rider market segment may be one of the most promising groups of potential customers. A recent study conducted for the Federal Transit Administration (FTA) and the American Public Transit Administration (APTA) indicates that choice riders can significantly affect overall system ridership. According to the study, more than one-third of the transit trips on the average transit system are made by choice riders. Figure 1-1 shows the proportion of system riders of different-sized agencies who have an automobile available. The figure indicates that larger systems tend to attract more choice riders, as do systems with rail service. Nonetheless, even small systems have the potential to attract choice riders and focusing efforts on understanding these customers can greatly impact any transit system's overall ridership. An important point to note is that these percentages are averages and therefore it is likely that some systems have much higher shares of choice riders than those reported in the figure. This illustrates that the potential *does* exist for transit systems to attract significant numbers of choice riders and that it can be extremely beneficial to better understand these customers.

Another reason for transit agencies to focus on understanding choice riders is that a significant portion of the choice rider market remains untapped. The 1990 Census found that 100 million of the 115 million commuters in the United States use the automobile to commute to work (Pisarski, 1996). It was also found that less than 10% of automobile owners reported riding

public transportation to work. Although not all of the remaining 90% of automobile owners comprise the choice rider market (some of these people may not have transit services available to them and therefore aren't potential customers), there is clearly a significant market that transit agencies can attempt to attract.

**Figure 1-1: Percentage of Choice Riders on Different Transit System**
(Source: McCollom, 1999)
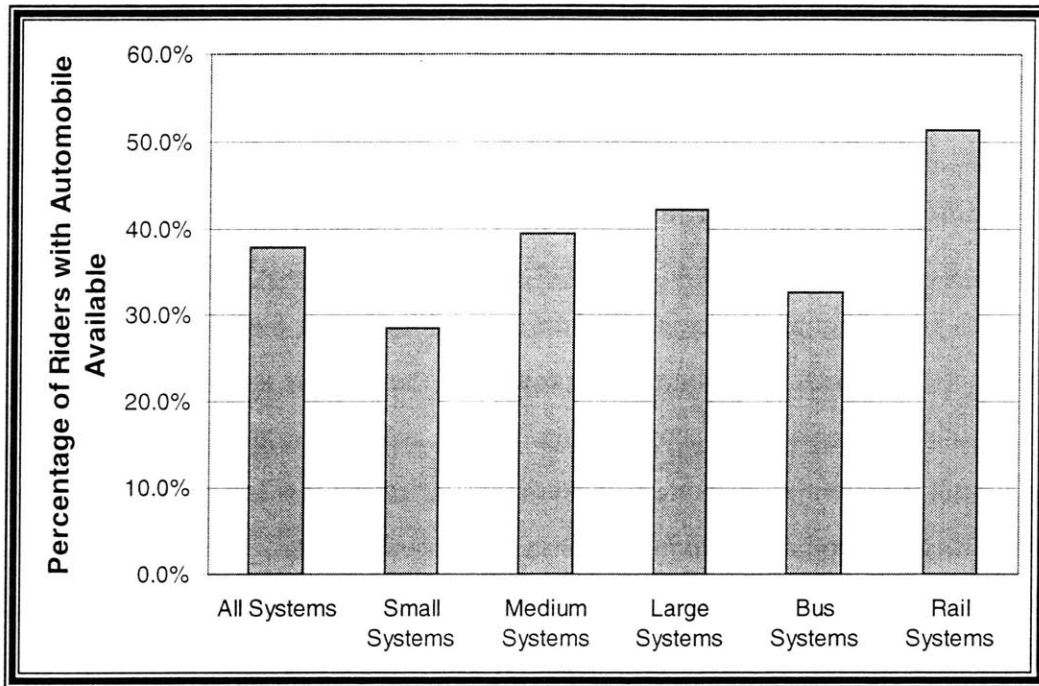


Attracting choice riders can be particularly important for new systems, especially those that are being built (at least partially) for the purpose of alleviating traffic congestion. San Juan, Puerto Rico is currently in the process of building a new heavy rail transit system, Tren Urbano. Currently, the vast majority of individuals who travel within the San Juan Metropolitan Area use the automobile. This results in massive congestion and a density of 56 vehicles per kilometer of paved road, the highest of all metropolitan areas in the world. In fact, from 1964 to 1990, the private automobile's mode share increased from 62.7% to 90.5%, evidence that the society is becoming more and more automobile oriented (Tren Urbano Final Environmental Impact Statement, 1995). Tren Urbano will have a tremendous impact on the transportation system in the San Juan Metropolitan Area (SJMA) and will have the potential to considerably alleviate

many of the transportation problems that currently plague this rapidly growing city. However, as Opening Day grows near, Tren Urbano planners will face the question of how to attract riders to this new, unfamiliar system. In order to attain the desired level of ridership and congestion mitigation, it will be necessary to convince many commuters who currently drive into the SJMA to consider the train as an alternative to the private automobile. Knowing which market research techniques are most effective for understanding these choice riders is the first step to learning how these potential customers can be drawn to the Tren Urbano system.

## *1.3 Access to Public Transit Services*

Easy access to transit services is a concern for all customers; however, choice riders and captive riders may have different requirements. Captive riders often walk to public transit stations, while choice riders may be more likely to use the car as an access mode. Many public transit systems are geared towards providing transportation to, from, and within major metropolitan areas. Although service often extends into suburban communities, the purpose is usually to provide transportation options into the city for people living in these areas rather than to provide transportation within the suburbs. Therefore, these suburban areas often have only one or two transit stations, which tend to be located in or near the town center. The residents of these communities usually don't live within walking distance of these transit stations. Furthermore, many of these communities don't have local bus service providing access to the stations. Consequently, one of the primary (or sometimes the only) access modes to transit for these individuals is the private automobile.

### 1.3.1 Park-and-Ride

The automobile owners described above have access to transit and thus have the option of either using this service or using their private automobile for commuting to work. They make up a large portion of the potential choice rider market for transit agencies. Of course, an important issue for these agencies is how to persuade the automobile-owning commuter to use transit instead of driving all the way into the city. One of the most promising strategies for accomplishing this is park-and-ride. The intent of park-and-ride is to provide a location for people to switch from low-occupancy vehicles, such as the private automobile, to high-occupancy vehicles such as trains and buses. Although the facilities can be used as drop-off locations, their primary purpose is to provide parking for individuals accessing transit via the

automobile. From the transit agency's point of view, park-and-ride may be a more effective way of extending the reach of transit into low-density suburbs than extending or adding new bus (or rail) service.

Many transit agencies that have focused on the effective design and operation of park-and-ride facilities have been able to increase significantly the number of choice riders on their systems. The Orange Line opened by the Chicago Transit Authority in 1993 is an excellent example of park-and-ride's potential for attracting choice riders and increasing ridership. The line contains several park-and-ride lots at its stations, and most of these lots receive considerable use. As Figure 1-2 illustrates, a CTA survey of riders one year after the Orange Line opened showed that close to 20% of riders previously drove all the way or rode with another commuter into work. This increase in choice riders undoubtedly had a significant effect on the overall increase in Southwest Corridor ridership of 31% (LaBelle and Stuart, 1995).

**Figure 1-2: Prior Mode Used by CTA's Orange Line Transit Riders: 1994**
(Source: Labelle and Stuart, 1995)
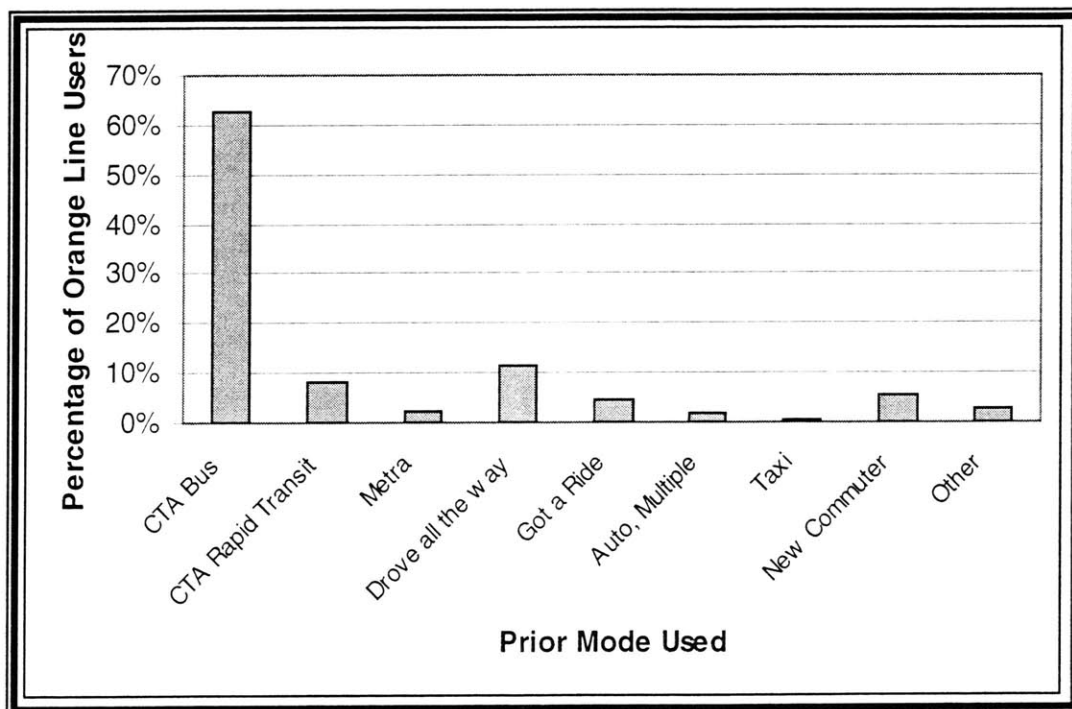


For many automobile owners, auto access to transit may be an important factor influencing their choice of commuting mode. In fact, the provision of park-and-ride facilities may be considered necessary in order for them to choose transit. However, simply providing park-and-ride doesn't

necessarily mean that people will use it. There may be attributes of the park-and-ride facility and the transit service itself that strongly affect the travel decision of choice riders. In other words, if the facility and transit service don't meet the potential customers' expectations, they won't choose transit. Consequently, focusing on the attributes of park-and-ride facilities (including their respective transit services) provides an interesting look at choice rider priorities. For this reason, park-and-ride has been chosen as the topic of the Boston surveys.

## 1.3.2 The Plaza Concept in San Juan

The focus on park-and-ride also provides an interesting example for Tren Urbano, where the *plaza* idea is being considered in additional to conventional park-and-ride. Conventional park-and-ride involves only one vehicle transfer, namely that from the automobile to a high-occupancy vehicle. The plazas that are being considered in Puerto Rico would require the customer to make two transfers. These plazas would be located in communities that are not being directly served by Tren Urbano. They would provide a location to which people could drive, park their cars, and then take a shuttle to the nearest Tren Urbano station. Because parking space at the Tren Urbano stations will be limited, plazas may provide a transit option for people who otherwise would not be able to access the system. Although plazas are not conventional park-and-ride, they still have many of the same attributes as conventional park-and-ride facilities. By focusing the surveys on park-and-ride, this thesis provides an example of how Tren Urbano planners can use market research techniques to explore attributes of the plaza idea.

## *1.4  Research Approach*

As stated previously, the primary purpose of the research approach is to evaluate alternative market research methods for understanding the choice rider. This is accomplished through a series of steps, as shown in Figure 1-3. Each step is briefly described in the following paragraphs. Following this general description, the next section will outline the steps that were used for each of the surveys conducted in Boston.

## 1.4.1 Market Research Method Selection

The first step of the research approach is the selection of market research methods to be explored in the study. The field of market research has existed for many years and, naturally, there are

many possible methods that might be considered for use in public transit systems. For this

research a number of different methods were evaluated using the following criteria:

- ◆ Main uses of the method

- ◆ Data requirements

- ◆ Information provided by the results

- ◆ Advantages and disadvantages of the method

In the end, three methods were chosen for testing and evaluation: conjoint analysis, the Kano

method, and attitude scales. The selection of market research techniques and details of the

chosen methods are discussed in Chapter 3.

**Figure 1-3: Research Approach**
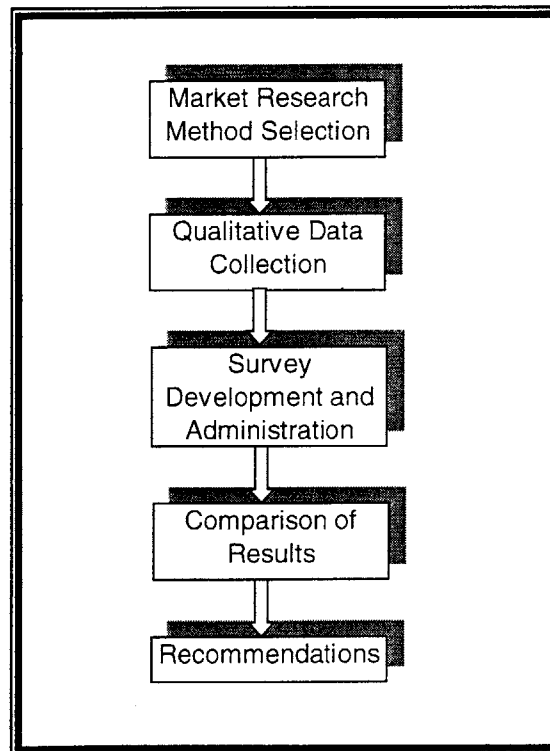


## 1.4.2 Qualitative Data Collection

Survey design often begins with the use of qualitative research methods such as focus groups and

personal interviews. A focus group is a group discussion focused on specific topics introduced

by a discussion leader. A personal interview is a one-on-one interview between a respondent and

the interviewer. This preliminary qualitative work provides the researcher with a better

understanding of appropriate questionnaire content and wording. It is important because the

researcher is often exploring a topic with which she is very familiar and designing a

questionnaire without input from potential customers may result in one that is incomplete or unclear to an ordinary person.

For the Boston survey, the qualitative research stage consisted of one focus group and one personal interview. The qualitative data that was obtained provided valuable insights and perspectives for use in developing the questionnaires used in later steps of the market research approach.

## 1.4.3 Survey Development and Administration

The next step in the market research approach is to develop questionnaires for each of the market research methods selected and distribute them at companies in Boston. Ideally, it would have been more instructive to conduct the surveys in San Juan since one of the specific goals of the thesis is to provide recommendations for a market research plan for Tren Urbano. However, because the primary researcher was based in Boston, it was not possible to conduct surveys in San Juan. Consequently, although the results of the surveys may not provide much information for use specifically by Tren Urbano, the research approach and general recommendations should prove useful.

In general, the Boston-based questionnaires were distributed at companies where employees have a number of commuting options and can therefore be considered potential choice riders. Two different distribution methods were used: paper and web-based. This allowed for an evaluation of different distribution methods in addition to the analysis of alternative research methods themselves. The differences between these two methods are described in Chapter 4.

## 1.4.4 Comparison of Results

The survey results for each of the methods are compared in order to determine whether they are consistent and what the significant differences are between the selected market research methods. In comparing the methods, it is also important to look at issues that arose during survey distribution and administration. In this way, trade-offs between method results and administrative issues can be highlighted.

## 1.4.5 Recommendations

Based on the survey experience in Boston, recommendations regarding the use of market research techniques to understand choice riders are made. Recommendations are provided both in a broad context relevant to many public transit agencies, and in specific the Tren Urbano context.

## *1.5 Survey Implementation*

Since park-and-ride has been shown to be an effective way of attracting choice riders, the surveys used in Boston focused on attributes of park-and-ride and its associated transit services. Figure 1-4 illustrates the steps that were used for each survey conducted in Boston. Each step is briefly described in the following paragraphs.

**Figure 1-4: Survey Implementation**
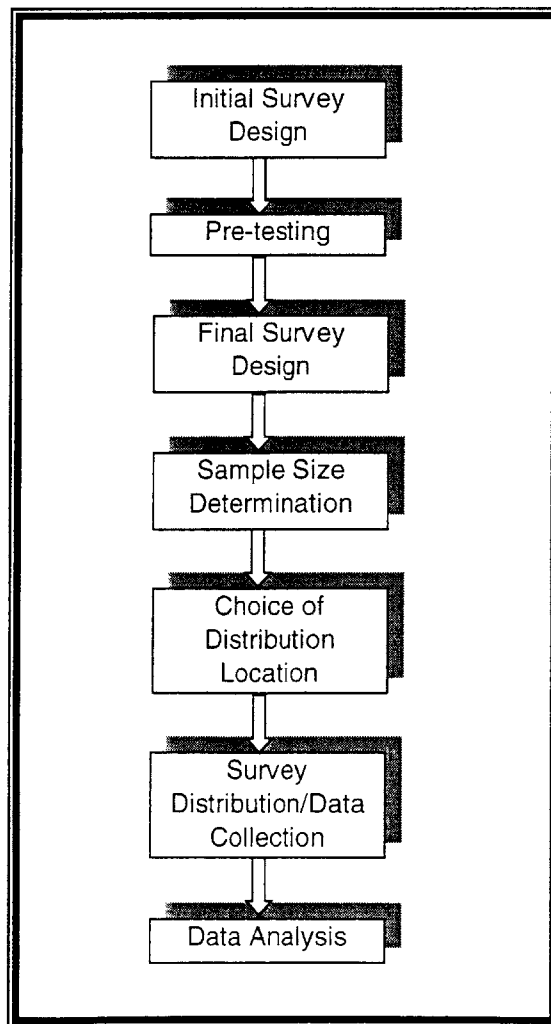
## 1.5.1 Initial Survey Design

Based on the qualitative phase discussed in the previous paragraphs, preliminary questionnaires were designed for each of the three selected survey methods. The primary considerations in the questionnaire design were content, appearance, length, and clarity. The content of the questionnaires was based on literature and qualitative research findings. Additionally, a number of socioeconomic questions were included so that data could be analyzed with respect to different market segments.

## 1.5.2 Pre-testing

Prior to administering a survey, it is extremely important to perform a pre-test to ensure that the questionnaire can be clearly understood and is not too long. Additionally, the pretest ensures that the questionnaire will successfully gather the information required by the researcher. After the questionnaires were drafted for the Boston survey, a pre-test was done by administering them to various individuals who were not members of the transportation community. These individuals were asked to complete the questionnaire, keeping track of the amount of time that was required to complete it, and note any questions that were not clear. They were then interviewed and asked to provide feedback for subsequent questionnaire revisions.

## 1.5.3 Final Survey Design

Based on pre-test results, the questionnaires were revised into the final questionnaire design. These questionnaires are shown and described in more detail in Chapter 4.

## 1.5.4 Sample Size Determination

The next step was to determine appropriate sample sizes for the various surveys. The statistical methods that can be used to determine sample size are well known and documented. In general, a larger sample size will ensure that the results are more representative of the population as a whole. However, financial and practical constraints always limit the number of individuals who can be included. Consequently, many market resources state that a sample size of 100 is the minimum that should be considered for any study (Urban and Hauser, 1992). Because the resources for this particular study were limited, a sample size of approximately 100 was attempted for each method. This number was chosen to ensure a statistically significant sample without requiring an inordinate amount of questionnaire distribution.

## 1.5.5 Choice of Distribution Location

Based on the necessary sample size and the specific characteristics of each questionnaire, appropriate distribution locations were selected. All of the questionnaires were distributed to professionals in the Boston area. However, some distribution locations had characteristics that were conducive to a particular type of questionnaire. For example, it was thought that the conjoint questionnaire would only be relevant to people who were faced with high parking costs. Consequently, the conjoint questionnaire was only distributed to employees who worked in the downtown area. Additionally, some companies were apprehensive about distributing surveys over the Internet and this had to be taken into consideration when selecting distribution locations.

## 1.5.6 Survey Distribution/Data Collection

After the distribution locations were determined, the questionnaires could be distributed. They were distributed to employees at ten different companies or organizations in Boston and Cambridge. It was believed that by conducting the surveys at places of business, middle- to high-income professionals could be targeted. These individuals are often what transit authorities have in mind when they use the term "choice rider". Many of them own automobiles and therefore have the choice of using a mode other than transit. These individuals were also chosen because they are similar to the potential choice riders that Tren Urbano hopes to attract.

## 1.5.7 Data Analysis

Each of the market research methods selected required a different data analysis technique. For example, conjoint analysis required the estimation of utility functions via linear regression, while attitude scales only required averaging the results. Therefore, each of the data sets was analyzed separately. The results of each analysis were then compared across methods.

## *1.7 Thesis Chapter Outline*

The remainder of this thesis consists of seven chapters, as outlined below.

*Chapter 2: Individual Choice Behavior and Market Research*

Chapter 2 first presents several theories about individual choice that have been developed in the literature. The chapter then discusses market research, which is a set of tools used to understand what attributes of a product or service are important to customers. In many cases these tools are grounded in consumer theory or can be used to improve one's

understanding of the individual decision-making process. Finally, the chapter presents the state-of-practice in transit market research and some of the recent literature in the field.

## Chapter 3: An Assessment of Market Research Methods

Chapter 3 first presents a variety of market research methods from which the three included in this thesis were selected. After all of the methods are presented, an explanation of the selection criteria for the chosen methods is provided. The remainder of the chapter includes a detailed description of each of the three selected methods (conjoint analysis, the Kano method, and attitude scales).

## Chapter 4: Boston Survey Administration and Data Collection

Chapter 4 describes the park-and-ride studies that were conducted in Boston. The chapter begins with a discussion of the questionnaire development, which included the use of qualitative research methods such as focus groups. It then continues by describing the survey distribution in Boston. Finally, a discussion of various distribution issues is provided.

## Chapter 5: Survey Results and Analysis

Chapter 5 presents the results and analysis of the Boston surveys. It begins with a description of the overall sample population for all methods. Next, the results and analysis of each method are presented. Finally, the chapter concludes with a comparison of the results across the three market research methods.

## Chapter 6: Public Transit Market Research Recommendations

The purpose of Chapter 6 is to recommend if, how and when transit agencies should implement the market research methods discussed in this study. The chapter aims to provide specific recommendations for Tren Urbano in terms of future market research efforts. The chapter begins by discussing each of the methods in terms of their value and appropriateness for transit agencies. The chapter then presents specific recommendations for Tren Urbano with regard to which market research methods to use and in which roles.

## Chapter 7: Summary and Recommendations for Future Research

The final chapter summarizes the research presented in the thesis and the findings. Additionally, the chapter presents a number of areas in which the research may be extended in future studies.

# Chapter 2: Individual Choice Behavior and Market Research

In order to survive in a competitive environment, it is important for any organization making any product or providing any service to understand the needs and preferences of its customers. Understanding these needs and preferences can allow a company to modify products (services) to better meet customers' expectations. Furthermore, this understanding provides insight into how to best present products to potential customers in a manner that highlights how the product or service meets the customers' needs and desires.

Like most organizations, public transit agencies operate in a highly competitive environment. Their current and potential customers, riders and non-riders of the transit services provided, often have many transportation options from which to choose. Public transit agencies have struggled to increase their ridership levels faced with continued suburbanization and increased competition from the automobile. Although there are some signs that these trends may be changing, transit agencies must offer services that meet both their customers needs and suit their preferences if they expect their current customers to continue using the services. This understanding of customer needs and preferences is even more important if transit agencies hope to attract new passengers who are currently choosing other modes of travel.

In this regard, public transportation agencies are no different than other organizations providing consumer products and services. The real difference is that they are competing with other transportation modes rather than with other companies producing similar products. In order to provide services that meet the needs of their current or potential riders, it is necessary for agencies to understand what customers expect from the public transportation service. They must also understand what customers expect from transportation services of all types in order to understand how their services compare with competing modes such as the automobile.

Market research is a tool that has been used successfully by firms for many years to better understand their customers. Public transit agencies, on the other hand, have been slow to use market research techniques to understand their riders. By better understanding and utilizing these techniques, agencies can move towards a better understanding of their riders and

potentially provide more effective transportation services that are more responsive to their riders' needs.

Figure 2-1 illustrates the foundations for describing market research applications suited to public transit agencies. As the figure shows, at the core of any market research methodology is the theory of individual choice behavior, a set of models that have been developed to explain how people make decisions. The first part of the chapter presents several theories about individual choice that have been developed in the literature. The chapter then discusses market research, which is a set of tools used to understand what attributes of a product or service are important to customers. In many cases these tools are grounded in consumer theory or can be used to improve one's understanding of the individual decision-making process. Finally, the chapter presents the state-of-practice in transit market research and some of the recent literature in the field.

**Figure 2-1: Foundations for Market Research Application to Public Transit**
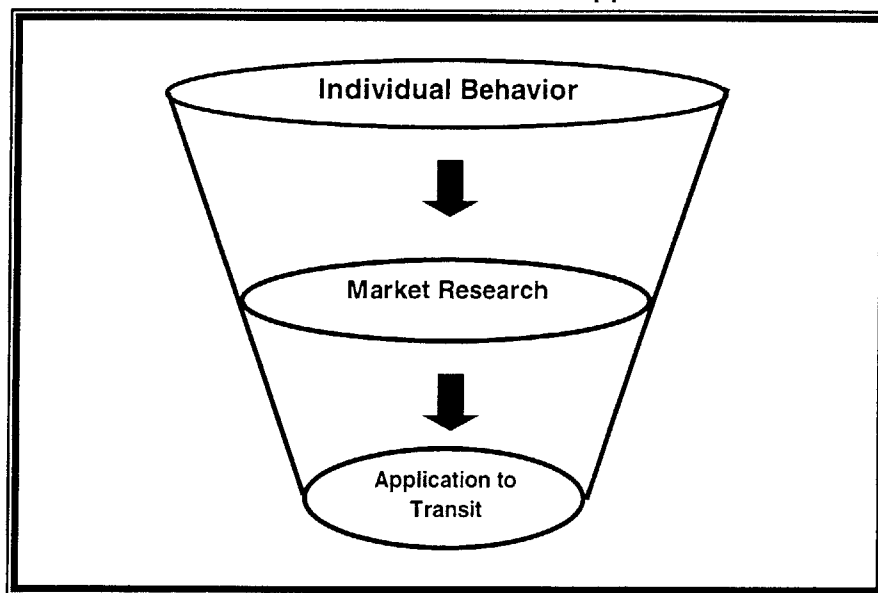


## 2.1 Individual Choice Behavior: Various Approaches

As mentioned previously, the theory of individual choice behavior is a set of models which are intended to describe the process people use when choosing between different options. The question of how people make decisions has been studied by psychologists, economists, and researchers in other disciplines for years and is fundamental in modeling human behavior. There is no universally accepted theory of individual behavior, and this area of research will

undoubtedly continue to evolve over time. However, a few theories have been widely accepted, and although they continue to evolve, they provide a good basis for understanding choice theory. These five theories are described in the following sections:

- Rational choice
- The recognition-primed decision model
- Contingent strategy selection
- Social decision making
- Psychological decision making

Rational choice is included in the discussion because it has been used by researchers in transportation applications for many years and is most often used to model mode-choice decisions. It assumes that individuals make choices by weighing the various attributes of alternatives and trying to satisfy some pre-determined objective. Although it allows for the mathematical modeling of choice behavior, it fails to account for other factors that may influence decision-making but cannot readily be quantified. The other theories discussed in this section address this shortcoming in decision theory by focusing on alternate ways in which people might make decisions, such as through the use of past experiences, social influences, or emotional factors.

## 2.1.1 The Theory of Rational Choice

Rational choice is perhaps the most widely recognized theory of decision making. It assumes that decision making is a process or sequence of events. According to Ben Akiva, this process is comprised of the following steps (Ben Akiva and Lerman, 1985):

1. Definition of the choice problem,
2. Generation of alternatives,
3. Evaluation of alternative attributes,
4. Choice,
5. Implementation.

When faced with a set of options, the choice step is the key step in the decision making process.

The choice step of this process contains the following elements:

1. Decision maker,
2. Alternatives,
3. Attributes of alternatives,
4. Decision rule.

Rational behavior is a term that is often used to describe the decision process described in the previous paragraph. According to Ben Akiva:

> In general, it (rational behavior) means a consistent and calculated decision process in which the individual follows his or her own objectives, whatever they may be. It stands in contrast to impulsiveness, in which individuals respond to choice situations in different ways depending on their variable psychological state at the time the decision is made.

A rational decision is made by evaluating each alternative based on its attributes and then choosing the one that best satisfies some pre-determined objective.

The primary advantage of the rational choice framework is that it allows for the mathematical modeling of choice behavior. Because each aspect of a decision is quantified and it is assumed that individuals make choices in a calculated manner depending on the specified attributes, rational choice allows researcher's to model and predict the decisions that people make. However, the primary drawback to rational choice is that people don't always make decisions rationally. There are aspects of decision-making that *can't* be quantified, such as social influences and emotional factors. Additionally, individuals don't always have perfect information about all of the alternatives, and cannot be expected to make decisions based on unknown parameters. Consequently, some psychologists have devised alternative choice theories that take into account some of the flaws in rational choice. Four of these theories are described in the following paragraphs. Although these theories may better represent the way individuals *actually* make decisions, they are not as conducive as rational choice to modeling and predicting choice behavior.

## 2.1.2 The Recognition-Primed Decision Model

An alternative theory of decision making is Klein's Recognition-Primed Decision (RPD) Model, which is shown schematically in Figure 2-2 (Klein, 1998). Unlike the rational choice model,

RPD does not require the decision-maker to compare all available alternatives and make a decision based on the attributes of each alternative. It postulates that decision-makers often make choices based on decisions that have been made in the past rather than weighing all possible alternatives. By knowing the results of those past decisions, one can assume the result in a similar situation will be consistent with those previously experienced results and thus a decision can be made without reviewing all possible alternatives.

**Figure 2-2: Integrated Version of Recognition-Primed Decision Model**
(Source: Klein, 1998)
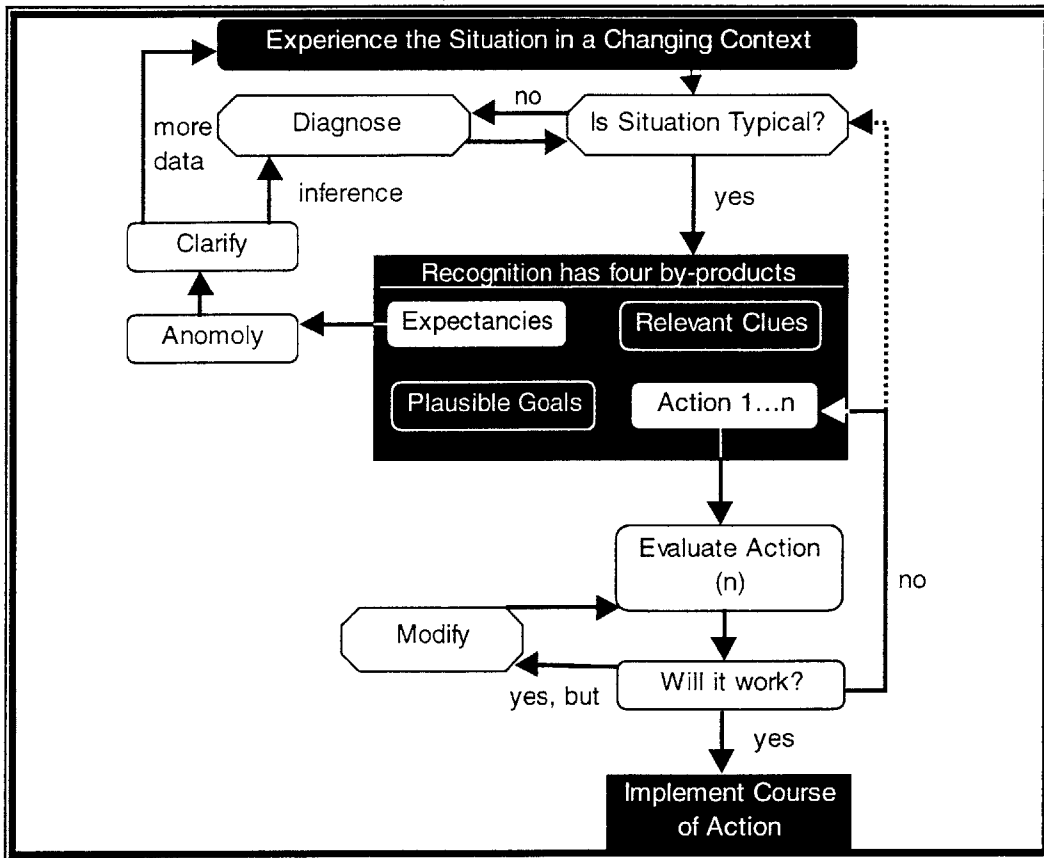


The schematic version of the RPDM model shows that decision-makers try to recognize whether a situation is typical or familiar. If so, they understand what goals are plausible, which cues are important, what they should expect out of the situation, and which courses of action are typical. They then evaluate each of these actions to determine whether the typical courses of action will work in the situation at hand. If necessary, the decision-maker can modify the courses of action so they will be feasible. Once the action has been deemed appropriate it can be implemented. Therefore, the model implies that people don't necessarily evaluate every possible course of action, but rather only those actions that have been successful in the past.

## 2.1.3 Contingent Strategy Selection

Another theory of decision making is that individuals make decisions depending on their particular situation at the time. Payne et al (1993) hypothesize that individuals use different decision strategies in different situations. They state that "an individual's use of multiple decision strategies in different situations, including various simplifying methods or choice heuristics, is an adaptive response of a limited-capacity information processor to the demands of complex decision tasks" (Payne, Bettman, and Johnson, 1993). The authors suggest that there are three major classes of factors that affect the way in which individuals make decisions, as illustrated in Figure 2-3. The figure shows that the choice of decision strategy is based on characteristics of the problem at hand, characteristics of the person making the decision, and characteristics of the social context of the decision. In other words, the individual's choice of a decision rule will depend on the circumstances surrounding the choice to be made.

**Figure 2-3: Contingent Strategy Selection**
(Source: Payne, Bettman, and Johnson, 1993)
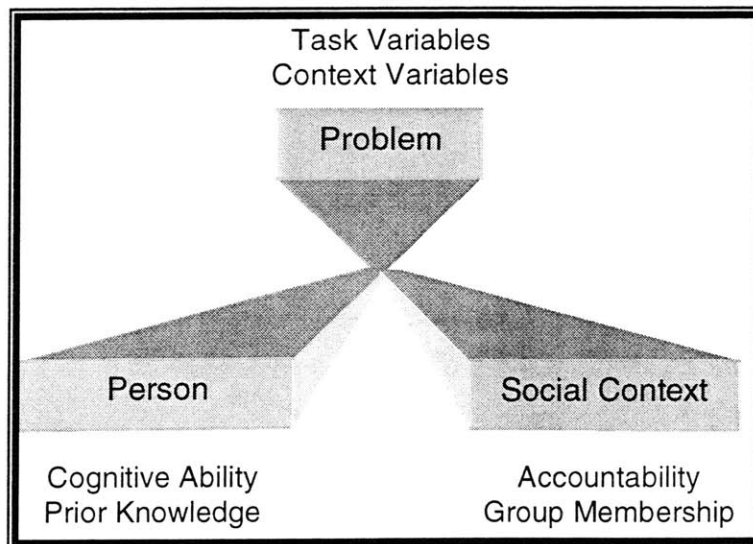


## 2.1.4 Social Decision-Making

The "social context" in which a decision is being made is an interesting concept and one that is overlooked in many decision models. Plous (1993) stresses the importance of social influences in decision making:

> People frequently discount or ignore consensus information when making causal attributions. Does this mean, then, that decision makers are unconcerned with the behavior and attitudes of other people? Far from it. Even the most independent decision makers are strongly affected by social factors (Plous, 1993).

Social influences are especially interesting when thinking about transportation decisions involving public transportation. It is often believed that people will not take public transit because of the stigma associated with it. It is thought that public transit is sometimes associated with the lower-income sector of the population who may be highly transit dependent. If this is true, then it is questionable whether traditional decision rules are valid for decisions involving transit since it may provide higher utility with respect to travel time, travel cost, etc., but still may not be the chosen alternative.

## 2.1.5 Psychological Decision-Making

In addition to social influences, there are other psychological factors which may come into play in decision making. Rieck provides some interesting observations about how people make decisions, including the following (Rieck, 1999):

- ♦ People make decisions emotionally. People seldom make rational, logical decisions. They decide based on a feeling, need, or emotion.

- ♦ People are egocentric...so any time you ask someone to do something, you must answer his or her unspoken question, "What's in it for me?"

- ♦ People want to avoid risk. People pursue gain, but the urge to avoid loss is more powerful because it works on a more basic level.

- ♦ People are creatures of consistency. We are driven to remain consistent in our attitudes, words, and actions.

Some of these points are especially interesting in a public transportation context. For example, the point that people are creatures of consistency is extremely relevant in terms of transportation choices. If this assertion is true, then people may continue to use their current mode of transportation even if a better alternative is presented. Therefore, choice riders who currently drive to work may not switch to transit even if their needs would be well met. Naturally, this might be a problem for transit agencies who are trying to attract these choice riders.

## 2.1.6 Summary of Individual Behavior Theory

Clearly, there are many schools of thought about how people make decisions. There are those psychologists and researchers who believe people make decisions rationally and therefore their behavior can be modeled and predicted. There are others who believe people act emotionally

and therefore don't go through a rational process when making a choice. There are those who claim the decision process varies depending on the situation at hand. Regardless of which model is actually used by people in making decisions, it is important to understand what factors they consider when making choices, whether they are social, habitual, rational or otherwise. Market research is a set of tools that help identify the important factors in customer's decision-making. These tools are discussed in greater detail in the following section.

## *2.2 An Overview of Market Research*

As mentioned above, market research is the collective term used for methods of eliciting information about customer preferences. The aim of this set of tools is to better understand which attributes of a service are important to customers. This information can then be used to influence the choices made by customers or potential customers. This section provides a brief overview of market research, including the purpose of conducting market research, different types of research, and methods for collecting data.

## 2.2.1 The Purpose of Market Research

In order for an organization to survive, it is necessary to know what customers expect out of a product or service. Churchill states that "effective (organizational) decision making depends on the quality of the information input, and marketing research plays an essential role in providing accurate and useful information" (Churchill, 1999). In other words, market research allows companies to better understand their customers and design products and services that meet their needs. Products and services are often thought of in the context of the "marketing mix" shown in Figure 2-4. The marketing mix is composed of the following elements, known as the 4Ps (Messinger, 1995):

- ♦ *Product:* The actual product or service that is being sold to consumers.
- ♦ *Price:* The pricing structure for the product or service.
- ♦ *Placement:* The channel of distribution, or the path the product takes to reach the ultimate customer.
- ♦ *Promotion:* Advertising, sales promotions, public relations, and personal selling.

**Figure 2-4: The Marketing Mix**
(Source: Lehman, 1989)
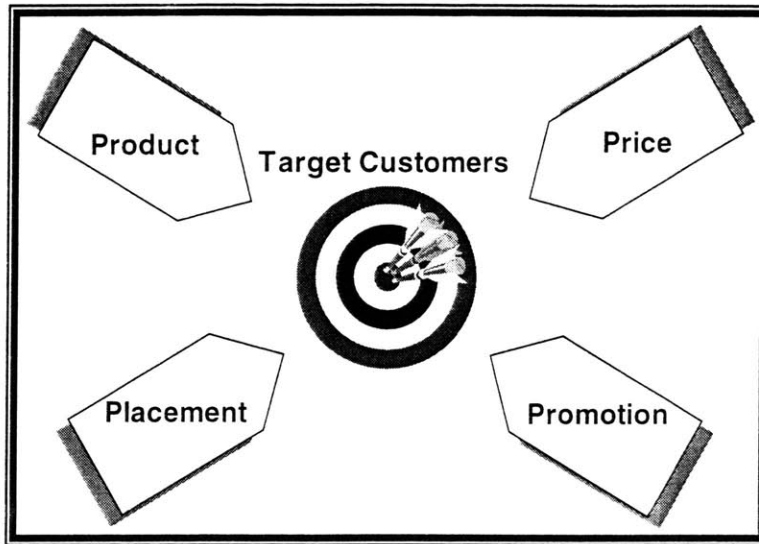


The American Marketing Association defines marketing research as follows:

> Marketing Research is the function which links the consumer, customer, and public to the marketer through information - information used to identify and define marketing opportunities and problems; generate, refine, and evaluate marketing actions; monitor marketing performance; and improve understanding of marketing as a process.

> Marketing Research specifies the information required to address these issues; designs the method for collection of information; manages and implements the data collection process; analyzes the results; and communicates the findings and their implications. (Lehmann, 1989)

Market research allows for the gathering and processing of information so that the marketing mix for a particular product or service can be better adapted to the needs of the customer. For example, one might look at the marketing mix for park-and-ride lots at Tren Urbano stations. The product is defined by the various aspects of the park-and-ride service, such as hours of operation, frequency of trains, walking distance between the automobile and the train station, and so forth. The price is the economic aspect of using the facility, such as the price of parking and the price of using the train. Placement in this case is fairly irrelevant since there is no production process and distribution *per se*. Promotion would include any communications methods used to inform commuters about the service, its various attributes and advantages. Consequently, market research not only provides insight for the design and operation of the facility (product and price), but also for potential marketing campaigns (promotion), intended to attract riders by stressing those attributes of the service that commuters deem most important.

## 2.2.2 Types of Market Research

Any market research approach can be categorized into one of three groups: exploratory, descriptive, or causal. These categories vary on four dimensions: research purpose, research questions, precision of the hypothesis formed, and the data collection methods used (Aaker and Day, 1990).

### Exploratory Research

Exploratory research is generally used when there is little prior knowledge about a research problem. It is fairly unstructured and flexible since there are no preconceptions about what will be found. Normally the research hypotheses are vague and ill-defined, such as what new service should be developed or how a service can be improved. Included in this type of research are literature reviews, individual and group unstructured interviews (including focus groups), and case studies.

### Descriptive Research

The purpose of descriptive research is to provide information about a particular aspect of the market environment. The hypothesis may still be speculative, but is better defined than the exploratory research hypothesis. For example, a descriptive research question might be to find out what kind of people ride public transit. The corresponding hypothesis might then be that people who live within 1 mile of a transit station and don't own an automobile ride transit, whereas people who live further from a station and own an automobile tend to drive. Descriptive research does not include explicit cause-effect relationships. In the previous example, one might find that the hypothesis is true, but be unable to conclude that living more than 1 mile from a station and not owning an automobile *causes* an individual not to ride transit. This type of conclusion could only be made with the use of causal research.

### Causal Research

Causal research is used to show that one variable causes another, as in the previous example. The hypotheses in causal research must be specific since the requirements for proving a causal relationship are strict. A sample causal hypothesis might be that a specific fare change will attract a specific number of new transit riders. In order to validate this hypothesis one must prove, for example, that similar fare changes have increased ridership similarly in the past.

Specifically, it is necessary to know that ridership increases have been caused by the fare change as opposed to other possible influences such as changes in service. Causal research often provides the most insight into the appropriate path for an organization to follow in order to meet its goals.

## 2.2.3 Data Collection Methods

Many different methods exist for collecting market research data, all of which can be categorized as either *secondary* or *primary*. Secondary data already exist and therefore don't require any additional collection by the researcher. Examples are:

♦ Existing information that the organization already has,

♦ Data from other organizations, such as census data or data from other studies,

♦ Syndicated data sources such as consumer purchase panels, store audits, and scanner-based systems.

However, market research studies are often very specific and it can therefore be difficult to locate the appropriate secondary data. Consequently, primary data are often collected to address specific research questions. Examples of primary data sources are surveys, experiments, and qualitative research methods. Table 2-1 shows the different data collection methods and their appropriateness with respect to different research categories.

**Table 2-1: Data Collection Methods and Research Categories**
(Source: Aaker and Day, 1990)

| Data Collection Methods | Category of Research | | |
|---|---|---|---|
| | *Exploratory* | *Descriptive* | *Causal* |
| *Secondary Sources* | | | |
| Information systems | a | b | |
| Databanks of other organizations | a | b | |
| Syndicated services | a | b | b |
| *Primary Sources* | | | |
| Qualitative research | a | b | |
| Surveys | b | a | b |
| Experiments | | b | a |

[a] Very appropriate     [b] Somewhat appropriate

Table 2-2 shows some of the different methods for collecting primary data. In this thesis, the research will generally be either descriptive or causal. It can be seen that a variety of methods

may be used, but that the most appropriate are surveys and experiments (primary sources). However, the research also included qualitative data collection in the form of personal interviews and focus groups. Table 2-3 provides a comparison of focus groups and personal interviews on a number of dimensions. It is important to consider the differences in the two qualitative methods when choosing one for use in developing a survey.

**Table 2-2: Methods for Collecting Primary Data**
(Source: Aaker and Day, 1990)

| Type of Research | Description | Typical methods |
|---|---|---|
| Qualitative | Unstructured interviews with small samples, usually intended to generate ideas and hypotheses | Expert opinion<br>In-depth interviews<br>Focus group interviews |
| Survey | Structured collection of data directly from representative samples of respondents | Mail interviews<br>Telephone interviews<br>Personal interviews<br>On-line interviews |
| Experimental | Introduce a change into the environment and then measure the resulting effect | Laboratory experiments<br>Field experiments |

## 2.2.4 Summary of Market Research

The previous paragraphs have provided a brief introduction to market research. They have shown the different market research techniques employed by many firms which also have application to public transit. The following sections describe the application of market research to public transit agencies. The first section describes typical applications of market research techniques by public transit agencies; in other words, the state of the art in the transit industry today. The chapter then summarizes some of the important recent research oriented transit market research studies.

## *2.3 The Use of Market Research in Public Transportation*

As described in Chapter 1, the past quarter century has seen a significant decline in public transit's share of passenger trips. Despite this, the transit industry has been slow to recognize the importance of tools such as market research to better understand their customers, even though

**Table 2-3: Comparison of Focus Groups and Individual In-depth Interviews**
(Source: Aaker and Day, Market Research, 1990)

| | **Focus Groups** | **Individual Interviews** |
|---|---|---|
| *Group Interactions* | Group interaction is present. This may stimulate new thoughts from respondents. | There is no group interaction. Therefore, stimulation for new ideas from respondents comes from the interviewer. |
| *Group/peer pressure* | Group pressure and stimulation may clarify and challenge thinking.<br><br>Peer pressure and role-playing may occur and may be confusing to interpret. | In the absence if group pressure. thinking of respondents is not challenged.<br><br>With one respondent, role playing is minimized and there is no peer pressure. |
| *Respondent competition* | Respondents compete with one another for time to talk. There is less time to obtain in-depth details from each participant. | The individual is alone with the interviewer and can express thoughts in a noncompetitive environment. There is more time to obtain detailed information. |
| *Influence* | Responses in a group may be "contaminated" by opinions of other group members. | With one respondent, there is no potential for influence from other respondents. |
| *Subject sensitivity* | If the subject is sensitive. respondents may be hesitant to talk freely in the presence of several other people. | If the subject is sensitive, respondents may be more likely to talk. |
| *Interviewer fatigue* | One interviewer can easily conduct several group sessions on one topic without encountering interviewer fatigue or boredom. | Interviewer fatigue and boredom are problems when many individual interviews are needed. |
| *Amount of information* | A relatively large amount of information can be obtained in a short period of time with relatively small cost. | A large amount of information can be obtained, but it takes time to do so and also to analyze the results. Thus costs are relatively high. |
| *Stimuli* | The volume of stimulus materials that can be used is somewhat limited. | A fairly large amount of stimulus materials can be used. |
| *Interview schedule* | It may be difficult to assemble eight or ten respondents if they are a difficult type to recruit (such as very busy executives). | Individual interviews are easier to schedule. |

these tools have been continuously and successfully used in the private sector and in other public sector organizations.

## 2.3.1 The Use of Market Research at Transit Agencies

In general, little has been published in the area of transit market research. In 1998, the Transit Cooperative Research Program published one of the most comprehensive overviews of market

research at public transit agencies (TCRP Report 37, 1998). This report is a handbook for integrating market research into transit management. It provides an overview of market research without delving into details about specific methods. Although it is a good introduction for transit agencies that have little (if any) experience with market research, it does not provide information about understanding choice riders and does not compare alternative market research methods. In addition to providing general guidelines for implementing market research techniques at transit agencies, the report reviews the state-of-practice in market and customer research in the industry. The report states that "in contrast to the view that research is indispensable to the private sector, many working in and with the transit industry perceive that there is little use of market or customer research in transit. Moreover, many believe that the research conducted has been limited primarily to supporting and evaluating promotional activities."

The research described in the TCRP report included 1998 a survey of 233 transit agencies nationwide. Among other things, the agencies were asked questions about the extent of their market research work and the purposes for which market research was conducted. As shown in Figure 2-5, a surprisingly large 72% of public transit agencies reported that they had conducted some type of primary research in the past three years. Another 8% of transit agencies had used secondary research during that time. This indicates that transit agencies are not opposed to using market research and, in fact, have considerable experience with some of these methods. However, the research also showed that close to 75% of agencies had conducted 2 or less studies within the past 12 months. Therefore, although many agencies *are* implementing some form of market research, their efforts are limited to very few studies per year.

**Figure 2-5: The Use of Market / Customer Research in Transit Agencies, 1996-1998**
(Source: TCRP, 1998)
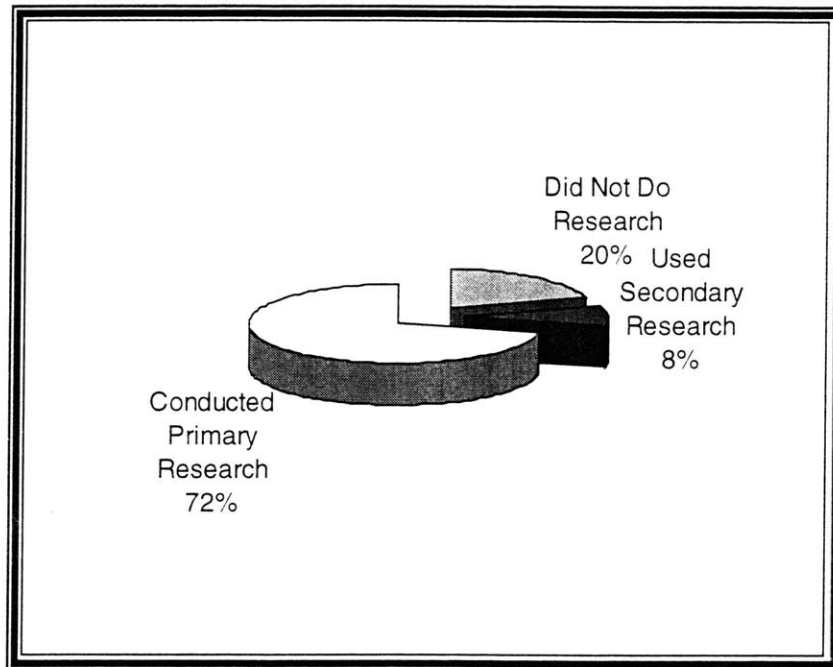


The study also found that large agencies were more likely to have conducted market research than small and mid-sized agencies. Table 2-4 shows the use of market research by transit agency size. The table shows that 83% of agencies claimed to have done some type of market research within the past 3 years, whereas only 73% of mid-sized agencies and 62% of small agencies had done research. The table also shows that, on average, large agencies had conducted a greater number of studies in the past year than small and mid-sized agencies. In fact the average number

**Table 2-4: Use of Market Research by Agency Size**
(Source: TCRP Report 37, 1998)

| | % Conducted Primary Market Research | | Average Number in Past Year |
|---|---|---|---|
| | *In Past 3 Years* | *In Past Year* | |
| **Large Agencies** | 83 | 69 | 7 |
| **Mid-Sized Agencies** | 73 | 56 | 2 |
| **Small Agencies** | 62 | 45 | 1 |

of studies conducted in large agencies was more than three times the number at mid-sized agencies and 7 times the number at small agencies. Earlier, Chapter 1 illustrated that the percentage of choice riders on large systems was greater than the percentage on mid-sized and

small systems. Although one certainly cannot conclude that lack of market research leads to a lower percentage of choice riders on the system, it is interesting to note that the systems that invest more time and effort on market research seem to have a higher percentage of choice riders.

As shown in Figure 2-6, the study also found that most agencies that conducted market research did so to assess customer satisfaction or assess public opinion of their performance or image. Additionally, more than 70% of the agencies reported that they used market research to measure market characteristics and trends, identify potential markets, and estimate demand. On the contrary, only half of the agencies had conducted market research in order to develop and test new services. Therefore, it seems that although transit agencies are using market research for some purpose, many have not realized its full potential for understanding their current or potential customers. In other words, market research efforts appear to be more geared towards evaluating current services than understanding how to change and expand service to better meet customer needs and preferences.

Another interesting point to note from Figure 2-6 is that less than half of transit agencies had used market research to evaluate advertising and promotions. In other words, the majority of transit agencies had not made any effort to find out whether their advertising campaigns were effective. Even fewer transit agencies had used market research to develop advertising and promotional materials. This implies that many transit agencies may be developing advertising campaigns without knowing which attributes of the system to focus on (which attributes will actually influence their potential customers). Additionally, only slightly more than a third of agencies had used market research to estimate fare elasticity. Estimation of fare elasticity allows transit agencies to measure their customers' sensitivity to fare changes and can be a powerful use of market research. It is surprising that transit agencies have not put more effort into understanding the relationship between fares and ridership.

**Figure 2-6: Purpose of Agency Market Research, 1996-1998**
(Source: TCRP Report 37, 1998)
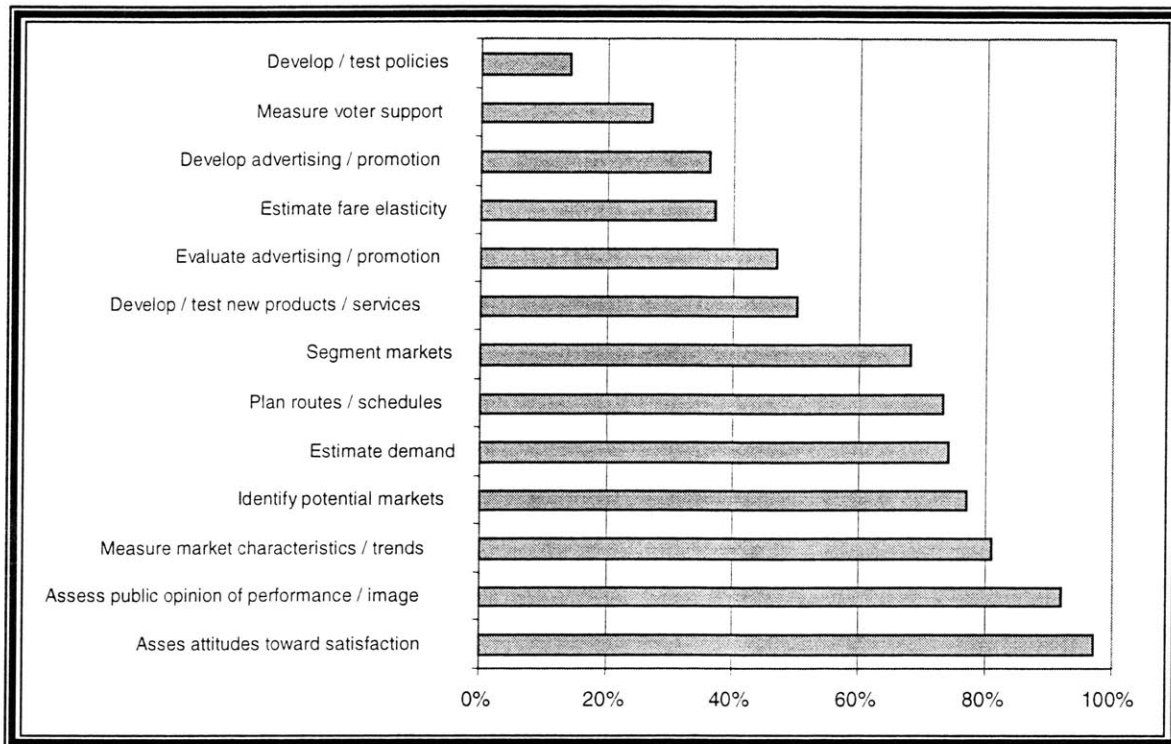


Figure 2-7 illustrates the market research methods that have been used by transit agencies in the past few years. Most agencies reported the use of on-board surveys, many of which were performed for the purpose of federal reporting compliance. One problem with on-board surveys is that they are limited to system riders and therefore don't provide any information about individuals who are not riding the system. Often these are the potential choice riders who are utilizing other modes of transportation. It appears that many transit agencies also do random telephone interviews, which may be more effective in targeting non-riders. However, Figure 2-6 illustrates that most transit agencies do not conduct research to identify system attributes that are important to potential choice riders. Rather, it seems that most market research that includes non-riders is done for the purpose of assessing public opinion of transit's image or performance. Therefore, although transit agencies may be including non-riders in their market research efforts, they may not be extracting as much useful information from them as possible.

**Figure 2-7: Research Methods Used at Public Transit Agencies**
(Source: TCRP Report 37, 1998)
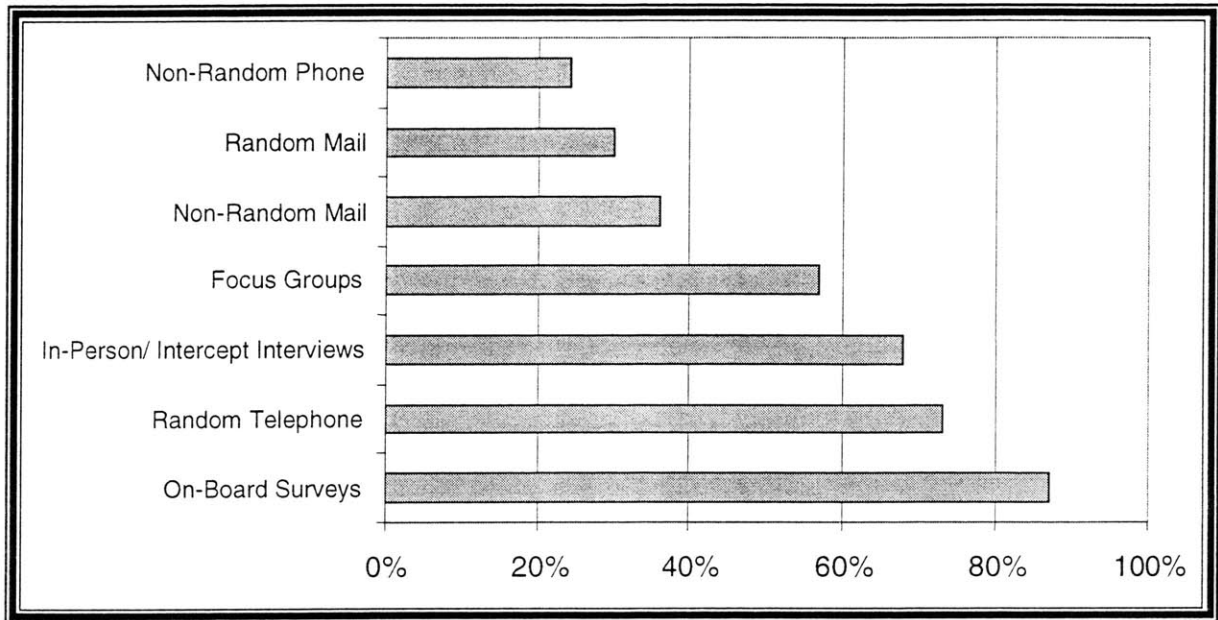


Figure 2-7 illustrates that the most widely used market research methods appear to be on-board surveys, random telephone interviews, and intercept interviews. Although these can be useful ways to gather information, they can also be costly since they require personal contact. Mail surveys, on the other hand, which may be less costly, are used by only a third of the agencies. Additionally, on-board, telephone, and intercept interviews are limited in the amount of information they can provide because they must be short and quick to complete. Mail surveys, on the other hand, can be completed by the respondent at their own convenience and can therefore include a greater number and complexity of questions, which may provide more detailed information. Furthermore, the TCRP report does not mention the Internet, which is becoming increasingly prevalent as a tool for conducting market research, but may still not be utilized extensively by public transit agencies.

In summary, the TCRP report indicates that transit agencies are by no means averse to the use of market research tools. In fact, most agencies have conducted some form of market research in the last few years. However, transit agencies have not realized the full potential of these tools, particularly in helping them maintain and increase market share. Although many agencies use research to help them understand customer satisfaction and public perception of their services, few use it to try and understand how they can attract riders to their systems. One of the most

useful purposes of market research is to understand which attributes of a product or service are most important to current and potential customers. Transit agencies have been slow to recognize that they can use research for this purpose. The methods explored in this thesis are used primarily for this purpose, and it will be shown that they can be extremely useful in helping transit agencies understand how to attract choice riders. Furthermore, agencies have historically relied on data collection methods that are costly and don't provide the potential to collect detailed information about potential customers. This research also illustrates that conducting surveys on the Internet or by distributing them at companies (or by mail) can be a useful, cost-effective way to collect detailed customer information.

## 2.3.2 Recent Research on Market Research for Public Transit Agencies

Some research into the application of market research methods by public transit agencies is underway. This section summarizes recent journal articles and conference presentations by:

> Aaron Weinstein, San Francisco Bay Area Rapid Transit District

> Transit Cooperative Research Program

> Peter Foote, Chicago Transit Authority

Perhaps the most relevant piece of recent transit market research literature is a study published by Aaron Weinstein at BART (Weinstein, 2000). The study evaluated two market research techniques for gauging the importance of different transit attributes to transit customers, namely factor analysis and bivariate correlation. The study was conducted using empirical data from BART and concluded that a simple approach, using a ranking of bivariate and correlation coefficients, was the most effective for use by transit agencies.

In addition to the market research handbook described in the previous section, TCRP has also published a report on the use of market segmentation to increase transit ridership (TCRP, 1998). The report includes guidelines for market segmentation by transit agencies based on a number of different attributes such as demographics and transit usage. It also includes recommendations about how agencies can use segmentation in their strategy development. Although the report distinguishes between transit and non-transit users as two different market segments, it does not focus on how transit agencies can attract non-transit users. Rather, it focuses on the identification of market segments.

Peter Foote at the Chicago Transit Authority recently published a paper describing a survey of park-and-ride users conducted by CTA (Foote, 2000). In the survey, respondents were asked questions about satisfaction, travel characteristics, prior mode used, reasons for park-and-ride use, demographics, and their opinion of the development of certain amenities at the park-and-ride lots. Although the survey asked why the individuals used park-and-ride, it did not include questions regarding the importance of specific system attributes in affecting their travel decisions.

In addition to these studies, some research has been conducted specifically for Tren Urbano. These studies were described in Chapter 1 and include:

♦ Toward a Positioning Strategy for Transit Services in Metropolitan San Juan, Alan Hoffman

♦ Transit Marketing: Strategies for San Juan, Puerto Rico, Charles Planck

♦ Older Adult Perceptions of Transit Security and Their Utilization of Public Transportation: Ridership Strategies for the Elderly on Tren Urbano, Lora Blackman.

This thesis extends this work by focusing on both qualitative *and* quantitative market research methods for looking specifically at choice rider perceptions.

# Chapter 3: An Assessment of Market Research Methods

The primary purpose of this research is to test and evaluate the use of selected market research methods in helping transit agencies understand choice riders so that they can more effectively attract and retain these customers. This chapter presents a number of market research methods that were available for use in this study, including a description of their advantages and disadvantages. The chapter then explains the criteria used to select three methods that were used in the Boston survey. The chapter concludes by presenting detailed descriptions of the selected market research methods.

## 3.1 Candidate Market Research Methods

The research approach used in this thesis required the selection of market research techniques from a range of possible methods. This section briefly describes the methods considered and Table 3-1 summarizes each method in terms of its main uses, data requirements, the type of information it provides, and its main advantages and disadvantages. It is from this list of potential methods that the ones used in this research were chosen.

## 3.1.1 Revealed Preference Techniques

Revealed preference techniques require the collection of data that reflect actual behavior. For example, one might observe mode choice as the dependent variable and then characterize the attributes of the different modes as independent variables. Travel demand models have historically relied on revealed preference techniques (Ben-Akiva and Lerman, 1985). These models generally use information about utilities that are inferred from observation of traveler choice behavior and therefore reflect actual behavior. Traditional mode choice models such as the logit and probit models are in the category of revealed preference techniques.

## Table 3-1: Characteristics of Different Market Research Methods

| Method | Main Uses | Data Requirements | Information Provided by Results | Main Advantages of Method | Main Disadvantages of Method |
|---|---|---|---|---|---|
| Revealed Preference Techniques | To understand what drives observed behavior | Actual behavioral data | Function representing important factors in actual choices | Reflect observed rather than hypothetical choices | ♦ Cannot collect data on new services<br>♦ Cannot explore hypothetical attributes |
| Stated Preference Techniques (Conjoint Analysis) | To understand which combination of attribute levels provides the greatest utility | Rankings of different attribute combinations | Utility function indicating importance of each attribute | ♦ Allows exploration of hypothetical services and attributes<br>♦ Forces respondents to make trade-offs | ♦ Actual vs. hypothetical behavior bias<br>♦ Questionnaire difficulty<br>♦ Can only incorporate a limited number of attributes |
| Perceptual Mapping | To identify "holes" in the current market | Perception of current services | Map of existing services on known dimensions | Uncovers potential new areas of market penetration | ♦ Doesn't provide information on attribute prioritization<br>♦ Doesn't explore *new* services |
| Similarity Analysis | To identify dimensions on which services are similar | Perception of current services | Map of existing services on unknown dimensions | ♦ Does not require an exhaustive list of attributes<br>♦ Looks at services as whole objects rather than combinations of attributes | Researcher must decide how respondents are distinguishing between services |
| Kano Analysis | To understand the relationship between functionality and customer satisfaction for different attributes | Importance of existence and non-existence of each attribute on a hedonic scale | Categorization of attributes according to relationship of functionality and customer satisfaction | Recognizes the relationship between product/service functionality and customer satisfaction | ♦ Questionnaire may be confusing to respondents<br>♦ Number of attributes is limited<br>♦ Results may be difficult to interpret |
| Attitude Scales | General understanding of attribute importance | Ranking of the importance of different attributes | Relative importance of attributes (numerical or graphical) | ♦ Easy to design<br>♦ Easy for respondents to understand<br>♦ Quick to complete<br>♦ Easy to analyze data | Does not provide the depth of information that other methods provide |

Although revealed preference techniques are often desirable because they reflect actual behavior, they also have a couple of serious limitations. Perhaps the most significant problem is the impossibility of collecting this type of data for new products or services. In the case of a new transit system, revealed preference data simply doesn't exist; therefore, alternative market research methods must be used. Furthermore, for a service already in operation, revealed preference techniques do not allow for the exploration of hypothetical attributes. Rather, they are limited to existing system parameters.

## 3.1.2 Stated Preference Techniques (Conjoint Analysis)

Stated preference techniques offer an alternative to the use of behavioral data. With stated preference techniques, respondents are asked to provide answers to hypothetical questions. For example, a respondent might be given a number of hypothetical alternatives and asked to rank them. Stated preference data does not rely on observed behavior, and therefore these techniques are more widely applicable and can provide more detailed information about customer preferences than revealed preference techniques. Unlike revealed preference methods, stated preference techniques can provide information about products or services that do not yet exist. Because much of the market research done in the private sector deals with new product or service development and introduction, these techniques have become popular for use by these organizations.

The major deficiency of stated preference data is that people do not always do what they say they will do. This can be especially problematic with the introduction of new products or services, since people may have a tendency to overstate their interest. Naturally, this type of bias has the potential to greatly affect stated preference study results and must be taken into consideration during data analysis and interpretation.

One of the most popular stated preference techniques is conjoint analysis. Conjoint analysis is primarily based on the concept of rational choice that was introduced in Chapter 2. It is a market research technique in which the respondent is asked to rank a number of alternatives based on his/her preference. Each alternative is a different combination of attribute levels, and the

respondent is forced to make trade-offs between different alternatives. For example, a conjoint analysis focused on park-and-ride might include the following attributes:

- *Attribute 1*: Parking price
- *Attribute 2*: Walking distance from car to station
- *Attribute 3*: Number of parking spaces available (ease of parking)
- *Attribute 4*: Frequency of trains

Each of these attributes is given a number of levels. For example, parking price might be free, $2/day, or $5/day. Similarly, the train frequency might be every 30, 60, or 90 minutes. The questionnaire presents of a number of combinations of these alternative levels, which the respondent is asked to rank. Table 3-2 shows an example of part of a short conjoint questionnaire using the attributes listed above. The rankings from this questionnaire are used to construct utility functions representing the relative importance of the various attributes.

### Table 3-2: Example of a Partial Conjoint Analysis Questionnaire

| Please rank the following options from 1-5, where 1 is the one you like least and 5 is the one you like best. | | | | |
|---|---|---|---|---|
| | **Cost** | **Walk Time** | **Parking Spaces** | **Train Frequency** | *Ranking* |
| **Option 1** | $5/day | 10 minutes | 200 | Every 90 minutes | |
| **Option 2** | $5/day | 5 minutes | 500 | Every 60 minutes | |
| **Option 3** | $5/day | 2 minutes | 200 | Every 30 minutes | |
| **Option 4** | $2/day | 10 minutes | 500 | Every 60 minutes | |
| **Option 5** | $2/day | 5 minutes | 200 | Every 30 minutes | |

The primary advantage of conjoint analysis is that it requires the respondent to make trade-offs between different attributes and levels. Stated differently, in order to increase the level of one attribute, it is necessary to decrease the level of another attribute. In addition to the stated preference bias mentioned previously, conjoint analysis has other disadvantages. One disadvantage is that only a limited number of attributes can be reasonably included in the study in order to maintain a practical survey length. Another disadvantage is that the survey is fairly difficult and time-consuming to complete. However, if designed and implemented effectively, conjoint analysis can provide useful, detailed information about customer preferences.

## 3.1.3 Perceptual Mapping

Perceptual mapping is a means to identify potential market entry positions for new products or services. The respondent is asked to characterize existing services based on their perceived attribute levels. Each service can then be positioned on a multi-dimensional attribute diagram so that "holes" can be identified for possible market penetration. For example, in the case of Tren Urbano a new mode of transportation, the train, is being introduced. Figure 3-1 illustrates a hypothetical perceptual map that might be constructed by a commuter in San Juan who has four travel options: driving alone, carpooling, taking the bus, or using a jitney service such as the públicos in Puerto Rico. For simplicity, the axes have been limited to two dimensions, travel time and travel cost, which are constrained to being positive. It should be noted that the classification of modes is based *on customer perceptions* rather than actual characteristics.

**Figure 3-1: Hypothetical Perceptual Map for Different Transportation Modes**
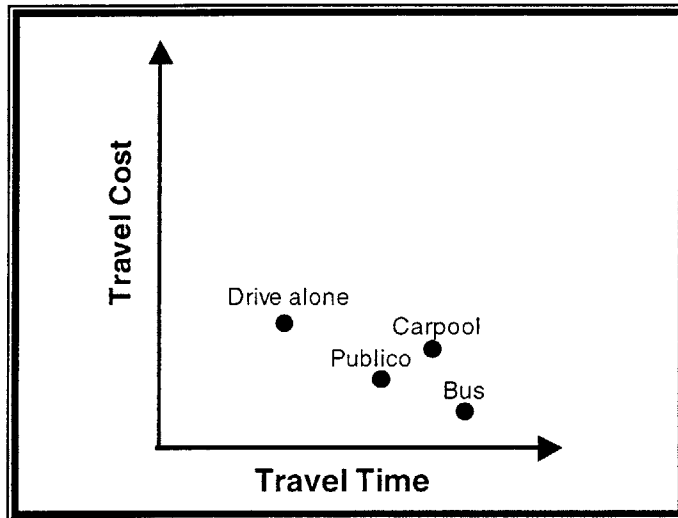


The figure shows how this individual perceives the different commuting options that are available to her. The information could then be used to identify how the new rail service can distinguish itself from the other modes. For example, the area below the drive alone mode and to the left of the público is empty, indicating that a mode that is quicker than the carpool, público, and bus and also cheaper than the automobile would be somewhat different than the current transportation options. This could be the focus of the rail service: to be quicker than other public transportation modes and less expensive than the automobile.

Although the information provided by a perceptual map can be useful in uncovering market possibilities, its value in terms of understanding how to influence customers is unclear. When trying to understand how to influence customers, it is important to know which service attributes are most important to this group of people. Perceptual maps don't provide this information. Although a classification of existing services is interesting, it does not provide an in-depth look at attribute prioritization. Similarly, perceptual maps don't tell the researcher anything about how the customer perceives attributes *specific to* the new service.

## 3.1.4  Similarity Analysis

Similarity analysis requires the respondent to judge the similarity of two products or services without identifying specific attributes. For example, a public transit similarity analysis might ask the respondent about the similarity between a bus and a train, as follows:

**How similar is a bus to a train?**

| *Extremely similar* | | | | | | *Extremely dissimilar* |
|---|---|---|---|---|---|---|
| [ ] | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) |

The results of these similarity questions are then represented in matrix form. For example, if four services (called A, B, C, and D) were being compared with each other, the matrix in Figure 3-2 might be formulated. The numbers in each of the cells represent the average similarity ranking for the services represented by those cells. For example, the value of 3.2 in cell A/B indicates that when asked how similar services A and B were, the average response was 3.2. It should be noted that based on the formulation of the similarity question shown above, lower similarity values indicate greater similarity.

After the similarity of the services has been determined, the researcher can use the information in a number of ways. For example, she can try and figure out what the various dimensions for comparison are and plot the services on a perceptual map such as that shown in the previous section. The axes of this map would be determined by the researcher after the data has been collected rather than before, as in the previous discussion of perceptual maps. Alternatively, based on the market share of the services included in the study, the researcher could try to

determine similar factors between services with high market share and high similarity in order to try to mimic these attributes in a new product.

**Figure 3-2: Similarity Matrix for Services A, B, C, and D**

|   | *A* | *B* | *C* | *D* |
|---|---|---|---|---|
| *A* |  |  |  |  |
| *B* | 3.2 |  |  |  |
| *C* | 1.7 | 3.9 |  |  |
| *D* | 5.1 | 3.3 | 4.7 |  |

The fact that similarity analysis does not use specific attributes can be both an advantage and a disadvantage. When using an attribute-based approach, it is often impossible to generate an attribute list that is both accurate and complete. By using an approach such as similarity analysis, this problem is eliminated. Additionally, it is possible that people don't think of products or services in terms of their attributes, but rather as whole objects, and similarity analysis can better capture this than attribute-based approaches. However, because attributes are not explicitly specified in similarity analysis, the results can be difficult to interpret. It is up to the researcher to decide why objects are considered similar, and this can be more an art than a science. If the objective of the study is to understand the importance of specific attributes, similarity analysis may not be the most appropriate methodological choice.

## 3.1.5 The Kano Method

The Kano method is relatively new compared to many other market research methods. Developed by Professor Noriaki Kano in the 1980s, it suggests that attributes of a product or service can be classified into different groups depending on how customers perceive their functionality. The method is based primarily on the Kano diagram shown in Figure 3-3.

## Figure 3-3: The Kano Diagram
(Source: Center for Quality Management, 1993)
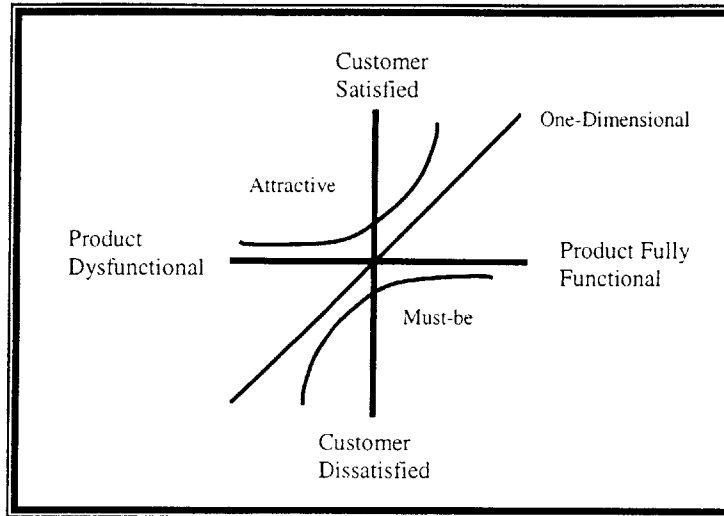


The horizontal axis of the Kano diagram indicates how fully functional some attribute of a service is, and the vertical axis represents how satisfied the customer is. Often it is believed that customer satisfaction is directly proportional to how functional a service is. This situation is represented by the line going through the origin at 45 degrees: the customer is more satisfied (up) with a more functional service (right) and less satisfied (down) with a less functional service (left). Kano classifies these customer requirements as "one-dimensional".

The Kano diagram also has a curve labeled "must-be" and one labeled "attractive". The must-be curve indicates aspects of the service where the customer is more dissatisfied when the service is less functional, but where customer satisfaction never exceeds the neutral level. Therefore, no matter how functional the service is in terms of that attribute, the customer will never be fully satisfied. For example, having poor brakes in an automobile causes a customer to be dissatisfied. However, good brakes don't necessarily raise the customer's satisfaction because they are expected in a car – therefore good brakes are a "must-be" attribute for an automobile.

The attractive curve indicates areas in which the customer is more satisfied when the service is more functional, but dissatisfaction never goes below the neutral level. For example, a CD player in a car might cause the driver to be more satisfied with the car, but the driver may not have been dissatisfied if the CD player were not present. Additionally, a customer may be

completely indifferent towards a particular attribute's functionality, in which case the attribute would be plotted as a horizontal line along the customer functionality axis.

In order to classify the attributes as described above, the Kano method requires that a pair of questions be asked for each attribute. Each pair contains a negatively and positively phrased question. For example, a pair of questions on train cleanliness might be phrased as in Table 3-3.

**Table 3-3: Pair of Customer Requirement Questions in a Kano Questionnaire**

| If the train car is clean, how do you feel? | 1. I like it that way<br>2. It must be that way<br>3. I am neutral<br>4. I can live with it that way<br>5. I dislike it that way |
|---|---|
| If the train car is dirty, how do you feel? | 1. I like it that way<br>2. It must be that way<br>3. I am neutral<br>4. I can live with it that way<br>5. I dislike it that way |

The main advantage of the Kano method is that it recognizes the relationship between a service's functionality and the customer's level of satisfaction. It is the first market research method that takes into account the different perceptions related to having and not having a product or service attribute. Other market research techniques simply try to uncover the overall importance of different attributes. However, there are a couple of drawbacks to the use of Kano's methods. Because the method is unconventional, the questions are often confusing to respondents. Furthermore, since two questions must be asked for each attribute, the total number of attributes included must be limited in order to control questionnaire length. Finally, because the attribute categorization is complex, it can be difficult to interpret the results in a meaningful way.

## 3.1.6 Attitude Scales

The attitude scale is perhaps the simplest means of eliciting customer preference information. The customer is given a list of attributes and asked to indicate each attribute's importance. An example of an attitude scale questionnaire in a transportation application is shown in Table 3-4.

## Table 3-4: Example of an Attitude Scale Questionnaire
(Source: Urban and Hauser, 1993)

| *How important is having a means of transportation?* | Of No Importance | Moderately Important | Important | Very Important | Extremely Important |
|---|---|---|---|---|---|
| 1. Which will always get me places I want to go on time. | [ ] | [ ] | [ ] | [ ] | [ ] |
| 2. Which will not require me to schedule trips in advance. | [ ] | [ ] | [ ] | [ ] | [ ] |
| 3. Which will allow me to relax while travelling. | [ ] | [ ] | [ ] | [ ] | [ ] |
| 4. In which I will not be too hot or too cold during the trip. | [ ] | [ ] | [ ] | [ ] | [ ] |
| 5. Which will not cause me to worry about being mugged or assaulted. | [ ] | [ ] | [ ] | [ ] | [ ] |

The responses to these questions are coded for each participant and then an average importance is calculated for each attribute.

The simplicity of attitude scales is by far their strongest advantage. This type of questionnaire is easy to design, easy for respondents to understand, and does not take much time to complete. Additionally, because of the simplicity of the questions, a large number of attributes can be included in the study. The drawback is that it does not provide the depth of information about service attributes that many other methods provide. For example, it is possible for a respondent to claim that everything is "extremely important", a result that is useless when trying to

understand which attributes an organization should focus on in order to influence its customers. Other methods such as conjoint analysis force respondents to make trade-offs between attributes and thus eliminate this problem. However, for organizations that have limited resources for market research, attitude scales can provide an inexpensive alternative to more complex methods for understanding customer attitudes.

## *3.2 Market Research Method Selection*

The previous section described a number of methods that could have been used in this research. From these, three methods were chosen based on the following:

- ◆ Main uses of the method
- ◆ Data requirements
- ◆ Information provided by results
- ◆ Advantages and Disadvantages of the method

In the end, the three methods selected were conjoint analysis, the Kano method, and attitude scales, for reasons described below.

### 3.2.1 Conjoint Analysis

The theory behind conjoint analysis was developed in the 1960s and the method has been widely used for market research purposes since then. A study in the late 1980s indicated that between 1981 and 1985, approximately 1,500 conjoint studies were conducted, illustrating the wide acceptance of this method (Willink and Cattin, 1989). The industries in which the method has been used vary greatly and include transportation (Charles River Associates, 1987): "One of the most interesting application areas for conjoint analysis is in the transportation industry, particularly airlines and other forms of passenger travel, where the service aspect is important to consumer choice" (Green and Krieger, 1993).

An example of the use of conjoint analysis in a transit context is Reed and Levine's study of the impacts of real-time schedule information on mode preference (Reed and Levine, 1997). In this study, respondents were given a number of travel situations and asked how likely they would be to drive alone or take the bus in each situation. Some of the attributes included in the study were bus fare, reliability, and information. Although the study focused specifically on the impact of

real-time information, it provides an indication that conjoint analysis may be a useful tool for better understanding choice riders.

Because conjoint analysis looks at different attribute levels, it can result in a deep understanding of customer preferences. The importance of an attribute may vary depending on its level, and conjoint analysis allows the researcher to explore this. For example, if a commuter is told that the price of parking is being raised from \$5 to \$10, it may have a completely different effect on him than a price increase from \$10 to \$15. The different effect of the alternative price levels may be captured by conjoint analysis. Additionally, conjoint analysis forces respondents to make trade-offs between the attributes. In order to gain a higher level of one attribute, they must sacrifice some of another attribute. Consequently, the method has the potential to uncover customer preferences more effectively than many other methods.

## 3.2.2 The Kano Method

The Kano method is an interesting market research technique that may have the potential to provide valuable insight into customer preferences since it is based on the relationship between customer satisfaction and service functionality. Although not as widely used as conjoint analysis, Kano analysis has been used in a variety of industries since its introduction in the 1980s, and continues to be explored as a useful means of eliciting customer preferences. The Center for Quality Management in Cambridge, MA has been studying the merits of the Kano method for some time and has observed its implementation at various companies. Some companies the Center has spoken with about the Kano method have described it as "brilliant" and have stated that "characterizing the customer requirements into Kano's categories is very valuable" (Center for Quality Management, 1993). Additionally, in recent years the Kano method has been taught at business schools, such as Harvard University and MIT's Sloan School of Management, where it has been recognized as "useful for uncovering this information (customer needs)" (Stein and Iansiti, 1995).

The method has not been widely applied to services, but has not been applied in the public transportation sector. However, it has the potential to provide valuable information about the relationship between customer satisfaction and the existence or lack of certain service attributes.

Additionally, the method makes use of a questionnaire that is simple for respondents to complete, but still provides in-depth information about customer preferences.

## 3.2.3 Attitude Scales

The simplest method selected for the study is the attitude scale. Unlike the Kano and conjoint methods, attitude scales aren't supported by a complex methodology. The questionnaires normally include simple questions and are designed to be completed quickly. The analysis stage often requires simple averaging of responses. Although the information obtained from an attitude scale is not as in-depth as that obtained from a conjoint or Kano study, the response rate for the survey tends to be much higher, which can be a significant advantage. Consequently, the implementation cost of this type of survey can be low compared to other methods, a factor that may be significant to transit agencies. One important consideration in the Boston implementation was that some respondents would have a very limited amount of time to complete the questionnaire. Because attitude scales are simple to complete, they were chosen for situations in which respondents' time was limited.

## *3.3 Selected Market Research Methods*

In this section, the selected methods will be presented in more detail.

## 3.3.1 Conjoint Analysis

Conjoint analysis is a method for linking a service's features to customer preferences or needs. It is most often used for the purpose of developing a new service. Respondents are presented with a number of alternatives consisting of different combinations of service attributes and are asked to rank them. Conjoint analysis requires respondents to make trade-offs between different attributes.

The steps involved in implementing a conjoint analysis are as follows (Prelec, 1999):
   1. Define attributes
   2. Select the number of levels for each attribute
   3. Define hypothetical products/services
   4. Design the survey
   5. Conduct the survey

6. Process survey results

7. Estimate utilities

Each of these steps is described below.

## Step 1: Define attributes

The first step in conjoint analysis is to define the attributes of the product or service being designed or evaluated. Often these attributes are chosen based on the results of preliminary qualitative research, such as focus groups or personal interviews. During these initial phases of the research, potential customers reveal aspects of the product or service that may be important in influencing their purchase behavior. These attributes may be ones that the marketing team has already thought of or may originate from the focus group or interview participants. In the end, the key criteria for selection of attributes are the belief that they are important to customers and the ability of the attribute to be technologically or operationally modified.

## Step 2: Select the number of levels for each attribute

Once the attributes have been chosen, it is necessary to decide on the number of levels for each attribute and the appropriate values for these levels. It is important that the attribute levels be reasonable from an implementation perspective and that the range of values be broad enough to provide meaningful results. There is no generally accepted method for determining the number of attribute levels. In many cases, this decision is based on previous studies, industry knowledge, and personal judgement. However, providing too many attribute levels may confuse or frustrate respondents; therefore a trade-off exists between the detail of information gathered and respondent burden.

## Step 3: Define hypothetical services

The next step in conjoint analysis is to define the hypothetical services. These services are combinations of the attribute levels determined in step 2. Naturally, if one were to include all possible combinations of attribute levels, the number of services would be unreasonable for respondents to process. An experimental design known as orthogonal arrays is often used to reduce the number of services included in the study as illustrated below.

Let $i$ and $j$ be two levels of attribute A, and $k$ a level of attribute B. Then:

$$\frac{\text{\# of products having } A_i \text{ paired with } B_k}{\text{\# of products with } A_i} = \frac{\text{\# of products having } A_j \text{ paired with } B_k}{\text{\# of products with } A_j}$$

In other words, the combinations are chosen so that the independent contributions of each attribute are balanced. Although there are mathematically complex ways of designing orthogonal experiments, the simplest and most common method is to use or adapt an existing design.

## Step 4: Design the Survey

There are two approaches that are generally used to collect data for conjoint analysis. The most common approach is the full-profile method, which uses the services designed in step 3. An example of this type of design was shown earlier in Table 3-2. With this approach, respondents are presented the services and asked to rank them according to their preferences. These preferences can be elicited in one of three ways:

♦ *Rank ordering:* The respondent is presented with all alternatives and asked to rank them. For example, if the respondent were presented with 10 services, she would be asked to rank them from 1-10.

♦ *Scoring:* The respondent is presented with all alternatives and asked to give each a score on a specified scale, such as 1-20. In this case, it is possible that two alternatives can earn the same score.

♦ *Selected pairs:* The respondent is presented with pairs of services and is asked to select between the services in each pair.

The other approach that is sometimes used for conjoint analysis is the trade-off approach. With this method, the respondent is presented with a matrix composed of levels for two different attributes. The respondent is asked to rank each combination of levels from most preferred to least preferred. Table 3-5 is an example of one of these tables with sample responses for park-and-ride attributes *cost* and *train frequency*. Naturally, a number of such tables would be necessary to explore the effects of all attributes chosen.

**Table 3-5: Two-attribute Trade-off Approach (User Rankings)**

| | | Train Frequency | | |
|---|---|---|---|---|
| | | Every 5 minutes | Every 15 minutes | Every 30 minutes |
| Cost of Using Park-and-Ride Compared to Driving | $10/day less | 1 | 2 | 5 |
| | Same | 3 | 4 | 6 |
| | $10/day more | 7 | 8 | 9 |

## Step 5: Conduct the Survey

There are various methods for administering a conjoint study. All begin with a brief description of the product or service concept being explored and a description of each of the attributes and their respective levels. The means of eliciting responses often depends on the complexity of the study. For example, one method used in studies with large numbers of alternatives is to write each alternative on a card and then ask the respondent to separate the cards into several piles depending on desirability. The respondent then proceeds to sort the cards within each pile, making the task less daunting than dealing with all alternatives at once. Paper-based surveys are normally used when the number of alternatives is small. Additionally, the Internet is being used more and more frequently for market research purposes and it is possible that this will become a popular means for distributing this type of survey.

## Step 6: Process Survey Results

As a first step in data analysis, the survey results must be tabulated in a format that can be processed by the model. Each service can be represented as a combination of binary variables for each attribute level, where an attribute level that exists is given a value of 1 and one that does not exist is given a value of 0. Then, for each respondent the ranking must be entered for each of the binary service representations. Table 3-6, which is based on the example shown in Table 3-2 provides an illustration of the data coding for a conjoint survey.

## Table 3-6: Conjoint Data Coding Example

| Cost of $5/day | 10 minute walk time | 5 minute walk time | 200 parking spaces | Train frequency every 60 minutes | Train frequency every 90 minutes | Ranking |
|---|---|---|---|---|---|---|
| 1 | 1 | 0 | 1 | 0 | 1 | 5 |
| 1 | 0 | 1 | 0 | 1 | 0 | 4 |
| 1 | 0 | 0 | 1 | 0 | 0 | 3 |
| 0 | 1 | 0 | 0 | 1 | 0 | 2 |
| 0 | 0 | 1 | 1 | 0 | 0 | 1 |

For each of the attributes, a base case has been chosen. In this case they are:

- Cost: $2/day

- Walk Time: 2 minutes

- Parking Spaces: 500

- Train frequency: Every 30 minutes

The remaining levels are then given a column in the data table, and each alternative is encoded using binary variables representing the inclusion of each attribute level. For example, the first three options had a cost of $5/day. Therefore, the $5/day cost column includes a value of 1 for each of these options. The last column of the table contains the respondent's rankings for each alternative.

## Step 7: Estimate Utilities

After the data has been encoded, part-worth utilities are estimated for each attribute. This is generally accomplished using linear regression in which the dependent variables are the rankings and the independent variables are the attribute levels. The linear regression model can then be represented as follows:

$$R_i = u_0 + \sum u_j^k X_{ij}^k$$

where $R_i$ is the ranking or rating assigned to service $i$,

$$X_{ij}^k = \begin{cases} 1 & \text{if product } i \text{ has level } j \text{ on attribute } k \\ 0 & \text{otherwise} \end{cases}$$

$u_j^k$ is the utility coefficient for level $j$ on attribute $k$, or the mean change in
ranking produced when the default level for attribute $k$ is replaced by level $j$.

The resulting regression coefficients represent *part-worth utilities* for each attribute, defined as the utility derived from different levels of the attributes. These part-worth utilities are often shown in graphical form, as in Figure 3-4.

**Figure 3-4: Example of Part-Worth Utilities**
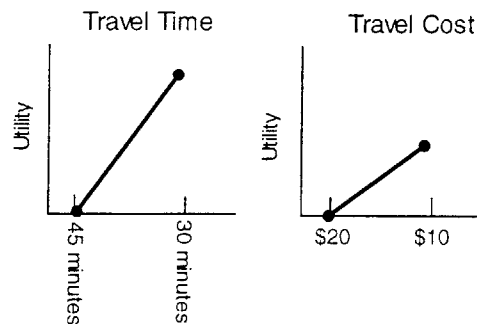


Several things about these graphs should be noted. First of all, one of the attribute levels has been chosen as the base and therefore has a part-worth utility of zero. Second, the part-worth utilities are *not* for the attribute as a whole, but rather for the specific levels of that attribute. Third, one can look at the slope of the utility line as an indication of the importance of each attribute *for the levels specified in the model*. In this case, the utility derived from decreasing travel time from 45 to 30 minutes is higher than that derived by decreasing the cost from $20 to $10. Although these part-worth utilities can provide a general understanding of attribute

importance, they are most often used to calculate the relative utilities of different service attribute combinations. In other words, once part-worth utilities have been estimated for attribute levels, different combinations can be explored so as to maximize overall utility.

## 3.3.2 The Kano Method

Professor Kano and his colleagues developed a set of ideas that can be summarized as follows:

1. Invisible ideas about quality can be made visible.
2. For some customer requirements, customer satisfaction is proportional to how fully functional the service is.
3. Some customer requirements are not one-dimensional – there are also "must-be" and "attractive" elements.
4. Customer requirements can be classified through a customer questionnaire. (Center for Quality Management, 1993)

The steps involved in implementing a Kano analysis are:

1. Define attributes
2. Design the survey
3. Conduct the survey
4. Process survey results
5. Analyze the results

Each of these steps is described below.

### Step 1: Define attributes

The first step of Kano analysis is similar to step 1 described for conjoint analysis, in which attributes of the product or service are selected for study. However, in the Kano method a greater number of attributes can be included than in conjoint analysis. The trade-off is that specific levels of these attributes are not explored as in conjoint studies. It should be remembered that the Kano method requires two questions to be asked for each attribute, which will limit the number of attributes that can be included without the questionnaire becoming too lengthy.

## Step 2: Design the survey

The next step in the Kano process is to design the survey, which is based on two questions for each attribute. The first question asks the respondent how she feels if a particular attribute is present (the *functional* form), while the other asks how she feels if the attribute does not exist (the *dysfunctional* form). Table 3-3 shown earlier in the chapter illustrates the use of functional and dysfunctional questions in a Kano study.

The table also shows response categories that might be used for each question. The type of scale is called a hedonic scale. The idea behind the ordering of responses is that the first response signifies a state of positive satisfaction, while the last response signifies dissatisfaction. Therefore, if a respondent says that she likes a specific attribute to exist, this is a stronger statement than claiming that she expects it to exist since the first statement implies that the attribute gives her satisfaction.

The wording of Kano responses is a topic that has been discussed extensively among both practitioners and researchers. Although Kano originally used the above wording, subsequent implementations have used different versions to improve clarity and minimize respondent confusion. One alternative to the original Kano scale is the following:

1.  This would be very helpful to me.
2.  This is a basic requirement for me.
3.  This would not affect me.
4.  This would be a minor inconvenience.
5.  This would be a major problem for me.

This scale may be clearer to the respondent and is used in the Boston park-and-ride survey conducted as part of this research. The point is that the specific wording of the scale is extremely important and must be carefully thought-out during questionnaire development.

## Step 3: Conduct the survey

Administration of Kano surveys tends to be simpler than conjoint surveys. Because the questionnaires are not difficult to understand and complete, complicated administration methods (such as the use of cards with conjoint studies) are not necessary. However, one administration

aspect that is extremely important is the questionnaire introduction. Because respondents are being asked two questions about each attribute, they may become annoyed and confused if they don't understand that the repetition is intentional. Therefore, it is important to inform the respondent that they will be answering two questions about each aspect of the product or service that is being studied. For example, the Boston questionnaire included the following instructions:

> *This questionnaire asks pairs of multiple-choice questions about the park-and-ride experience. Each pair focuses on one aspect of park-and-ride.*
> *Please check the box under the column that best describes how you feel for each question. Please make an effort to answer each question without thinking about the previous one.*

This paragraph clearly informs the respondent that they will see two questions for each park-and-ride attribute. In this way, the respondent knows that the repetitiveness of the questionnaire is intentional and that the answer to one question in a pair does not necessarily determine the answer to the second question.

## Step 4: Process survey results

The purpose of Kano analysis is to better understand customer requirements, and this is accomplished by categorizing each requirement based on the results of the survey as discussed in section 3.1.4. In the survey processing stage, each customer requirement is categorized as one of the following for each respondent:

> *A: Attractive - Customer more satisfied with greater functionality, but dissatisfaction never falls below neutral level.*

> *M: Must-be - Customer more dissatisfied with less functionality, but satisfaction never rises above neutral level.*

> *O: One-dimensional: Customer satisfaction and functionality are directly proportional.*

> *I: Indifferent: Functionality has no effect on customer satisfaction.*

> *R: Reverse: Customer is more satisfied with less functionality*

> *Q: Questionable: Results of survey are inconclusive*

The first four categories have already been explained. A questionable requirement is one in which there is a contradiction in the customer's answers to the questions. A reverse requirement is one in which the a priori judgement of functional and dysfunctional was the reverse of the

customer's perception. The attribute classification is done using the Kano evaluation table shown in Table 3-7.

**Table 3-7: Kano Evaluation Table**

| Customer Requirements | | Dysfunctional | | | | |
|---|---|---|---|---|---|---|
| | | 1. Like | 2. Must-be | 3. Neutral | 4. Live with | 5. Dislike |
| Func-tional | 1. Like | Q | A | A | A | O |
| | 2. Must-be | R | I | I | I | M |
| | 3. Neutral | R | I | I | I | M |
| | 4. Live with | R | I | I | I | M |
| | 5. Dislike | R | R | R | R | Q |

For each customer requirement or attribute on each questionnaire, the classification in the above table is based on the respondent's answers to the pair of questions. The results of all questionnaires can then be tabulated and summarized in a table such as that shown in Table 3-8 in which each entry is equal to the sum of entries from individual survey respondents. For example, the table indicates that 21 of 23 respondents provided an answer showing that attribute 1 was one-dimensional.

**Table 3-8: Kano Tabulation of Responses for all Respondents**

| Attribute | A | M | O | R | Q | I | Total | Grade |
|---|---|---|---|---|---|---|---|---|
| 1. | 1 | 1 | 21 | | | | 23 | *O* |
| 2. | | 22 | | | 1 | | 23 | *M* |
| 3. | 13 | | 5 | | | 5 | 23 | *A* |
| 4. | 6 | 1 | 4 | 1 | | 11 | 23 | *I* |

**Step 5: Analyze the results**

The last step of the Kano method is analysis of the results from step 4, which determines the "grade" column shown in Table 3-8, indicating the overall classification of each attribute. The simplest and most common way of determining the overall attribute grade is to score each

attribute according to its mode (the most frequently occurring category). This is the method used in Table 3-8. It can sometimes be useful to look at the second most frequently occurring category as well since it can provide additional insight. For example, there may be two attributes with 50 responses each. For the first attribute, 30 respondents rate it as attractive while the remaining 20 rate it as must-be. For the second attribute, 30 respondents also rate it as attractive, but the remaining respondents rate it as indifferent. Clearly, the two attributes are perceived differently even though they both received the same primary ranking. Therefore, it can be useful to note the second or even third most frequent ranking for each attribute so these types of differences can be discovered.

In general, if any requirement receives a substantial number of questionable (Q) scores, it should be deleted from the analysis since the results cannot be interpreted. Additionally, if a large number of respondents give an attribute a reverse (R) score, this indicates that the attribute is perceived differently than the researcher expected. Specifically, an attribute is reverse if its existence actually dissatisfies the respondents. If the majority of respondents indicate that an attribute is reverse, it may be reasonable to re-code all responses by switching the responses to the functional and dysfunctional questions.

## 3.3.3 Attitude Scales

The attitude scale technique was chosen because of its simplicity and ease of implementation. Attitude scale questionnaires simply ask the respondent to indicate the importance of each attribute for a product or service.

The steps involved in implementing a survey with an attitude scale are the same as those outlined for the Kano method although the implementation is quite different. Each step is described below.

### Step 1: Define attributes

As with the Kano method described previously, attributes of the product or service must be chosen for further study. A type of attitude scaling called the self-rated importance questionnaire is often used in conjunction with Kano studies. In this case, the attributes, and consequently the questions, are directly related to those included in the Kano study.

## Step 2: Design the survey

A key element in the survey design is the selection of an appropriate scale. The following paragraphs describe four different scales that are commonly used in market research and Figure 3-5 provides an example of each scale type.

### *Likert Scale*

This is the most common scale used in market research. The respondent is given a statement about a product or service attribute and is asked to agree or disagree with the statement. The advantages of this type of scale are that it is easy to administer, easy to respond to, and it measures the intensity of the respondent's feeling towards the statement given. The problem with the Likert scale is that it measures attributes on an ordinal rather than an internal scale. In other words, in the example shown in Figure 3-5, moving from "neither agree nor disagree" to "strongly agree" clearly indicates a stronger agreement with the statement, but there is no guarantee that the service is viewed as *twice* as convenient.

### *Semantic Differential*

Semantic differential scales are similar to Likert scales in that they measure intensity of feeling, but in this case the respondent is presented with two bipolar statements and is asked to check a category indicating how close their feelings are to one of the two statements. This type of scale is also easy to administer, but can be problematic in that generating bipolar statements is often difficult.

### *Graphical*

Another way a respondent might indicate her feeling towards a statement is to represent it as a position on a line, where the ends of the line are two opposing statements. The line can either have pre-specified markings or can be unmarked, although unmarked lines are difficult to code for analysis. Using this type of scale may help alleviate the ordinal vs. internal scale problem mentioned previously, however there is no proof of this.

## Figure 3-5: Different Types of Attitude Scales
(Source: Urban and Hauser, 1993)

**Likert Scale**

*The subway is a convenient way to get to work*

| Strongly agree | Agree | Neither Agree nor Disagree | Disagree | Strongly Disagree |
|:---:|:---:|:---:|:---:|:---:|
| [ ] | [ ] | [ ] | [ ] | [ ] |

**Semantic Differential**

*Subway*

Saves me time in getting to work  └─┴──┴──┴──┴──┴──┘  Takes me more time to get to work

**Graphical**

Good ─┬─
     ─┼─
     ─┼─
*Subway atmosphere*  ─┼─
     ─┼─
Bad ─┴─

**Itemized**

*Monetary Cost*

| Of No Importance | Moderately Important | Important | Very Important | Extremely Important |
|:---:|:---:|:---:|:---:|:---:|
| [ ] | [ ] | [ ] | [ ] | [ ] |

*Itemized*

With this type of scale, the respondent is either presented with an attribute and asked to rank it according to its importance or presented with an attribute of a specific service and asked how the service ranks with respect to that attribute. These scales are easy to administer and respond to and generally tend to be more reliable than graphical scales. With careful design and testing, it is possible to construct an itemized scale that is close to an interval-like scale, eliminating the

ordinal vs. internal scale problem discussed previously. Itemized scales were used for the attitude survey conducted in this thesis.

The selection of an appropriate scale is based largely on the type of information that the researcher hopes to extract from the survey. It can also depend on characteristics of the product or service being studied. For example, with the Boston study, we were not interested in how well current modes meet the expectations of commuters with respect to different aspects, but rather how important each of those aspects was to the commuters.

It was therefore logical to use an itemized scale in which the importance of each attribute was measured independent of any particular mode. On the other hand, if we had been interested in how commuters rate various modes on a number of attributes, a Likert or semantic differential scale might have been used.

Two other questions often arise when a researcher is developing a scale for an attitude questionnaire. The first is how many scale points should be used. This number will depend on the ability of respondents to make distinctions between the different scale levels and on the method of administration. For example, if the survey is being administered over the telephone, generally no more than 4 scale points are used so that the respondent can remember each of them. Normally, the range of scale points is between 4 and 8. The other question that researchers often think about is whether to provide a "neutral" category on the questionnaire. Proponents of the neutral category argue that often respondents *are* neutral and it is therefore fair to allow them to indicate this. Opponents argue that a neutral category allows respondents to avoid commitment to a point-of-view. This question is one that has not been answered definitively in market research, and therefore the use of a neutral category tends to be a judgement call.

## Step 3: Conduct the survey

As with the Kano survey, administration of attitude scale questionnaires is straightforward, requiring only simple instructions since respondents understand the questionnaire scale when they look at it. Although the survey conducted for this research used the paper-based method for administration of the attitude scale questionnaires, a web-based version could undoubtedly be

implemented. However, because the questionnaire is simple and quick, a paper-based version will often be sufficient in terms of response rate, whereas with other methods a web-based version may help to increase response rate.

## Step 4: Process survey results

After questionnaires have been administered, the responses must be coded. Normally a number is given to each category in the scale. For example, if there were five categories, the responses might be given a number between 1 and 5, although the actual value of these numbers is fairly meaningless since they can be arbitrarily chosen. The value is derived from comparing these numbers for different attributes.

## Step 5: Analyze the results

Often this type of data is analyzed using simple averages. For example, for each attribute, one might simply calculate the average response and then compare this value to that for the other attributes in order to understand its relative importance. Additionally, the data are often cross-tabulated according to various market segments.

# Chapter 4: Boston Survey Administration and Data Collection

In order to test the effectiveness of the three selected methods in helping to understand choice riders, four different questionnaires on park-and-ride were developed for distribution at companies in the Boston area. Understanding which attributes of park-and-ride are important to choice riders can increase understanding of how transit can attract these potential customers as discussed in Chapter 1. For the attitude scale method, a questionnaire dealing with attitudes about commuting in general was also developed and administered. This chapter describes the surveys that were conducted in Boston both to test the research methods and to gain a better understanding of choice riders. The chapter begins with a discussion of the questionnaire development, which included the use of qualitative research methods. It then continues by describing the survey administration at companies in the Boston area. Finally, the chapter discusses various issues with regard to paper vs. web-based distribution methods.

## *4.1 Questionnaire Development*

One of the most important steps in implementing a survey is development of the questionnaire. The questionnaires were developed in a standard manner for market research studies and consisted of the following four steps:

**Step 1:** Focus groups and personal interviews

**Step 2:** Initial questionnaire design

**Step 3:** Pre-testing

**Step 4:** Questionnaire revision and final design

Each of these steps is discussed below.

### 4.1.1 Personal Interviews and Focus Groups

Survey design often begins with the use of qualitative research methods such as focus groups and personal interviews. A focus group is a discussion among 8-10 people focused on specific topics introduced by a discussion leader. The participants are encouraged to express their own views and to react to views of others in the group. This preliminary qualitative work provides the researcher with basic information for questionnaire content and wording.

For the Boston survey, the questionnaire development process consisted of one focus group and one personal interview. This is a small amount of initial data, and it is recommended that future studies use a greater number of focus groups and/or interviews. However, the qualitative data that was obtained provided valuable insights and perspectives for use in developing the questionnaires.

## Personal Interview

The personal interview dealt with general perceptions of public transportation in Boston. It was conducted with an engineer at a company in Watertown, a town right outside Boston that is served by public transportation. This individual lives in Providence, Rhode Island, which is approximately 48 miles from Watertown, and commutes either by public transportation or by private automobile, depending on his daily schedule. When commuting by automobile, he drives directly to work, where free parking is provided. When he uses public transportation, he parks at the commuter rail station in Providence and takes commuter rail to South Station in Boston, where he catches the Red Line to Harvard Square. From there he rides a trolley bus to his final destination in Watertown. Therefore, not only was this participant an excellent choice because of his use of both the private automobile and public transportation, but he also utilizes a variety of transit modes, providing for an interesting discussion.

Before the interview was conducted, an interview guide was written. The interview guide is essentially the roadmap for the interview and contains all the topics to be covered during the discussion. Although the interviewer wants the respondent to express his thoughts freely, it is important that all relevant topics be covered; therefore a list of questions is critical. The interview guide is shown in Appendix A. It starts out with an introduction, in which the interviewer introduces herself and provides a brief description of the purpose of the interview and the importance of the respondent's views. This particular interview guide then continues with an exercise called ZMET, which will be described in more detail in the next paragraph. After the ZMET activity, the interviewer begins the in-depth interview, where the most crucial questions are covered.

The Zaltman Metaphor Elicitation Technique (ZMET) is based on the premise that thoughts often occur as images and that metaphors are central to cognition (Zaltman, 1996). The method requires that prior to the interview date, the respondent find 6-10 pictures that represent their feelings towards the topic under discussion. In this case, the respondent was asked to find images that represented his experience with public transportation in Boston. These images and their relation to the topic of interest are then discussed during the interview. The discussion guide in Appendix A provides an example of the types of questions the interviewer might ask about the images. The images that were chosen by the respondent in this interview are also included with the interview transcript in Appendix A.

The primary idea behind the personal interview is to gain an understanding of the respondent's perception of the product or service of interest. In this case, we were interested in the respondent's perception of public transportation services in Boston and the interview identified the following primary customer needs:

- Freedom of mobility
- Ability to plan and control a daily routine
- Accessibility and convenience
- Comfortable, stress-free environment
- Low cost, good value

All of these ideas were incorporated into the questionnaires. Additionally, the interview helped suggest language to be used in the questionnaires.

*Focus Group*

The focus group focused specifically on remote parking (such as the plaza idea) and attempted to uncover views about the plaza idea that is being considered in San Juan. It was conducted with administrative staff from the Massachusetts Institute of Technology and dealt both with general perceptions of transit and with park-and-ride facilities. The group consisted of eight participants, four men and four women. Table 4-1 provides some basic information about the focus group participants, including their town of residence, normal commuting mode(s) to MIT, and perceived commuting alternatives.

**Table 4-1: Focus Group Participant Profile**

| Participant | Town of Residence | Distance to MIT | Mode(s) to MIT | Perceived Alternative Modes |
|---|---|---|---|---|
| 1 | Concord | 16 miles | Drive | *Option 1:* Park-and-ride to subway<br>*Option 2:* Walk to commuter rail to subway |
| 2 | Cohasset | 24 miles | Drive. commuter boat. walk. subway | *Option 1:* Drive to subway<br>*Option 2:* Commuter rail to subway |
| 3 | Wilmington | 17 miles | Drive | Commuter Rail |
| 4 | Waltham | 7 miles | Bus, walk | *Option 1:* Drive<br>*Option 2:* Commuter rail to subway |
| 5 | Weymouth | 19 miles | Park-and-ride to subway | *Option 1:* Drive<br>*Option 2:* Commuter rail |
| 6 | Malden | 6 miles | Drive | Bus, subway |
| 7 | Weymouth | 19 miles | Drive | Bus |
| 8 | Acton | 21 miles | Drive | Commuter rail |

As Table 4-1 shows, the group was fairly heterogeneous, representing a number of towns and commuting modes. This variety provided an interesting group dynamic and resulted in constructive participant interaction.

As with personal interviews, focus groups require the use of a guide to lead the discussion (see Appendix B for the guide used). After a brief introduction the moderator tries to provoke discussion, normally by starting with a question in which every participant is asked to share some basic information with the group. In this case, the opening question solicited the information included in Table 4-1. The guide then continues with introductory questions, transition questions and key questions, successively narrowing the discussion to the specific topic of interest. The discussion guide illustrates this by first asking respondents how they feel about commuting and then eventually narrowing the discussion specifically to remote parking.

For some questions, the respondents were asked to formulate lists, which were written on flip charts. For example, one of the early questions asked the respondents what they liked best about their mode of commuting to work. After all responses had been recorded, the participants were

asked to share their thoughts about the various attributes listed. This technique both allows respondents to see answers given by other members of the group and provides a more interesting discussion environment. The lists generated with the use of the flip chart are included in Appendix B.

The discussion session provided many valuable insights with regard to commuting behavior and park-and-ride. The following paragraphs provide a summary of the responses for each question. (See Appendix B for the full focus group transcript).

## Question 2: What do you like best about your current way of traveling to work? Of all the things listed, which do you feel are the most important?

In general, this question prompted significant response. As expected, the response varied depending on the mode of travel used. For example, the respondents who drive to work stressed the flexibility that driving offers. Many of these individuals either have children or jobs with uncertain hours. Therefore, they need to be able to leave work at different times from day to day. These respondents also liked the relaxing and comfortable environment offered by an automobile. For example, one respondent stated that she didn't have to deal with "weird people on the T," and another noted how the car gives him "quiet time to myself". The individuals who ride transit stated some different advantages of their current mode, such as being able to get to work regardless of weather and not having to deal with traffic (or road rage, as one respondent stated). The interesting point is that for these individuals, transit also provides them with a relaxing, comforting environment since they can get on the train or bus and just "zone-out." Overall, when asked which of the advantages were most important, three items on the list were mentioned: *Freedom and flexibility* (this was extremely important for auto-users), *time,* and *cost*.

## Question 3: Those of you who drive to work, what things do you see as barriers to you using transit? Those of you who use transit, what are the biggest inconveniences of riding transit to work? Which of these are the most important?

Not surprisingly, the attribute that was seen as the biggest advantage of driving was also seen as the most significant barrier to taking transit – *flexibility*. Many of the participants don't like the fact that transit has a set schedule: when they want to leave work, or when they have to leave

work to pick up their kids, they don't want to have to wait for the next train to arrive. Another significant aspect that was mentioned was the *cost of transit compared to driving and parking at MIT*. Because parking at the university is relatively inexpensive, it doesn't make economic sense to pay for transit if someone already owns an automobile. However, the point was made that if a person doesn't own a car, it is definitely cheaper to ride transit than to purchase an automobile. One respondent noted the *multi-modal aspect of transit* as a major barrier. Other points that arose were the *comfort level of transit*, the fact that you *can't easily transport items* on the T, and the fact that you *can't run errands* if you take public transit.

**Question 4: Those of you who drive...do any of you live walking distance from a commuter rail or subway station? Have you ever considered driving to a commuter rail station, parking, and then taking commuter rail (or any other type of public transit) into the city? Why or why not?**

Surprisingly, some of the individuals who drive to MIT live remarkably close to a T station. One respondent lives only half a mile from a commuter rail station. Why do these people drive instead of taking public transportation? The reasons noted were similar to responses given for previous questions. First of all, it is much *cheaper* to drive to work if you already own a car. Second, *travel time* on the T is much higher than driving. Finally, in some cases there is *no parking available* at the commuter rail station, so the participant doesn't view park-and-ride as an option.

**Question 5: What characteristics/attributes of a remote parking facility (such as the plaza concept) would influence your decision to use it? Would you be more or less likely to use this instead of driving to the station and parking there...why?**

The response to the idea of remote parking was extremely negative. A few respondents said there was no way they would even consider using this option. The biggest reason for this reaction was that respondents realized this *would add another mode to their commute*, and there was strong opposition to this. They thought that if the service could somehow replace another mode they might consider using it. However, the group still came up with some interesting points. First of all, they noted the importance of *free parking*. Along the same lines, they mentioned the topic of *parking cost at the final destination*. If parking at MIT were extremely expensive, they would consider this as an alternative. They mentioned the possibility of

receiving a *tax or insurance break* as an incentive to using the service. One interesting point was that it might be useful to make the shuttle like a car. Essentially, it would have to be a *comfortable, clean environment.*

**Question 6: In front of you, you have a sheet of paper with a list of various attributes of this remote parking facility. I would like you to go through these different items and rank them in order of importance to you, 1 being the most important and 12 being the least important.**

The response to this question seemed to reinforce points made earlier in the discussion. *Free parking and free shuttle service* seemed to be important, as well *as extended facility hours* and *frequent shuttles.* In general, it seemed that the women were much more concerned with *security* issues than the men. Interestingly, one respondent pointed out that he thought some of these attributes were "must-haves", such as *lighting, a covered area, security personnel, and a short walk from parking to the facility.* However, even though the other respondents agreed that these things had to be present, some of them were not ranked as the most important attributes.

**Question 7: What else could be done to encourage you to use remote parking?**

The participants came up with a few more attributes that were not included on the previous list. For example, they again brought up the subject of *vehicle environment.* If transit were more like a car, people would be more inclined to use it. The participants stressed transit is crowded and uncomfortable. If this could be changed, they would consider using it. Another major topic discussed was the *payment system.* Currently, the MBTA only offers monthly passes. Some participants thought it would be useful to have bi-weekly passes or debit cards. They all disliked the token system immensely. They also expressed the need for the transit system to *accommodate children*, although when the idea of daycare at the remote parking facility was raised they were opposed to it. In general, the perception was that transit was not a place where you want to leave your children. However, one participant mentioned that if you could somehow have a number of independent day-care centers near the remote parking facility he might consider using them. Additionally, the participants liked the idea of having a *grocery pick-up* at the remote parking area.

As can be seen in the previous paragraphs, the focus group provided extremely valuable information, much of which was included in the questionnaires. As with the personal interview, the focus group also helped suggest language for the questionnaires.

## 4.1.2 Initial Questionnaire Design

Based on this qualitative research, preliminary questionnaires were designed for each of the three selected survey methods. The primary considerations in the questionnaire design were content, appearance, length, and clarity. The questionnaire content was based on the literature review and the outcome of the qualitative research stage. The attributes included in the surveys were thought to be important in influencing commuters to use park-and-ride. The following paragraphs describe key attributes included in the study.

*Travel Cost*

Most park-and-ride studies cite cost as being one of the primary reasons commuters choose to ride transit instead of driving directly to work. A survey of park-and-ride users in Calgary cited "a number of reasons for choosing to travel by Calgary Transit, primarily relating to the cost of travel and, in particular, the high cost of parking in the downtown area" (Bolger, 1992). In the same study, 82 percent of the respondents claimed that they would discontinue use of the park-and-ride facilities if parking were no longer free. This statistic emphasizes the importance of travel cost in mode choice decisions. Similarly, a study in Portland found that saving money on parking in the city was the primary factor that prompted commuters to use Tri-Met instead of driving into the city (Ambruso, 1991).

An important fact to note is that the "travel cost" associated with commuting is composed of a number of elements. As mentioned in the Calgary and Portland studies, the cost of parking may be the single most important factor affecting peoples' commuting decisions. In some cities, such as Boston, parking in the Central Business District (CBD) can cost as much as $25-$30 per day. However some employers, especially those on the outskirts of the CBD, provide free parking for their employees; therefore this aspect of travel cost will not affect all commuters to the same extent. For commuters with free parking, the mode choice decision may depend on a comparison of monthly transit fare versus the cost of gasoline and mileage costs for their personal automobiles. If the commuter needs to drive to a park-and-ride lot to take transit, the

cost of parking at the park-and-ride facility will be another factor to consider. The issue is how important these various aspects of travel cost are in influencing the traveler's decision.

## Time Savings

Because many cities experience severe congestion, public transit is often viewed as a transportation option that saves time for commuters. For these commuters, park-and-ride lots are often an integral part of their commuting experience. According to an NCHRP report, "in heavily congested travel corridors where transit is provided with an exclusive right-of-way, commuters using park-and-ride services may realize travel time savings, more reliable travel times, and a more relaxed commuting trip" (Turnbull, 1995).

As with travel cost, travel time is composed of many pieces, and it is possible that these different parts of travel cost may be perceived differently by commuters. For example, a commuter may prefer to spend 20 minutes reading the newspaper on a train rather than spending those 20 minutes in traffic. It is important to take this into account when trying to use market research to understand why people make decisions. In the case of park-and-ride, there are many different pieces of the total trip time that are likely valued differently by the commuter. The first piece is the drive to the facility. The commuter then has to look for a parking spot, park, and walk to the station where he waits for the train. Finally, the commuter rides the train into the city and travels onward to the final destination. For example, the commuter is likely to value waiting time and walking time higher than actual travel time in a vehicle, either transit or an automobile.

## The Relaxing Transit Experience

The NCHRP refers not only to travel time, but also the experience of having a "relaxed commuting trip". Many commuters value the fact that they can relax, read, or sleep while traveling to work by transit. If they were to drive into work, their attention would have to be fully focused on driving and the commute would become unproductive if not frustrating. Consequently, the physical environment on the train is important in attracting choice riders. For example, if the train is overcrowded and passengers are forced to stand, this time is no longer as relaxing and enjoyable. Similarly, if the train is dirty or seats are uncomfortable, commuters are likely to shy away from using the service. In general, the issues mentioned above are ones that

can be altered, and therefore it is instructive to understand their importance in commuters' mode choice decisions.

## Accessibility of Park-and-Ride Lot

Another attribute of park-and-ride that may significantly influence the decision to use it is accessibility. A survey of various authorities worldwide that use park-and-ride revealed, not surprisingly, that "facilities should be located in corridors of heavy travel demand at or near motorway junctions or on major radials so as to involve as little diversion from normal commuting paths as possible" (Dickens, 1991). In other words, if a park-and-ride facility is in a location that requires a significant diversion from the commuter's normal path, it is unlikely that the commuter will use it. A similar concept that has not been explored extensively is whether the distance between the park-and-ride lot and the commuters' residence plays a part in the decision process. Likewise, entry and exit from the facility must be easy and the user must be assured that she will find a parking space. After all, the idea is for the commuter to avoid the hassles of traffic. If the park-and-ride experience becomes frustrating it is likely that the commuter will choose not to use it.

## Safety and Security

The importance of safety and security in park-and-ride lots is an issue that is not discussed extensively in the literature, but is something that should clearly be explored. By safety and security, one may be thinking about personal safety or the security of an automobile when it's left in a park-and-ride lot. It is an issue that may be expected to be of greater importance to certain segments of the population, such as women. Its importance may also vary greatly from city to city since some cities are generally viewed as being safer than others. In that respect, it is likely to be an extremely important issue in Puerto Rico, where the general population is more security-conscious than in many other U.S. cities. It is possible that lack of adequate safety and security measures may deter people from utilizing the lots and it is therefore an interesting parameter to explore through market research.

## Flexibility

Flexibility is a fairly broad concept that is extremely important in travel decisions. One of the reasons that many commuters travel to work by car is that the private automobile provides the flexibility they desire to adapt their commute to their personal and professional lives. In today's

workplace, employees often work odd or extended hours, and the transportation system has to be accommodating to the needs of these transportation customers. Additionally, with more and more women entering the workforce there are issues such as childcare that need to be addressed. Parents must feel that if their child needs to be picked up early from school they can get there quickly. If transit cannot provide this needed flexibility it will not be considered a viable option for these commuters.

The difficulty in including flexibility in a market research study is in quantifying this nebulous concept. In terms of park-and-ride, there are various attributes of the system and the facility that may improve the flexibility provided to the traveler. For example, providing more frequent service will ensure that the commuter does not have to wait long for a train. Providing a service with extended hours provides greater flexibility for people who may have to work late. Encouraging the development of day-care centers or other concessions at or near the park-and-ride facility may make it easier to incorporate everyday activities into the transit experience. Rutherford et al (1991) performed an initial feasibility study regarding the development of private services at park-and-ride lots and concluded that "private development of park-and-ride lots can help enhance patronage and rider satisfaction, provide lot security, and generate revenue for transit purposes" (Rutherford, Frank, and Tull, 1991). Although the study was not based on statistical findings, it illustrates the potential of these types of services for increasing flexibility for commuters. In general, the agency may want to focus on these and other aspects of the system that make it easier for the commuter to maintain a flexible schedule since doing so may make commuters more likely to use the system.

## Information

Providing travelers with information is an extremely important but is often overlooked by transit agencies. Simply put, people like to know what's going on and become frustrated when left in a state of uncertainty. Khattak and Polak (1993) studied the effects of providing parking information to travelers and found that:

1. Drivers were more likely to have knowledge of center city parking lots if they used several information sources (such as radio broadcasts and newspaper advertisements), were active seekers of parking information, and searched for parking rather than going directly to a parking facility,

2. Drivers were more inclined to use underutilized parking facilities if they received information about them via newspaper or mailings (Khattak and Pollak, 1993).

The study shows that providing information about parking facilities can influence parking behavior. However, other types of information may be more important to commuters than parking information. For example, informing riders when there will be a delay in service may be extremely important in increasing customer satisfaction. Similarly, providing information about the reason for delay and an estimated time in which service will resume may significantly lessen rider anxiety and frustration. Providing this type of information also allows the traveler to consider alternative modes if the delay will be very long. This service characteristic is especially important when trying to attract choice riders since many will use transit for their commute to work and cannot afford to be late or not know when they will arrive at their final destination. Consequently, the value of information is an attribute of the system that warrants further investigation since it may potentially be an important factor in attracting choice riders.

## 4.1.3 Pre-testing

Prior to administering a survey, a pre-test is essential to ensure that the questionnaire can be clearly understood and is not too long. Additionally, the pretest ensures that the questionnaire will successfully gather the information required by the researcher. After the questionnaires were drafted for the Boston survey, a pre-test was done by administering them to various individuals who were not members of the transportation community. These individuals were asked to complete the questionnaire, keeping track of the amount of time that was required to complete it, and note any questions that were not clear. They were then interviewed so that they could provide feedback for subsequent questionnaire revisions. In general, the number of pretest participants needed ranges from 15 to 25. In this case, the number of participants was lower than normal because of time and resource constraints.

## 4.1.4 Questionnaire Revision and Final Design

Based on pre-test results, the questionnaires were revised to produce the final questionnaire design. Additionally, it was decided that some of the questionnaires would be administered over the Internet. In general, this did not require a great deal of alteration in the general design, although a few issues did arise which will be presented later in the chapter. The following paragraphs describe the final questionnaire design for each of the survey methods.

## Conjoint Survey

The conjoint questionnaire (see Figure 4-1) consists of 18 different alternatives, each comprised of a specific set of attributes and levels. The questionnaire had three attributes with three levels and three attributes with two levels. The attributes chosen represented six primary attributes thought to affect park-and-ride usage based on the exploratory research: travel cost, flexibility, travel time, safety and security, comfort, and accessibility. The attribute levels were chosen based on values that were thought to be reasonable for Boston. For example, a travel cost increment of $10/day was chosen because the current cost of parking in the city may be as high as $20/day. A train frequency of every 5 minutes to every 30 minutes was chosen in order to be consistent with frequencies on the Boston rail system. The distance from home attribute levels were chosen based on the idea that 5 miles is the longest distance commuters may be willing to travel to reach a park-and-ride lot. In general, there is no truly scientific way to choose the attribute levels for a conjoint survey. At times, the levels are limited by physical constraints. If they are not limited in this way, it may be necessary to do preliminary research in order to learn which values are appropriate for the population being sampled.

The instructions for the conjoint questionnaire first asked the respondents to assume they were considering the use of park-and-ride, an assumption that was necessary for this particular questionnaire. It asked the respondents to rank the alternatives in order of preference, with 1 being the worst alternative and 20 being the best alternative. It may also be necessary to explain each of the attributes in more detail and in this survey, this description was included on a separate page, which is not shown in the figure.

## Figure 4-1: Conjoint Questionnaire

Please assume you are going to use a park-and-ride facility (a parking lot where you park your car and then take the train or subway to work).

The following table presents a number of different options for this park-and-ride facility. Each option is a different combination of various aspects of the facility.

In the score column, please give each option a score from 1-20, where 20 is the BEST score an option can get and 1 is the WORST score. You may want to look the whole table over quickly before starting

| | Cost of park-and-ride compared to driving all the way to work | Train frequency | Park-and-ride travel time compared to driving all the way to work | Is there a security guard at the park-and-ride facility? | Is the train usually crowded? | Distance between park-and-ride facility and your home | Score |
|---|---|---|---|---|---|---|---|
| Option 1 | $10/day more | 30 minutes | 15 min. less | Yes | No | 5 miles | |
| Option 2 | $10/day more | 30 minutes | 15 min. more | No | Yes | 5 miles | |
| Option 3 | $10/day more | 15 minutes | Same | No | No | 1 mile | |
| Option 4 | $10/day more | 15 minutes | 15 min. more | Yes | No | 5 miles | |
| Option 5 | $10/day more | 5 minutes | 15 min. less | No | No | 1 mile | |
| Option 6 | $10/day more | 5 minutes | Same | Yes | Yes | 1 mile | |
| Option 7 | Same | 30 minutes | Same | No | No | 1 mile | |
| Option 8 | Same | 30 minutes | 15 min. more | Yes | Yes | 1 mile | |
| Option 9 | Same | 15 minutes | Same | Yes | No | 5 miles | |
| Option 10 | Same | 15 minutes | 15 min. less | No | Yes | 5 miles | |
| Option 11 | Same | 5 minutes | 15 min. more | No | No | 1 mile | |
| Option 12 | Same | 5 minutes | 15 min. less | Yes | No | 5 miles | |
| Option 13 | $10/day less | 30 minutes | 15 min. less | No | No | 1 mile | |
| Option 14 | $10/day less | 30 minutes | Same | Yes | No | 5 miles | |
| Option 15 | $10/day less | 15 minutes | 15 min. more | No | No | 1 mile | |
| Option 16 | $10/day less | 15 minutes | 15 min. less | Yes | Yes | 1 mile | |
| Option 17 | $10/day less | 5 minutes | 15 min. more | Yes | No | 5 miles | |
| Option 18 | $10/day less | 5 minutes | Same | No | Yes | 5 miles | |

## Kano Survey

The Kano questionnaire (see Figure 4-2) consisted of a pair of questions for each attribute. The structure of this survey allowed for the inclusion of more questions than the conjoint survey, and therefore more attributes were included in the Kano study. There are two parts of the Kano questionnaire that are noteworthy. First, respondents were explicitly told that there would be a pair of questions dealing with each attribute. In this way, the respondents were not surprised and confused by this aspect of the questionnaire. The second notable part of the Kano survey is the wording of the hedonic scale. Figure 4-2 shows the scale used for the Boston survey, which was carefully thought out and tested before the survey was administered. Although this particular hedonic scale could be used again in future studies, it is important to evaluate the scale whenever a Kano analysis is planned to make sure it is clear and understandable to respondents.

## Figure 4-2: Kano Questionnaire

If you were considering using a park-and-ride lot for your commute (a lot where you park your car and then ride the train into work), what would be important in influencing your decision to use it?

This questionnaire asks pairs of multiple-choice questions about the park-and-ride experience. Each pair focuses on one aspect of park-and-ride.

Please check the box under the column that best describes how you feel for each question. *Please make an effort to answer each question without thinking about the previous one.*

|  | This would be *very helpful* in influencing me to use park-and-ride | This is a *basic requirement* for me to use park-and-ride | This would *not affect* my decision | This would be a *minor barrier* to using park-and-ride | This would *strongly influence* me *not* to use park-and-ride |
|---|---|---|---|---|---|
| 1a. Parking at the park-and-ride facility is free | [ ] | [ ] | [ ] | [ ] | [ ] |
| 1b. You have to pay to park at the park-and-ride facility | [ ] | [ ] | [ ] | [ ] | [ ] |
| 2a. Your employer pays for your T pass | [ ] | [ ] | [ ] | [ ] | [ ] |
| 2b. Your employer does not pay for your T pass | [ ] | [ ] | [ ] | [ ] | [ ] |
| 3a. The price of parking near your workplace is extremely expensive (eg. $25/day) | [ ] | [ ] | [ ] | [ ] | [ ] |
| 3b. The price of parking near your workplace is relatively inexpensive (eg. $5/day) | [ ] | [ ] | [ ] | [ ] | [ ] |
| 4a. Using park-and-ride instead of driving all the way to work saves you travel time | [ ] | [ ] | [ ] | [ ] | [ ] |
| 4b. It takes more time to get to work using park-and-ride than just driving all the way | [ ] | [ ] | [ ] | [ ] | [ ] |
| 5a. You can quickly and easily find a parking spot at the park-and-ride lot | [ ] | [ ] | [ ] | [ ] | [ ] |
| 5b. It takes you a long time (eg. 15 minutes) to find a parking spot | [ ] | [ ] | [ ] | [ ] | [ ] |
| 6a. You have a short walk (less than 1 minute) from where you park your car to the train | [ ] | [ ] | [ ] | [ ] | [ ] |
| 6b. You have a long walk (more than 5 minutes) from where you park your car to the train | [ ] | [ ] | [ ] | [ ] | [ ] |
| 7a. There are plenty of seats available on the train | [ ] | [ ] | [ ] | [ ] | [ ] |
| 7b. The train is crowded and you have trouble finding a seat | [ ] | [ ] | [ ] | [ ] | [ ] |

**Figure 4-2: Kano Questionnaire (Continued)**

| | This would be *very helpful* in influencing me to use park-and-ride | This is a *basic requirement* for me to use park-and-ride | This would not affect my decision | This would be a *minor barrier* to using park-and-ride | This would *strongly influence* me *not* to use park-and-ride |
|---|---|---|---|---|---|
| 8a. The train has stowage areas for transporting items | [ ] | [ ] | [ ] | [ ] | [ ] |
| 8b. The train does not have stowage areas for transporting items | [ ] | [ ] | [ ] | [ ] | [ ] |
| 9a. The train is clean | [ ] | [ ] | [ ] | [ ] | [ ] |
| 9b. The train is dirty | [ ] | [ ] | [ ] | [ ] | [ ] |
| 10a. It is easy to get your car in and out of the park-and-ride facility | [ ] | [ ] | [ ] | [ ] | [ ] |
| 10b. It is difficult to get your car in and out of the park-and-ride facility | [ ] | [ ] | [ ] | [ ] | [ ] |
| 11a. The park-and-ride facility is less than 5 miles from your house | [ ] | [ ] | [ ] | [ ] | [ ] |
| 11b. The park-and-ride facility is more than 5 miles from your house | [ ] | [ ] | [ ] | [ ] | [ ] |
| 12a. There is a security guard or a security camera at the park-and ride lot | [ ] | [ ] | [ ] | [ ] | [ ] |
| 12b. There is no security guard or security camera at the lot | [ ] | [ ] | [ ] | [ ] | [ ] |
| 13a. The train has frequent service (it comes often) | [ ] | [ ] | [ ] | [ ] | [ ] |
| 13b. The train does not come very often | [ ] | [ ] | [ ] | [ ] | [ ] |
| 14a. There are announcements of delays or changes in service | [ ] | [ ] | [ ] | [ ] | [ ] |
| 14b. Delays or changes in service are not announced | [ ] | [ ] | [ ] | [ ] | [ ] |
| 15a. The train runs 24 hours a day | [ ] | [ ] | [ ] | [ ] | [ ] |
| 15b. The train runs on a limited schedule (eg. 7am to 7pm) | [ ] | [ ] | [ ] | [ ] | [ ] |

## General Commuting Attitude Scale Questionnaire

As noted previously, park-and-ride is not the only means of attracting choice riders, so one attitude scale survey was designed to ask respondents about general commuting attributes (see Figure 4-3). Each question represented a different attribute, and the attributes represented a similar level of detail to those included in the Kano survey. For example, in the general commuting questionnaire, travel time was broken down into total travel time, in-vehicle time, and out-of vehicle time. Attributes for this survey were selected either as generalizations of park-and-ride attributes or specific commuting attributes mentioned in the qualitative data collection sessions.

**Figure 4-3: General Commuting Attitude Scale Questionnaire**

| How important are the following in your commuting decisions? | Of No Importance | Moderately Important | Important | Very Important | Extremely Important |
|---|---|---|---|---|---|
| 1. Total monetary cost | [ ] | [ ] | [ ] | [ ] | [ ] |
| 2. Parking cost | [ ] | [ ] | [ ] | [ ] | [ ] |
| 3. Total travel time | [ ] | [ ] | [ ] | [ ] | [ ] |
| 4. Amount of time spent in a vehicle (could be an automobile, train, bus, etc.) | [ ] | [ ] | [ ] | [ ] | [ ] |
| 5. Amount of time spent walking | [ ] | [ ] | [ ] | [ ] | [ ] |
| 6. Having a relaxing commute | [ ] | [ ] | [ ] | [ ] | [ ] |
| 7. Being able to transport items to and from work | [ ] | [ ] | [ ] | [ ] | [ ] |
| 8. Being able to make commuting time productive (eg. Being able to do work) | [ ] | [ ] | [ ] | [ ] | [ ] |
| 9. Physical comfort | [ ] | [ ] | [ ] | [ ] | [ ] |
| 10. Personal space/time to yourself | [ ] | [ ] | [ ] | [ ] | [ ] |
| 11. Not having to take too many types of transportation/vehicles | [ ] | [ ] | [ ] | [ ] | [ ] |
| 12. Feeling safe from being mugged or assaulted | [ ] | [ ] | [ ] | [ ] | [ ] |
| 13. Ability to do errands en route | [ ] | [ ] | [ ] | [ ] | [ ] |
| 14. Flexibility (Come and go as you please) | [ ] | [ ] | [ ] | [ ] | [ ] |
| 15. Knowing when there will be delays | [ ] | [ ] | [ ] | [ ] | [ ] |

*Park-and-Ride Attitude Scale Questionnaire*

The park-and-ride attitude scale questionnaire (see Figure 4-4) was similar to the general

commuting questionnaire, but included questions specific to park-and-ride, mirroring those in the

Kano study. This is a method that is used quite frequently when the Kano method is

implemented in order to validate the Kano responses. However, the attitude scale itself was

exactly the same as that used for the general commuting questionnaire.

**Figure 4-4: Park-and-Ride Attitude Scale Questionnaire**

| If you were considering using a park-and-ride lot*, how would you rate the importance of the following factors? | Of No Importance | Moderately Important | Important | Very Important | Extremely Important |
|---|---|---|---|---|---|
| 1. Parking price at the park-and-ride lot | [ ] | [ ] | [ ] | [ ] | [ ] |
| 2. Train fare | [ ] | [ ] | [ ] | [ ] | [ ] |
| 3. Parking price at your place of employment | [ ] | [ ] | [ ] | [ ] | [ ] |
| 4. Travel time on transit vs. driving all the way to work | [ ] | [ ] | [ ] | [ ] | [ ] |
| 5. Ease of finding a parking space at the park-and-ride lot | [ ] | [ ] | [ ] | [ ] | [ ] |
| 6. Walking distance between where car is parked and the train station | [ ] | [ ] | [ ] | [ ] | [ ] |
| 7. Availability of seats on the train | [ ] | [ ] | [ ] | [ ] | [ ] |
| 8. Being able to transport items to/from work easily | [ ] | [ ] | [ ] | [ ] | [ ] |
| 9. Cleanliness of the train | [ ] | [ ] | [ ] | [ ] | [ ] |
| 10. Ease of getting in and out of the park-and-ride facility | [ ] | [ ] | [ ] | [ ] | [ ] |
| 11. Distance between park-and-ride and home | [ ] | [ ] | [ ] | [ ] | [ ] |
| 12. Personal safety | [ ] | [ ] | [ ] | [ ] | [ ] |
| 13. Security of car at the park-and-ride | [ ] | [ ] | [ ] | [ ] | [ ] |
| 14. Train frequency | [ ] | [ ] | [ ] | [ ] | [ ] |
| 15. Knowing when the train will be delayed | [ ] | [ ] | [ ] | [ ] | [ ] |
| 16. The train's hours of operation | [ ] | [ ] | [ ] | [ ] | [ ] |

## Socioeconomic Questions

Each of the questionnaires included socioeconomic questions (see Figure 4-5), which were the same across all methods. The questions were chosen based on expectations that different market segments might have different perceptions about transit and park-and-ride attributes. For example, it was thought that males and females might perceive certain attributes differently, as might younger and older respondents and transit and non-transit riders. An attempt was made to provide multiple-choice options for most of these questions. However, because of limited space on the questionnaires, some socioeconomic questions were open-ended, such as the occupation question.

### Figure 4-5: Socioeconomic Questions Included in Surveys

```
16. My age is (circle one):      20-29        30-39        40-49        50-59        60 and over

17. I am (circle one):      Male        Female

18. I use the following to get to work (circle all that apply):    car      bus      walk      bike
                           carpool      subway      commuter rail      commuter boat      other

19. My home zip code is _____

20. The closest commuter rail or subway station to my home is _____

21. The distance between this station and my home is (circle one):
           less than 1 mile        1 mile – 5 miles        more than 5 miles

22. I regularly use a park-and-ride lot (circle one):        Yes        No

23. My occupation is _____
```

## 4.2 Sample Size Determination

The next step was the determination of appropriate sample sizes for the various surveys. While a larger sample size will give a more precise characterization of the population as a whole, financial and time constraints often limit the number of individuals who can realistically be questioned. The statistical methods often used for sample size determination are based on confidence intervals, which are constructed with the use of the standard deviation of a sample statistic, such as the sample mean. However, often the statistical methods are not the best way to determine sample size. As stated by Urban and Hauser (Urban and Hauser, 1993):

> *Although there are theoretical methods of defining the best sample size based on the value of information, these are difficult to implement in a complex, sequential*

*new-product development process. Classical methods of considering the standard deviation of the resulting estimate are useful, but vastly oversimplify the problem because information is collected on many variables and often analyzed by multivariate methods for which sampling properties are not easily determined. Judgment, norms, and experience are the best guides for sampling decisions.*

Consequently, many market research sources state that a sample size of 100 is the minimum that should be considered for any study. Because the resources for this particular study were limited, a sample size of approximately 100 was attempted for each survey. This number ensures a statistically significant sample without requiring an inordinate number of responses. In the end, two of the four surveys included less than 100 respondents due to exceptionally low response rates.

## *4.3 Survey Distribution*

The questionnaires were distributed to employees at ten different companies or organizations in Boston and Cambridge. As shown in Table 4-2, the companies varied by type of business, allowing for a fairly diverse respondent pool. The names of the companies and organizations have been omitted to ensure anonymity of the respondents.

**Table 4-2: Categorization of Companies Participating in Surveys**

| Type of Business | Number of Organizations |
|---|---|
| Consulting | 2 |
| Medical services | 1 |
| Pharmaceutical | 1 |
| Financial | 2 |
| Academic/Research | 1 |
| Engineering | 1 |
| Technology | 1 |
| Government | 1 |
| **TOTAL** | **10** |

Although four different questionnaires were developed, only one type of method was used at each company in order to reduce respondent confusion. The surveys were distributed via e-mail and the Internet whenever possible. However, some companies opposed this type of distribution for reasons discussed later in the chapter. Because all companies that were asked to participate

in the conjoint survey were agreeable to using web-based surveys, all conjoint questionnaires were distributed in this way. One company participating in the Kano survey opposed the web-based method, and therefore part of the Kano survey was conducted over the Internet and part was conducted with paper-based questionnaires. The attitude scale questionnaires were very short and quick to complete and were conducted using the paper instruments distributed to employees during their lunch hour.

Table 4-3 shows the approximate response rate for each type of questionnaire and for the paper-based and web-based methods. These response rates are a preliminary indication of the success of the different methods and their potential for use at other transit agencies.

### Table 4-3: Questionnaire Response Rates

| Research Method | Type of Business Receiving Questionnaire | Number of Questionnaires Distributed | Number of Questionnaire Responses | Response Rate |
|---|---|---|---|---|
| Conjoint | Engineering Medical Consulting Financial | 410 | 70 | 17% |
| Kano | Government Academic/Research Pharmaceutical Technology | 210 | 96 | 46% |
| Attitude Scale | Financial | 350 | 210 | 60%* |
| **TOTAL** | | **970** | **376** | **39%** |
| Paper-based | Financial Pharmaceutical | 400 | 242 | 61% |
| Web-based | Engineering Medical Consulting Financial Government Academic/Research Technology | 570 | 134 | 24% |

*Because of the distribution method for the attitude scale questionnaires, an exact response rate could not be calculated. Consequently, the rate in the table is estimated.

As the table illustrates, the conjoint study resulted in an extremely low response rate, most likely due to the difficulty of the questionnaire. The attitude scale questionnaires resulted in the highest response rate, most likely due to the low level of effort involved in filling out this type of simple questionnaire. Additionally, these questionnaires were distributed in person, which may have had an effect on the response rate. Even though the Kano questionnaire was significantly longer

and more time-consuming than the attitude scales. the response rate was still remarkably high. Therefore, when more detailed data and analysis is desired, the Kano method may offer a viable alternative to simple attitude scales in terms of potential for achieving an adequate response rate.

According to the above table, the paper-based questionnaires had a much higher response rate than the web-based surveys. In reality, the response rates shown for these two distribution methods may be slightly misleading. As stated previously, the conjoint and Kano questionnaires were distributed over the Internet, while the attitude scale questionnaires were distributed using paper. However, the conjoint and Kano questionnaires were also significantly more lengthy and difficult than the attitude scales. Therefore, the discrepancy in response rates for the two distribution methods may be due, at least in part, to the higher difficulty level of the Internet based surveys rather than the distribution method itself. It is entirely possible that solely paper-based distribution of the conjoint and Kano surveys may have resulted in lower response rates.

## 4.4 Issues with Surveys Distributed via the Internet

Over the last few years, electronic survey distribution has become increasingly popular. This type of distribution is much easier than traditional paper surveys from an administrative perspective. With the use of e-mail, a researcher can distribute hundreds or thousands of questionnaires with the touch of a button. The transaction cost for this type of distribution is extremely low compared to other distribution methods. Also, the electronic questionnaire can be developed in such a way that data is automatically stored in a database, eliminating the need for manual data encoding. However, electronic distribution of surveys is not trivial, and this section describes some of the issues encountered during the Boston survey.

### Unreliability of Technology

Even though Internet technology is continuously evolving, it is still far from perfect. When administering a survey electronically, the researcher has to be prepared for technological problems. For example, during the Boston survey administration, the computer that was being used for data collection was taken off-line without informing the researcher. Consequently, there was a period of time in which the web page was not functional. These types of problems are fairly common with electronic surveys, and although they can be minimized through better

communication, it is unrealistic to expect a problem-free survey experience. If the researcher wants to minimize the potential for serious administration problems, Internet-based surveys may not be the best option.

## Company Skepticism

Many companies are skeptical of surveys in general, and Internet-based surveys can sometimes make these companies feel even more uncomfortable. Although most of the organizations participating in the Boston survey were open to distributing a web-based version of the questionnaire, one of the companies strongly opposed this type of distribution. A representative of the company provided the following reasons for this opposition:

- ♦ Anything on the web is a potential conduit for computer viruses.
- ♦ Company assets, such as e-mail, should be used for company business only.
- ♦ Companies do not like the idea of anyone being able to access their entire workforce as easily as they can through e-mail distribution lists.

Although only one organization expressed these sentiments, this may still indicate a general skepticism towards administering surveys to employees over the Internet, and this should be carefully researched before significant effort is invested in the development of web-based surveys.

# Chapter 5: Survey Results

Chapter 5 first provides the profile of respondents for the Boston surveys. Next, a section of key findings is included for each of the surveys. The final part of the chapter provides a discussion of the survey results across the various methods and reasons why there was no significant difference in most cases between transit and non-transit rider perceptions of the various park-and-ride attributes.

## *5.1 Profile of Respondents*

Each survey included a number of socioeconomic questions. These questions provided information about the sample population and allowed identification of differences in perceptions among the market segments represented. Table 5-1 shows the overall respondent profile for each of the four surveys included in the study.

### Table 5-1: Profile of Survey Respondents

| | | Percentage of Total Respondents | | | | |
|---|---|---|---|---|---|---|
| Characteristic | Category | Overall (380 resp) | Conjoint (69 resp) | Kano (91 resp.) | General Commuting Attitude Scale (103 resp) | Park-and-Ride Attitude Scale (117 resp) |
| Sex | Male | 58.6% | 42.9% | 61.5% | 59.2% | 64.1% |
| | Female | 41.4% | 57.1% | 38.5% | 40.8% | 35.9% |
| Age | 20-29 | 50.8% | 57.1% | 60.4% | 35.9% | 53.8% |
| | 30-39 | 29.4% | 27.0% | 23.1% | 39.8% | 28.2% |
| | 40-49 | 12.3% | 15.9% | 9.9% | 17.5% | 9.4% |
| | 50-59 | 7.5% | 0% | 6.6% | 6.8% | 8.5% |
| Transit Ridership | Transit Rider | 62.0% | 52.4% | 50.5% | 66.0% | 72.6% |
| | Non-Transit Rider | 38.0% | 47.6% | 49.5% | 34.0% | 27.4% |
| Park-and-Ride Use | Use Park-and-Ride | 18.7% | 28.6% | 9.9% | 13.6% | 24.8% |
| | Don't Use Park-and-Ride | 81.3% | 71.4% | 90.1% | 86.4% | 15.2% |
| Distance of Transit Station from Home | Less than 1 mile | 46.3% | 50.8% | 53.8% | 41.7% | 41.9% |
| | 1-5 miles | 41.2% | 30.8% | 30.8% | 47.6% | 44.4% |
| | More than 5 miles | 12.6% | 15.4% | 15.4% | 10.7% | 13.7% |

Overall, the survey included 380 respondents. The conjoint survey was given to professionals in the engineering, medical, consulting, and financial sectors and 69 complete responses were received. The Kano survey was given to professionals in the government, academic/research, pharmaceutical, and technology sectors. Ninety-one (91) Kano questionnaires were returned fully completed. The two attitude scale surveys were given to professionals in the financial sector and a total of 220 responses were received.

Overall, slightly more than half of the respondents were male. Although the overall sample population included a greater number of males than females, the majority of respondents for the conjoint survey were females. Compared to the other three surveys, the park-and-ride attitude scale survey contained the greatest difference between the percentage of males and females in the sample.

The most highly represented age group in the survey was 20-29 years, comprising more than half the respondents. One possible explanation for this is that older professionals are likely in more senior corporate positions and therefore didn't have the time to fill out the questionnaire. Junior staff, on the other hand, may have had more spare time for participating in the survey. The general commuting attitude scale questionnaire was the only one with a significantly different age group representation than the overall sample population. Thirty-one percent of the respondents in this sample were between the ages of 20-29 and forty-one percent were between the ages of 30-39.

The respondents were asked to indicate which modes of transportation they used to travel to work. As Table 5-1 illustrates, 62% of the total respondents ride transit to work at least occasionally, with the private automobile being the next most common commuting mode. The majority of respondents do not use a park-and-ride lot in their commute to work.

The respondents were also asked to indicate the approximate distance of the nearest transit station from their home. As Table 5-1 indicates, almost half the respondents live within a mile of a transit station and the vast majority of the remaining respondents live within 5 miles. This

may be one of the reasons for the high transit mode share: transit is convenient for most of the sample.

One important point to note is that the sample for this study was not random. Specific companies were targeted and then samples were taken within these companies. This is similar to the type of study a transit agency such as Tren Urbano might conduct. The agency wouldn't be interested in the entire choice rider population, but rather a specific sub-set of that population, such as employees at selected companies. Therefore, it is not important that the sample be representative of the choice rider population as a whole, but rather that the samples from each company be representative of the choice rider population within those companies. In the case of the Boston surveys, it was not possible to identify biases within the company populations because the characteristics of these populations were unknown. However, in future implementations it will be important to ensure the sample adequately represents the population surveyed.

## 5.2 Conjoint Survey

The results of a conjoint survey are part-worth utilities for each of the attributes, representing their contribution to overall utility. For the Boston conjoint study, the least desirable level was chosen as the base for each attribute so that utility functions would be represented as increases in utility. This allowed the slopes to be more easily compared for the different attributes. The results are shown in Figure 5-1, normalized to a common scale for comparison purposes. The slopes of the part-worth utility functions allow for the comparison of different attributes and attribute levels included in the survey. For example, in Figure 5-1 the slope of the utility function for the daily cost of park-and-ride being the same as the current travel cost and the cost being $10 less is greater than the slope for train frequency of every 15 minutes and every 5 minutes. This indicates that a $10 decrease in travel cost from the current cost is much more important to respondents than an increase in train frequency from every 15 minutes to every 5 minutes.

## Figure 5-1: Part-worth Utilities for Conjoint Study

### Cost Utility

Utility vs. Travel Cost Compared to Current Commute ($10/day more, Same, $10/day less)

### Train Frequency Utility

Utility vs. Number of Trains per Hour (2 to 12)

### Travel Time Utility

Utility vs. Travel Time Compared to Current Commute (15 minutes more, Same, 15 minutes less)

### Security Utility

Utility vs. Security Guard Present (No, Yes)

### Train Crowding Utility

Utility vs. Crowded Train (Yes, No)

### Convenience Utility

Utility vs. Distance of Park-and-Ride Lot from Home (5 miles, 1 mile)

The part-worth utility functions that result from a conjoint study can provide valuable insight into perceptions of different attributes and levels. For attributes that exhibit linear utility functions, the analysis suggests that equivalent increments in the attribute level will result in equivalent increases or decreases in utility. For example, the approximately linear travel cost

utility function in Figure 5-1 indicates that a $10/day increase in travel cost results in a loss of utility equal to the utility gain derived from a $10/day decrease in cost.

Train frequency, on the other hand, does not exhibit a linear utility function. The function indicates that the utility gained by increasing the frequency from 2 trains/hour to 4 trains/hour is larger than that gained by increasing the frequency from 4 trains/hour to 6 trains/hour. In order to provide a utility gain equal to that derived by increasing frequency from 2 trains/hour to 4 trains/hour, it would be necessary to increase the frequency to 12 trains/hour (increases utility by 0.5 units). This is not surprising since one would expect that after a certain point, decreases in headway become less important to commuters. When train frequency is increased from 2 trains/hour to 4 trains/hour, headway is decreased from 30 minutes to 15 minutes, a decrease that is clearly detectable by commuters. However, adding another 2 trains per hour only decreases headway from 15 minutes to 10 minutes, and this change may not be as important to commuters. It is not until headway is decreased to 5 minutes that commuters value the difference as much as the 30 to 15 minute decrease.

Comparative travel time is also slightly non-linear according to the part-worth utility functions in Figure 5-1. The function shows that the loss of utility resulting from a 15-minute increase in travel time (1 unit) is greater than the utility gain from a 15 minute decrease in travel time (0.5 units). In other words, the respondents consider it more important for their travel time not to increase above its current level than for it to decreases below that level. This may indicate that respondents are not unhappy with their current travel time - it is not exceptionally important for it to decrease. However, if it were to increase, they would consider this a drawback to using park-and-ride.

To delve deeper into the trade-offs between various attributes, it is possible to calculate the value of these attributes with respect to travel cost savings. This is possible because travel cost exhibited a linear utility function, and therefore it might be assumed that intermediate points on the utility curve can be derived from the estimated function. For example, the utility functions show that respondents derive 0.5 utility units from either a travel-cost decrease of $2/day or a travel time decrease of 15 minutes. This indicates that the value of a 15-minute decrease in

travel time is equivalent to a $2/day reduction in travel cost in terms of the utility perceived by the potential and current choice riders of the service. Similarly, the utility curves indicate that the value of being in a non-crowded train is approximately $2/day to this group of people. Table 5-2 shows the equivalent daily cost changes for each of the attributes included in the conjoint study. From these values, it is possible to see the relative importance of the various attributes.

**Table 5-2: Equivalent Daily Cost Changes for Conjoint Attributes**

| Attribute specification | Equivalent daily cost change |
|---|---|
| Avoiding a 15-minute increase in travel time | $5/day |
| 15-minute decrease in travel time | $2/day |
| Increase in train frequency from 2/hour to 4/hour | $2/day |
| Increase in train frequency from 4/hour to 6/hour | <$1/day |
| Increase in train frequency from 4/hour to 12/hour | $2/day |
| Presence of a security guard | $1.50/day |
| Being on a non-crowded train | $2/day |
| 4-mile decrease in distance between park-and-ride facility and respondent's home | <$1/day |

Tables such as this one can be very useful for transit agencies in terms of understanding the trade-offs between different attributes. For example, the table shows that increasing train frequency from 2 trains/hour to 4 trains/hour has approximately the same value to respondents as providing a security guard at the park-and-ride facility. However, if the system were already operating with a train frequency of 4/hour, this frequency would have to be increased to 12/hour in order to increase respondent satisfaction as much as by providing security personnel. These results show that there is a trade-off between these attributes. If the agency was running 12 trains/hour but not providing security personnel, it could reduce the frequency to 4 trains per hour and provide a security guard. Since these changes are valued similarly by commuters, this may not cause the agency's customers to be dissatisfied. They may realize that trains are coming less frequently, but they will likely also understand there is additional security and recognize that there was a trade-off involved. However, it is important to note that this example is only valid if

capacity is not a significant issue. In other words, if the decrease in train frequency leads to an increase in train crowding (which is often the case), the train crowding attribute is also being affected and this must be taken into account in the analysis. If it is assumed that there is adequate capacity on the train so that crowding does not increase significantly with the decrease in frequency, then the trade-off between frequency and security described above is valid.

As mentioned previously, it was possible to calculate monetary values for the various attributes because the travel cost attribute exhibited a linear part-worth utility function. However, one must consider the possibility that the comparative travel cost values selected for the survey may have been inappropriate. The level of $10/day was chosen based on the fact that parking costs in downtown Boston (and even in some parts of Cambridge) can be as high as $20 to $25 per day. Therefore, it was believed that the $10/day level would be appropriate for commuters who were faced with these high parking costs. However, as the socioeconomic data show, a significant percentage of the respondents currently ride public transit for their commute to work. For these individuals, their daily travel cost may be as low as $1/day. Additionally, during the survey some respondents indicated that their employers subsidize their transit passes or parking. For all these people, the concept of paying or saving an additional $10/day may not have been meaningful.

One must consider that the travel cost utility function may not actually be linear for the attribute values given, although this was assumed for the analysis in the previous paragraphs. Figure 5-2 shows an alternative utility function that also fits the utility values found in the study. This alternative utility function is linear between the values of $5/day more and $5/day less, but not between the values respondents were presented with in the Boston conjoint study. This alternative function illustrates the case in which the values chosen were too extreme: travel cost savings above $5/day are so extreme that they are perceived similarly regardless of their value. If Table 5-2 had been formulated using this alternative utility function, the equivalent daily cost changes would have been different. This example illustrates the importance of selecting attribute levels that are reasonable and applicable to both the sample population and the agency. In fact, it would be better to research the attribute levels using qualitative research or other data sources before constructing a conjoint survey.

**Figure 5-2: Alternate Travel Cost Part-Worth Utility**
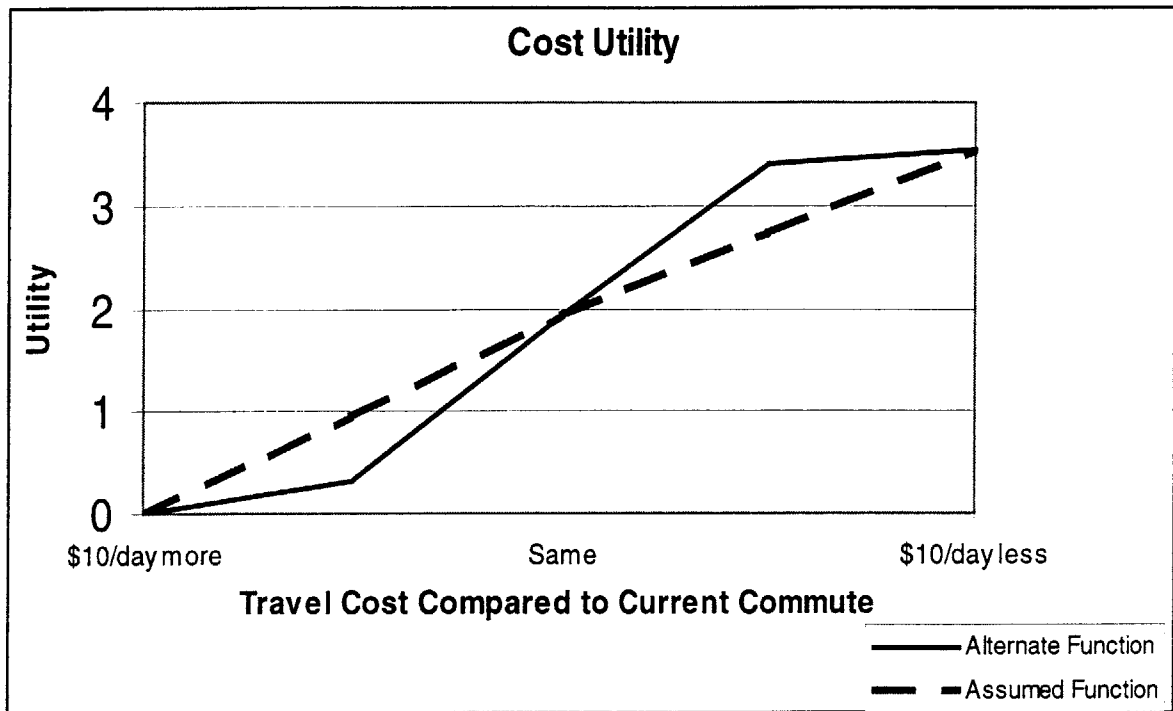


5.3 Kano Survey
================

The results of a Kano survey are categorizations for each of the attributes included in the survey. To review, the categories in a Kano analysis are:

> A: Attractive - Customer more satisfied with greater functionality, but dissatisfaction never falls below neutral level.

> M: Must-be - Customer more dissatisfied with less functionality, but satisfaction never rises above neutral level.

> O: One-dimensional- Customer satisfaction and functionality are directly proportional.

> I: Indifferent- Functionality has no effect on customer satisfaction.

> R: Reverse- Customer is more satisfied with less functionality

> Q: Questionable- Results of survey are inconclusive

A graphical representation of the categories was shown earlier in Figure 3-3. The Boston Kano survey included 15 attributes. Table 5-3 shows each of these attributes and the first and second most frequently occurring Kano categories for each. For one of the attributes, one category

clearly dominated so the second most frequently occurring category is marked as negligible. The following paragraphs discuss some of the key findings from the Boston Kano survey.

**Table 5-3: Boston Kano Survey Results**

| Attribute | Most Frequently Occurring Category | Second Most Frequently Occurring Category |
|---|---|---|
| Low parking price | Attractive | One-dimensional |
| Employer-paid transit pass | Attractive | Indifferent |
| Inexpensive workplace parking | Attractive | One-dimensional |
| Travel time savings | One-dimensional | Attractive |
| Ability to find parking easily | Must-be | One-dimensional |
| Short walk from car to train station | Indifferent | Attractive |
| Non-crowded train | Attractive | Indifferent |
| Stowage compartments on train | Indifferent | (negligible) |
| Clean train | Indifferent | Attractive/Must-be |
| Short distance between home and park-and-ride facility | Indifferent | Attractive |
| Ease of entry/exit to/from facility | Must-be | Indifferent |
| Security personnel | Indifferent | Attractive |
| Frequent train | One-dimensional | Must-be |
| Extended service hours | Attractive | Indifferent |
| Information | Must-be | Indifferent |

All three of the travel cost attributes were categorized as attractive by the majority of respondents. The first two attributes, parking cost at the park-and-ride facility and transit pass subsidization, were defined as either being free or requiring a fee. In other words, no specific cost level was provided. The fact that these two attributes were categorized as attractive indicates that the respondents would be satisfied if they didn't have to pay for parking or their transit pass, but would not necessarily be dissatisfied if they were required to pay. The third travel cost attribute, parking cost at the respondent's workplace, was defined as either $25/day (high value) or $5/day (low value). The attractive categorization for this attribute indicates that respondents are satisfied with low workplace parking costs, but high costs don't necessarily cause dissatisfaction.

In general, these results are not terribly surprising. One would expect anyone to be more satisfied with a lower price. However, the fact that the respondents wouldn't be dissatisfied if they had to pay for using the service is not unreasonable. The respondents were all professionals, likely in the mid- to high-income bracket. Therefore, although they clearly think about travel cost, they may not be as sensitive to these costs as individuals with lower incomes as long as the costs are within a reasonable range. The somewhat surprising finding for these attributes was the percentage of respondents who were completely indifferent towards cost, particularly the employer subsidized transit pass attribute. It was initially thought that an employer subsidized transit pass would be highly valued by employees. However, the survey found that 20% of respondents were indifferent towards this benefit. One might think this 20% might just represent the commuters who drive to work and therefore don't care about the transit pass. However, contrary to this idea, the statistical analysis showed no significant difference between transit riders and non-transit riders for this attribute. The comparison of transit riders to non-transit riders will be discussed in more detail in section 5.6.

The travel time attributes received mixed categorizations. Total travel time compared to driving all the way to work was considered to be either one-dimensional or attractive by most respondents. The one-dimensional categorization is not surprising. It implies that the respondents would be more satisfied with a shorter commute on transit and dissatisfied with a longer commute. However, the secondary attractive categorization was quite surprising since it indicates that some respondents would not be unhappy if transit took longer than driving. This may indicate that there are attributes of transit that make it desirable to some respondents even if travel time is longer.

The fact that being able to find parking easily was considered a one-dimensional or must-be attribute was not surprising since trying to find a parking space can be extremely frustrating. Similarly, it is not surprising that most respondents considered high train frequency to be either must-be or one-dimensional, since wait time can also be very frustrating. Finally, the indifferent categorization for walk time is reasonable since many people are either accustomed to walking in the city or consider it beneficial for health reasons.

The crowded train attribute resulted in a fairly even category split. This is not entirely surprising because it is possible that respondents may have been using a different experience base for this question. In other words, some of the respondents currently ride commuter rail or would ride commuter rail if they chose transit. Other respondents use or would use the subway. These modes are completely different in terms of comfort and crowding level. Commuter rail riders generally travel farther distances and are on the train for a longer period of time than subway riders. Therefore, they are likely accustomed to being able to find a seat on the train. The subway, on the other hand, is often crowded, especially during peak hours, and therefore subway riders may not expect to find a seat. Based on these assumptions, it is not surprising that the crowded train attribute elicited a mixed response.

Additionally, because of the wording of the crowded train question, it may have been perceived as a double-barreled question by respondents. A double-barreled question is one that includes two or more questions in one. The question pair was worded as follows:

> Functional question: *There are plenty of seats available on the train*
>
> Dysfunctional question: *The train is crowded and you have trouble finding a seat*

The dysfunctional question may actually contain two different attributes: train crowding and being able to find a seat. It is possible that respondents view these differently. For example, a train might not be "crowded" in a respondent's opinion, but she may still not be able to find a seat. Therefore, the dysfunctional question was not as straightforward as it should have been and may have caused some confusion.

The focus group conducted in the qualitative stage of the research indicated that carrying items to and from work was a concern for commuters and therefore storage compartments on the train might be important. However, the Kano survey found that almost all respondents were indifferent towards this attribute. Although this is surprising considering the opinions of the focus group participants, it is not an unreasonable result, especially for people who ride or would ride the subway. For these people, theft might be an issue if they were to put their belongings in storage compartments, so they probably wouldn't use the storage. The results simply indicate that the opinion of the focus group participants with respect to storage compartments may not have been the opinion of the population as a whole.

Another surprising result was the percentage of respondents who were indifferent about train cleanliness. The result may be a function of how people perceive "dirty" for public transportation in Boston. In other words, when respondents think of a train being "dirty", they are likely not thinking of it being *unsanitary*. This type of extreme statement might have provoked more of a response from customers.

The distance of the park-and-ride facility from the respondent's home was defined as either being less than 5 miles or more than 5 miles. Most respondents either claimed to be indifferent towards this attribute or categorized it as attractive. This result was surprising since park-and-ride studies have found that 5 miles is generally the maximum distance people will drive to a park-and-ride facility. The ease of entry and exit attribute had even more surprising results in that a large number of the respondents were indifferent towards it. One would think that having difficulty entering and exiting the park-and-ride facility would be extremely frustrating for commuters and that it would cause them to be dissatisfied with the facility.

The majority of respondents in the Kano survey claimed they were indifferent towards having a security guard or security camera at the park-and-ride facility. This is not a surprising result in Boston, where the general opinion seems to be that security is not an issue. However, if the survey had been conducted in a different city, such as New York or San Juan, the results may have been quite different.

In terms of extended service hours, the results of the Kano survey were also surprising. A priori, it was expected that extended service hours would be important to professionals because they often have unusual schedules and long work hours. Although the majority of respondents did claim this attribute was attractive, one-dimensional, or must-be, another 30% claimed indifference towards extended service hours. One reason for this surprising response might be the way the attribute was presented on the questionnaire. The question pair was presented as:

Functional: *The train runs 24 hours a day.*

Dysfunctional: *The train runs on a limited schedule (eg. 7am to 7pm).*

It is possible that these statements did not adequately captured schedule flexibility. A more appropriate question pair may have been:

Functional: *The train has evening and mid-day service.*

Dysfunctional: *The train does not have evening and mid-day service.*

Finally, based on the qualitative data phase, it was expected that information provision would be considered important to choice riders. The Kano survey found that most respondents considered information to be a must-be or one-dimensional attribute, as expected.

## *5.4 Park-and-Ride Attitude Scale Survey*

The park-and-ride attitude scale survey asked respondents about the importance of various aspects of the park-and-ride experience. The overall results are shown in Figure 5-3.

**Figure 5-3: Importance Levels for Attributes in Park-and-Ride Attitude Scale Survey**
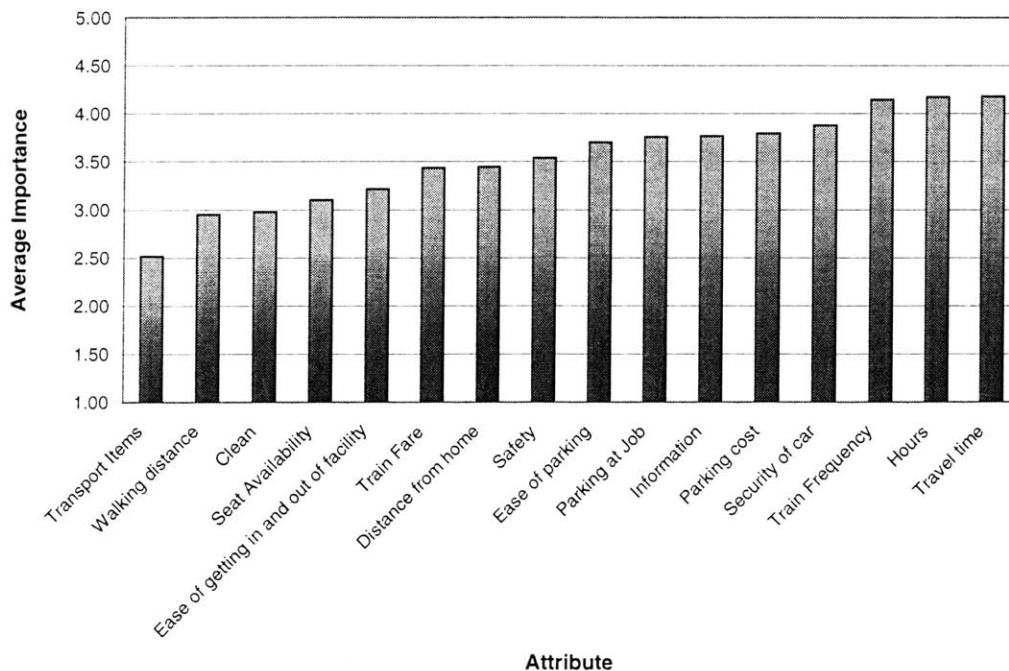


The questions on the park-and-ride attitude scale mirrored those included in the Kano survey, and the results are consistent between the two methods. The graph shows that overall travel time, train frequency, and hours of operation were considered the most important attributes. Other important attributes were parking cost, parking price at the respondent's place of work,

ease of parking at the park-and-ride facility, personal safety, security of the respondent's automobile, and information provision. The less important attributes included were walking distance from the respondent's car to the station, seat availability on the train, the ability to transport items, and cleanliness of the train.

Although the Kano survey only included one attribute for safety and security, the park-and-ride attitude scale contained two such attributes. Interestingly, the results showed that automobile security was considered slightly more important than personal safety. Although this may seem counter-intuitive, it is not necessarily unreasonable for Boston commuters. Boston is generally considered a safe city, and it is likely that people simply don't think about their personal safety. However, automobile theft is an issue in Boston and some of its surrounding cities. Therefore, it is possible that people are more concerned with the security of their automobile than with their personal safety because they feel it is more likely for their car to be stolen or vandalized than for them to be personally harmed.

## 5.5 General Commuting Attitude Scale Survey

The general commuting attitude scale survey asked respondents about the importance of various aspects of the commute to work without focusing on a specific mode. The overall results of this survey are shown in Figure 5-4.

**Figure 5-4: Importance Levels for Attributes in General Commuting Attitude Scale Survey**
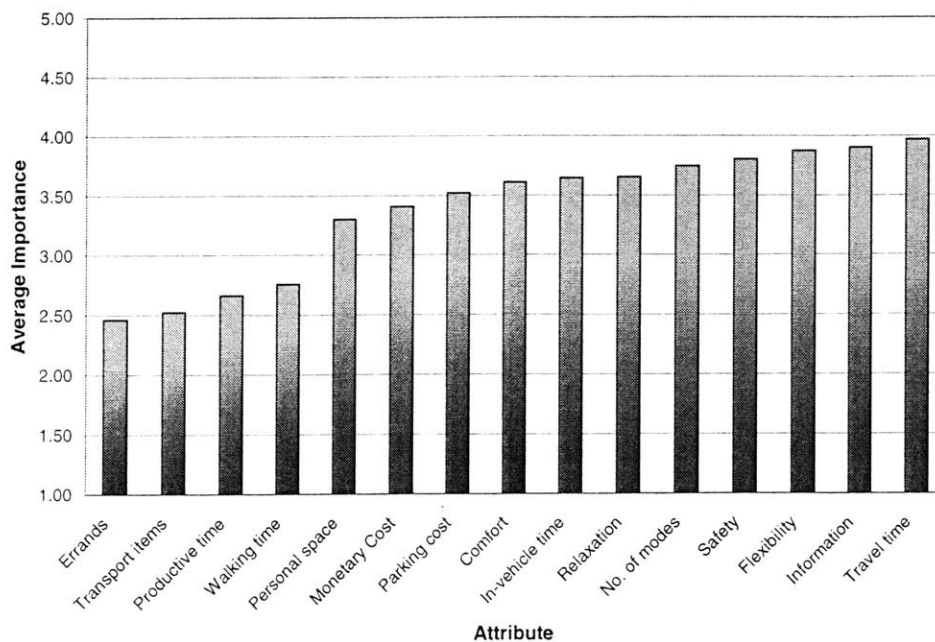
The graph shows that overall travel time was considered the most important attribute to respondents, followed by information and flexibility (defined as the ability to come and go as you please). Other important attributes were safety, the number of modes used, comfort, relaxation, and in-vehicle time. The least important attributes to commuters were the ability to do errands en-route, being able to transport items to and from work, the ability to make commuting time productive time, and the amount of time spent walking.

The survey results were largely consistent with previous findings. However, there were a couple of interesting results. The first is that respondents didn't think it was important to be able to make commuting time productive. This is surprising since one might think professionals would want to do work while traveling. In fact, this was an aspect of commuting that was raised during the qualitative research phase. However, the findings may not be unreasonable. The fact may be that most commuters simply want a relaxing, hassle-free ride to and from work. In fact, they may not even *want* to do work and may consider the commute a time to unwind rather than think about work.

Another surprising finding was the relative importance of safety indicated by the respondents. As discussed earlier, Boston is generally considered to be a safe city, and therefore personal safety is not an issue that most Bostonians think about. However, the wording of the safety question on the general commuting survey may have provoked the high importance response. The question was worded as follows:

*How important is it for you to feel safe from being mugged or assaulted during your commute?*

Clearly, this is a much stronger statement than asking about the presence of a security guard or camera. Because the question included the phrase "mugged or assaulted" it may have been a leading question, and it would have been unreasonable for anyone to consider the attribute to be unimportant.

## *5.6 Comparison of Results Across Methods*

In terms of results, the primary difference between the three market research methods is the type of information they provide about customer preferences. Attitude scale surveys provide the least detailed information. The result of this type of survey is a relative importance level for each

attribute. By classifying attributes according to the relationship between their functionality and customer satisfaction, the Kano method looks deeper into attribute importance. The Kano method also provides insight into possible market segments based on customer perceptions of the importance of various attributes. Conjoint analysis allows the agency to explore the trade-offs between specific attributes and therefore provides the most detailed information for use in making informed planning and policy decision. For example, the Boston conjoint study indicated that train frequency could be reduced from 12 trains/hour to 4 trains/hour as long as a security guard was provided at the park-and-ride facility without impacting customers' overall satisfaction with the service (assuming capacity is not a significant issue and the train does not become overly crowded). They are willing to trade train frequency for station security at the levels identified above.

The three market research methods provided comparable results in terms of attribute importance. In most cases, differences in results were due to sampling error or inappropriate questions rather than the methods themselves. The following paragraphs provide a description of the attribute importance results across methods. Because the park-and-ride attitude scale survey was more similar to the other methods than the general commuting survey, this part of the discussion focuses on the park-and-ride survey. It can be seen that the results are consistent across the methods and that the primary difference is in the level of detail provided by each method.

### 5.6.1 Travel Cost

*"The cost (of traveling) isn't that much of a factor. My company pays for almost half of my T pass, so money's not an issue. And definitely, I feel that I'm saving a lot more money. The only thing that I'm really expending greatly by taking the T is time. Everything else is a benefit. I'm saving money because every time I don't drive that's 100 miles I don't put on my car and I've taken the T over a hundred times so that's 10,000 miles I haven't put on my car."*

The conclusion about travel cost from the various surveys is that it is important to choice riders, but not as important as other attributes. This is likely due to the fact that the choice riders who participated in this survey were mid- to high-income professionals. For these people, cost may not be as great an issue as it is to lower income individuals. The attitude scale survey found travel costs to be important, but not *exceptionally* important. The Kano survey supported and extended this finding by categorizing travel cost as attractive, indicating that choice riders would be satisfied if they didn't have to pay for transit or parking, but that having to pay would not

cause them to be dissatisfied. The conjoint survey looked at specific cost levels and found changes in travel cost to greatly affect utility at extreme levels such as $10/day. However, if one looks at smaller cost changes, such as $1 or $2 per day, utility is not affected as much as a 15 minute increase in travel time, for example. Therefore, the conjoint survey also indicates that travel cost may not be the most important attribute to commuters.

## 5.6.2 Travel Time

*"As far as my perception of the (travel) alternatives, I think that the trade-off is really extreme. A couple of years ago I had to get the car fixed and my wife needed her car and I had to walk to the train station and so forth back and forth and it literally took, like, 2 hours to get here. And I almost thought that if I just started walking from Concord I would actually get here quicker!"*

All of the surveys found travel time to be very important to choice riders, a result that is not surprising since the respondents were all professionals who likely have busy schedules. The attitude scale survey found total travel time to be one of the most important attributes. This result was supported by the Kano survey, which found travel time to be largely a one-dimensional attribute, indicating that customer satisfaction is directly proportional to travel time. The Kano results also identified a segment of the sample population that appeared to be indifferent towards travel time. The conjoint survey indicated that respondents would be willing to make significant trade-offs in order to avoid increases in travel time. For example, respondents would be willing to sacrifice a security guard at the park-and-ride facility or being on a non-crowded train in order to avoid a 15-minute increase in travel time. This indicates that travel time is important to these respondents.

The surveys also included an attribute representing train frequency, an indicator of wait time. This attribute was considered to be extremely important in the focus group and in the park-and-ride attitude scale survey, and these opinions were supported by the Kano survey. The Kano results indicated that 40% of the respondents considered train frequency to be one-dimensional and another 35% considered it to be a must-be. The conjoint survey provided a more detailed result in that it showed a decrease in headway from 30 minutes to 15 minutes to be very important to respondents, but additional increases to be less important. In order to increase utility by the same amount as that caused by the 30- to 15-minute headway decrease, it would be necessary to decrease headway from 15 minutes to 5 minutes. This is a subtle point that can only be discovered through use of a conjoint survey.

The attitude scale and Kano surveys also included a couple of different elements of travel time. One of these elements was walk time, which was found to be relatively unimportant in the attitude scale survey and was classified as indifferent in the Kano survey. These results are consistent and indicate that commuters generally don't mind spending time walking. Additionally, the surveys included an attribute for the amount of time spent searching for a parking space. The attitude scale survey found this attribute to be moderately important. The Kano survey found it to be one-dimensional or must-be, indicating that it was very important. However, the Kano question specifically included a parking space search time of 15 minutes as a "long time". Because this value is rather extreme, it is not surprising that the Kano survey provoked a stronger response with respect to this attribute.

### 5.6.3 Comfort

*"My car...I have it set up so that it has, like, water and food, everything I need within reach."*

*"Actually, the boat that I take has all those things...it has bagels, it has newspapers...it's got beer. They've got a lot of different options if you want to eat. The boat has these conveniences."*

The surveys contained a number of attributes representing comfort. The first comfort attribute represented the importance of crowding on the train. For the attitude scale questionnaire, the attribute was specified as seat availability and was not considered to be very important to respondents. Unfortunately, the Kano question regarding train crowding turned out to be a double-barreled question which confused crowding with seat availability. The response to this question was mixed and therefore neither strongly supports nor contradicts the result of the attitude scale survey. The conjoint survey found crowding to be less important to respondents than other attributes such as travel time increases, which supports the findings of the attitude scale questionnaire.

The attitude scale and Kano surveys also included attributes for train cleanliness and the ability to easily transport items to and from work. With the attitude scale survey, both of these attributes were unimportant. The Kano finding that most respondents were indifferent towards the two attributes supported this result.

## 5.6.4 Accessibility

*"The other alternative is to take the commuter rail, but it doesn't really make sense because I have to travel further away from the direction I'm going to get to the commuter rail station."*

In general, accessibility to the park-and-ride facility was not as important as was thought a priori. All of the surveys specified an attribute representing the distance between the park-and-ride facility and the respondent's home. The attitude scale survey found this attribute to be only moderately important compared to other attributes. With an 80% indifferent categorization for the home to park-and-ride distance attribute, the Kano survey supported the attitude scale result. The conjoint survey also supported this result by showing the value of a 4-mile decrease in home-to-facility distance to be less than the value of all other attributes. One possible explanation for this result is that commuters don't mind driving to a park-and-ride facility as long as it's in the direction they travel to work and they don't face traffic. As shown in the quote above, this was a sentiment expressed during the focus group session.

The attitude scale and Kano surveys also included an attribute for ease of exit and entry from or to the park-and-ride facility. The attitude scale survey also found this attribute to be unimportant to respondents. Similarly, the Kano results found that 50% of the respondents were either indifferent towards this attribute or considered it attractive. However, the Kano results provided the additional information that 35% of the respondents considered the attribute to be must-be. Therefore, although many of the respondents were unconcerned with ease of entry and exit, there was a definite market segment for whom this attribute was very important.

## 5.6.5 Safety and Security

*" I didn't put a very high priority on security and lighting and all that."*

The park-and-ride attitude scale found personal security to be moderately important. What was more interesting was that this survey found security of the automobile to be more important to respondents than personal safety, indicating that Bostonians may believe it is more likely for their car to be stolen than for them to be personally injured. The Kano survey found that most respondents were either indifferent towards having a security guard at the facility or thought it was an attractive attribute. Therefore, it appears that the Kano respondents indicated less concern for safety and security than the attitude scale respondents. However, this may be explained by the way in which the attribute was presented on the two questionnaires. The Kano

survey defined the attribute as the presence or absence of security personnel, while the attitude scale survey simply presented it as "personal safety". It is possible that these two attributes were perceived differently, especially since personal *safety* is not the same as the *security* that might be offered by a security guard. This may account for the discrepancy in response between the two methods.

The conjoint study provides additional insight in terms of the trade-offs respondents were willing to make in order to have a security guard at the facility. For example, respondents would rather have a security guard at the facility than a headway decrease from 15 minutes to 10 minutes. However, for the most part, security was not as important as the other attributes. For example, avoiding a 15-minute increase in travel time was significantly more important than security personnel. Similarly, a decrease in train headway from 30 minutes to 15 minutes was more important than security. This indicates that, although there are some attributes that could be compromised in order to have a security guard, security is not considered *exceptionally* important to Bostonians.

## 5.6.6 Flexibility

*"Another thought that comes to mind is it would be useful for me if the system were designed for people who have children and have to shuttle them to and from school , to and from childcare facilities and that sort of thing. For it to be really useful in my family it would have to take into account that I'm picking up my kids, I'm dropping them off, and so forth. I don't think the system is designed and suited for that."*

The indicator of flexibility included on the surveys was whether the train ran extended service hours. For the park-and-ride attitude scale questionnaire, this attribute was defined simply as "the train's hours of operation" and was considered very important to respondents. For the Kano survey, most respondents categorized the attribute as attractive, one-dimensional, or must-be, but there was a segment of the sample population that claimed to be indifferent towards extended service hours. As explained previously, this may have been because extended hours were defined as 24 hour/day service, which may not have adequately captured schedule flexibility. Consequently, for the most part the Kano results support those of the park-and-ride attitude scale survey. The conjoint survey did not include an attribute representing flexibility.

## 5.6.7 Information

*"The subway stopped between stations, they didn't give you any information. They didn't give you any estimated time of when it would resume. And then the commuter rail left without me."*

In general, the results of the surveys supported the a priori hypothesis that information provision would be important to choice riders. The park-and-ride attitude scale questionnaire found information to be the second most important attribute. In the Kano survey, the majority of respondents categorized information as one-dimensional or must-be, also indicating that it is very important. The conjoint study did not include an attribute representing information.

## 5.6.4 Differences in Transit and Non-Transit Rider Perceptions

One important a priori expectation was that transit and non-transit riders would perceive some attributes differently. This expectation was based on the thought that commuters' choice to ride or not ride transit would depend on their perception of various travel attributes, many of which were included in these surveys. Consequently, results were tabulated separately for transit and non-transit riders and the differences between these results were tested at a 5% significance level. The general commuting attitude scale survey was the only one that found statistically significant differences in attribute perceptions between transit and non-transit riders.

When considered more carefully, the results described above are not entirely surprising. The park-and-ride attributes were presented to respondents in a *hypothetical* context; therefore, their responses didn't necessarily reflect their current mode choices. The respondents were *not* asked how they perceived current transit services with respect to the various attributes. For example, they weren't asked how they perceived transit's travel time compared to other modes. If this had been the case, one might have expected to find a difference between the two groups. However, this was not the question asked in the surveys. Rather, the question was how these individuals valued different attributes of transit, a question that is not directly linked to mode choice. In other words, the fact that transit riders choose to ride transit may not be because they value travel attributes differently; rather it may be because they perceive that transit provides a lower level of service with respect to these attributes. Furthermore, some of the non-transit riders may not be familiar with the transit options available to them. Their valuation of attributes may be similar to transit riders, but they may perceive the current transit service differently than these people.

To some extent, the results of the general commuting attitude scale questionnaire support this hypothesis. This questionnaire was different from the other three in that it asked about the

importance of the attributes in the respondents commuting decisions. Therefore, it was more closely linked to their *actual* choices than the hypothetical park-and-ride surveys. For example, with the information attribute the hypothetical park-and-ride surveys asked all respondents about information given by the transit system and therefore all respondents were thinking about the attribute in a transit context. However, with the general commuting survey the transit mode was not specified so the two groups may have perceived the questions differently based on their current experiences. Transit riders are familiar with the information or lack of information provided to them by the public transit agency. They experience first-hand the frustration of standing in a stopped train and not knowing when they will be moving again. If on the subway, they may feel trapped underground in a tunnel without any option to change their situation. Individuals who drive, on the other hand, can see out of their car windows and evaluate their commuting delay. They may even have the option of altering their route in order to circumvent the cause of delay. Therefore, lack of information is not as frustrating for these individuals since they can still maintain some level of control over the situation even if they don't know what causes is: there may not be as much uncertainty as with transit delays.

The productive commuting time attribute may have a similar explanation since the general commuting survey was more closely linked to *actual* mode choices. It is possible that many transit riders have chosen to ride transit because they want to make their commute productive, whereas individuals who drive have already made the choice not to work during their commute. Consequently, the commuters for whom productive travel time is important have already chosen to ride transit for their commute to work, so it is not surprising that transit riders assigned a higher importance to productive time than non transit riders. Again, this questionnaire is provoking responses linked more closely to current commuting choices; therefore, it is not surprising that the responses given by transit and non-transit riders were significantly different.

# Chapter 6: Recommendations for Transit Agencies and Tren Urbano

With the proper use of market research techniques, transit agencies *can* better understand their potential riders and how they can be attracted to public transportation. The purpose of this chapter is to recommend how and when transit agencies should implement the market research methods discussed in this study. The chapter aims to provide specific recommendations for Tren Urbano in terms of their market research efforts. The chapter begins by discussing each of the methods in terms of their value and appropriateness for transit agencies. The chapter then presents specific recommendations for Tren Urbano with regard to which market research methods to use and in which roles.

## *6.1 The Use of Market Research Methods at Transit Agencies*

For a public transit agency embarking on a market research effort, the choice of research method should be based on the purpose of the study and the goals of the agency. All of the methods explored in this research have the potential to be useful in a specific transit context. However, because they produce different types of information and level of detail about customer preferences, the choice of method should depend on the information desired by the agency. Additionally, the methods are all different in terms of their ease of implementation and analysis, and these issues should also be taken into account by the agency. The following paragraphs discuss some of the issues surrounding the use of the market research methods. Issues specific to each method are discussed, as well as the specific context in which they are likely to be most useful.

### 6.1.1 Qualitative Research

At the start of any market research effort, it is always important to collect qualitative data. Qualitative methods are usually easy to implement and often less costly than survey distribution and analysis. At the most basic level, qualitative techniques can help the agency decide whether additional market research is necessary. The information and opinions gathered during a qualitative study are interesting and insightful, and the agency may decide that it has gathered enough information to satisfy its market research goals. Alternatively, the agency may feel that

additional quantitative research is necessary because the focus group did not provide all of the information desired or because they don't feel these results can be generalized to the entire population of interest. If the agency decides to conduct additional studies, the information gathered during the qualitative research phase can help in developing surveys to be used in the quantitative phase. Although the agency may have a general idea of which attributes to include in a survey, the qualitative information may uncover additional attributes that the agency didn't previously consider.

The research presented in this thesis utilized two qualitative research methods: personal interviews and focus groups. Based on the experience with these methods, it appears that focus groups may be more appropriate for use by public transit agencies. First of all, focus groups allow a number of people to be interviewed at one time and therefore require less time than interviewing the respondents individually. Also, the interaction between respondents that occurs during a focus group session stimulates the flow of ideas and opinions. This interaction is especially interesting in a transit context, because it is often thought that social influences affect peoples' decision to use or not use transit. Therefore, it is suggested that transit agencies begin their market research efforts by conducting at least a couple of focus groups with members of the population of interest. This will allow them to decide whether to continue with quantitative methods and, if so, how to focus these efforts.

## 6.1.2 Attitude Scale Survey

The attitude scale is, by far, the easiest of the three quantitative methods to implement and analyze. The questionnaires are easy to develop and quick for respondents to complete. The simplicity of these questionnaires has the potential to result in a high response rate. In the Boston surveys, the attitude scale method had the highest response rate of the three methods. The data from this type of survey is straightforward, easy to analyze and understand. Therefore, attitude scales can be attractive to agencies that have little experience with market research since they are not based on a complex methodology.

The drawback to attitude scales is that they do not provide the richness of data that the other methods provide. With an attitude scale questionnaire, respondents are asked to indicate the

importance of each attribute on a given scale. One potential problem with this is that respondents may have a tendency to classify attributes as more important than they actually are. This can be seen in the Boston attitude scale surveys, where the majority of attributes received average importance scores above the neutral level. Consequently, with attitude scales it may be difficult to understand the real relative importance of the various attributes. However, it is unquestionable that this type of survey can provide at least a general indication of attribute importance.

This general understanding of attribute importance can be useful in a number of different public transit contexts, including:

- Developing new services,
- Adjusting current service,
- Identifying potential markets, and
- Developing initial ideas for new policies/policy changes.

Each of these is discussed in more detail in the following paragraphs.

In the private sector, attitude scale questionnaires are often used to gain a general understanding of the importance of attributes of a new product or service. The important attributes can then be focused on during product or service design stages. Transit agencies can also use attitude scales for this purpose. For example, if a transit agency were considering extending its commuter rail service (or re-introducing service such as the Old Colony in Massachusetts), it would be instructive to know that the commuters who live in that service area consider parking availability at the station to be very important. This would indicate that the agency should consider building park-and-ride lots at the stations. If the agency were to do an attitude scale survey for different attributes of these park-and-ride lots, it may discover that personal security is of great concern to potential riders, and it might therefore focus efforts on potential security measures for these facilities. Basically, the attitude scale questionnaire highlights aspects of the new service that are important to potential customers and can therefore focus the design and planning process on these aspects.

Attitude scales can also provide valuable information for transit agencies in terms of adjustments to existing service. By understanding which service attributes are important to customers or potential customers, agencies can adjust their existing services to better meet the needs and expectations of these individuals. For example, if an agency were to distribute an attitude scale survey to non-riders, the agency might discover that vehicle cleanliness is very important to these people. Based on this finding it may choose to alter its train cleaning procedures. Similarly, the agency may discover that train frequency is an important attribute to a group of potential customers and may consider altering service frequency in an attempt to attract these potential customers. Just as the attitude scale provides areas of focus for the design and planning of a new service, it can provide areas of focus for changing existing services.

The previous discussion highlights the fact that knowing how potential customers rate various attributes of the transit service allows the agency to focus on the critical attributes. In this way, the agency may be able to identify potential markets and better understand how to target these markets. For example, the survey may show that the people in a suburban community place high importance on being able to come home from work in the middle of the day (perhaps many of them work part-time or on flex-schedules). In other words, there is a market for mid-day commuter rail service in this community and the agency has identified a potential market that it may attempt to attract.

Finally, just as attitude scales can help an agency identify where to focus efforts for service development and adjustment, it can also identify areas in which the agency might look to change or implement new policies. For example, an attitude scale survey might indicate that the cost of parking is very important to potential park-and-ride users. Based on this information, it may choose to explore reduced parking prices at its park-and-ride facilities. In fact, it may decide to eliminate parking fees altogether. The point is that attitude scales can identify policies such as the park-and-ride fees that might be re-evaluated to match better with current or potential customer needs and perceptions.

## 6.1.3 Kano Survey

Based on the results of the Boston surveys, it is questionable whether the Kano method really adds value to the information provided by an attitude scale. By classifying attributes according to the relationship between their functionality and customer satisfaction, the Kano method attempts to look deeper into attribute importance. For example, an attitude scale might indicate that a certain attribute is important to respondents. Kano analysis goes a step further and classifies this attribute according to the relationship between its functionality and customer satisfaction. The attribute might be classified as attractive, an indication that customers are satisfied when the attribute is present, but not dissatisfied when it is not present. On the other hand, it might be classified as must-be, indicating that customers expect it, but that its existence doesn't result in increased customer satisfaction. In both these cases, the attribute is "important", but is *perceived* differently by the customer.

The issue is whether this distinction between different attribute perceptions warrants the use of a Kano survey over an attitude scale survey. Do transit agencies really care about these differences in perception? In terms of the attitude scale uses described in the previous section (eg. developing new services, exploring new policies, etc.), the Kano method doesn't provide enough additional information to warrant its use over attitude scales. The Kano method is complex and can be difficult to understand. The results can be confusing and difficult to interpret. Because two questions must be included in the survey, the number of attributes that can be reasonably included may be limited. From a respondent's perspective, the hedonic scale and functional/dysfunctional question pairs can be confusing or misunderstood. Clearly the Kano method has methodological and implementation issues that make it much more difficult to use than attitude scales.

Furthermore, the results from the Boston surveys indicated that, in many cases, the two methods provided very similar information about attribute importance. For example, the attitude scale survey found parking cost at the park-and-ride facility to be relatively important to commuters. The Kano survey took this further by classifying parking cost as an attractive attribute. However, the attractive categorization doesn't change how parking price should be viewed from

---

a policy perspective. The fact is that it is still considered important to commuters and therefore it should be taken into consideration when a parking fee is being determined for the facility.

The Boston Kano survey also provided insight into possible market segments based on customer perceptions of the importance of various attributes. For example, the Kano survey found that while many respondents considered being in a non-crowded train attractive, many others were indifferent towards this attribute. These results indicate that there may be different market segments based on the customers' attitudes towards train crowding. In fact, a recent TCRP report indicates that "attitudes toward a specific service category is a frequently used type of basis variable for market segmentation" (TCRP Report 37, 1998). However, it is not clear that this information couldn't have been obtained from the attitude scale survey. Because the analysis of this survey was done using *average* importance rankings, this type of market segmentation was lost in the data analysis process. If the analysis has used frequency of response rather than averages, the market segments that emerged in the Kano analysis may also have emerged in the attitude scale analysis. Therefore, there is no clear indication that the Kano method offers the advantage of market segmentation over attitude scales.

The area in which the Kano method may be more useful than attitude scales is in developing marketing strategies for transit agencies. In trying to persuade potential customers to use a service, it may be useful to focus on the attributes that are considered attractive to these customers. Although a transit agency may be tempted to market a service based on attributes that customers expect to exist (must-be attributes), it may really be the attractive attributes that will lure new customers. It doesn't make sense to market the service on attributes that the customer expects from the service. Rather, it is more effective to point out attributes that distinguish it from other transportation choices. This means the agency should not focus on must-be attributes. However, these attributes are expected and the agency must ensure that they are being provided if they want people to actually use the service. These attributes shouldn't necessarily be excluded from marketing campaigns, but for the campaigns to truly be successful, it is more useful to focus on attractive or one-dimensional attributes since these are more effective in luring potential customers to the service.

For example, in the Boston Kano survey, being able to find parking easily at the park-and-ride facility was considered by the majority of respondents to be a must-be attribute. Commuters simply expected to be able to find parking easily if they are to consider using the service. However, having free parking at the facility was considered attractive, indicating that commuters didn't think it was necessary, but that it would be a nice advantage to have free parking. Consequently, it might make sense for a park-and-ride marketing strategy to focus on the provision of free parking at the facility rather than on the ease of finding a parking space. This is not to say that the ease of finding parking shouldn't be mentioned at all in the campaign. The point is that the commuter expects that there is parking available (and the agency should ensure that there is), but having free parking is considered an added bonus and may therefore be a more influential attribute. The point is that although Kano categorizations may not provide additional useful information in terms of developing or changing policies and services, they *can* provide useful guidance for the development of effective transit marketing strategies.

## 6.1.4 Conjoint Survey

Conjoint analysis provides information at a much more detailed level than the other methods. This type of analysis allows the agency to explore the trade-offs between various attributes in order to make more informed planning and policy decisions. For example, an agency might have done an attitude scale study and found that both inexpensive parking and the existence of security personnel were important to customers. However, because the agency has limited financial resources, it may not be able to provide both inexpensive parking *and* a security guard in the park-and-ride lot. A conjoint study can help the agency decide which of these it should provide. By forcing customers to make trade-offs among the various attributes, the agency can gain a better understanding of how much customers value a guard. For example, the study might find that increasing the parking cost by $2 reduces utility by less than the increase in utility caused by providing a security guard. In this case, the agency might decide that charging a $2 parking fee would be an appropriate course of action in order to offset the cost of hiring a security guard for the facility.

From this example, it can be seen that conjoint analysis is most useful for specific planning and policy decisions at a transit agency. It helps an agency understand the attribute trade-offs that

customers are willing to make and this information can be used to inform policy decisions. Information at this level of detail cannot be obtained from any of the other market research methods. However, because of the nature of the method, it is necessary to have a small set of attributes and levels of each defined before implementing a conjoint study. By the time an agency decides to implement this type of study, it should already have limited the number of attributes it is exploring and should be at the point of making specific attribute *level* decisions. Therefore, the fact that conjoint analysis provides more detailed information does not mean that the other methods are useless. On the contrary, these methods can help the agency make decisions that don't require the level of detail resulting from conjoint analysis and can also help an agency decide which attributes to include in a conjoint survey when more detailed decisions are required.

Although the level of detail provided by conjoint analysis can be extremely useful for transit agencies, there is a definite trade-off in terms of method complexity. Conjoint surveys can be difficult to develop for a couple of reasons:

- The agency must select a limited number of attributes to include in the survey
- The agency must select appropriate attribute levels

Additionally, conjoint surveys are time-consuming and difficult for respondents to complete, which may result in low response rates and may require less efficient and more complicated methods of distribution. The low response rate in the Boston implementation illustrates these points. However, the fact remains that conjoint analysis provides a depth of information that cannot be obtained with the other market research methods. To say that transit agencies should not consider the use of conjoint analysis because of its complexity ignores the value of information the method can provide. Rather, the suggestion to transit agencies is that they only use conjoint analysis when they are at the point of making specific attribute level planning and policy decisions in which the necessary information cannot be obtained through other means.

## *6.2 Recommendations for Tren Urbano*

San Juan, Puerto Rico is currently in the construction phase of a heavy rail system, Tren Urbano. The initial phase is a single line 17 km in length containing at-grade, below-grade, and above-grade segments. Tren Urbano is the first heavy rail system built in Puerto Rico, and the hope is

hope is that it will help alleviate some of the congestion problems that plague this rapidly growing metropolitan area. Currently, the public transit system in San Juan consists of buses and públicos, informal jitney services that operate in a loosely regulated environment. The Tren Urbano system is expected to begin revenue service in July 2002.

To date, there has been little market research conducted for Tren Urbano (see Section 1.1.2), and there are no concrete plans for future research efforts. However, as shown in this thesis, market research can be useful for transit agencies in terms of understanding their potential customers and providing services that meet their needs and expectations. In San Juan, one of the goals for Tren Urbano is to provide a transportation alternative for people who currently use the private automobile. In order to successfully meet this goal, it is important to better understand these potential choice riders. The following paragraphs describe a preliminary market research plan for Tren Urbano targeted towards decisions that are critical at this point in time. The recommendations are based on the research that has been conducted in this thesis. The section begins with a discussion of the relevant characteristics of Tren Urbano in the context of market research on potential choice riders.

## 6.2.1 Characteristics of Tren Urbano

Tren Urbano has a number of characteristics that are relevant in terms of future market research:

> Currently, there is no rail system in San Juan,

> The public transit that currently exists has historically been inefficient and ineffective,

> The current public transit system has few choice riders,

> Tren Urbano will be operating in an extremely political environment,

> The Tren Urbano service will be operated under contract by a Siemens-led consortium,

> Tren Urbano will be operating in a multi-transit agency environment,

> The system is not yet in operation, so there is some room for change.

Each of these characteristics is described in more detail below, specifically in the context of their implications for market research.

**Currently, there is no rail system in San Juan.** Unlike Boston, many people in San Juan have never seen a rail system. When surveys were conducted in the Boston area, it was not necessary to describe the transit system because everyone is familiar with it at some level, even if they are not current riders. However, when market research is conducted for Tren Urbano, it will be necessary to describe the system to respondents since their knowledge of the system will likely be limited to information that has been given to the public. Therefore, it is important to structure the market research tools in a way that doesn't bias the results. In other words, Boston respondents were able to answer questions about transit attributes based on their knowledge of the current system. Respondents in any Tren Urbano study must base their responses on the information they are given about the system; therefore, it is important to provide impartial information so as not to bias the results of the market research study.

**The public transit that currently exists has historically been inefficient and ineffective.** For Tren Urbano to be successful it will have to differentiate its service from the existing transit services in San Juan. This differentiation must be in *perception* as well as reality. In other words, not only does the system have to operate more efficiently than the other transit services, but people also have to perceive that the system is different. Market research can be an important part of helping Tren Urbano achieve this goal. It is also important that market research studies clearly differentiate Tren Urbano from these existing services so that respondents understand it will operate at a higher level of service.

**The current public transit system has few choice riders.** Most of the respondents in a choice rider survey will not be familiar first hand with transit service characteristics. This is an important fact to take into consideration in the design of a market research tool. Specifically, qualitative tools such as focus groups can help the agency understand their respondents' extent of knowledge about public transit services. Additionally, the fact that there are few choice riders makes it impossible to do any revealed preference research. The Boston MBTA system has a significant number of choice riders, and it would be possible to conduct a study in which choice riders are compared to non-riders to try and determine the characteristics of the system that are influencing these choice riders. This type of study is impossible to conduct in San Juan since

there are few, if any, choice riders; therefore, most pre-service market research will have to be conducted using stated preference techniques.

**Tren Urbano will be operating in an extremely political environment.** In San Juan, decisions are often made on a political basis rather than through a technical process. For example, a $1 fare on Tren Urbano was determined politically rather than with the explicit use of information about fare elasticity or other market conditions. Therefore, it is important that market research be conducted well in advance of the decision-making process. In this way, the agency can be better armed to inform these decisions even if, in the end, they are made at a political level.

**The Tren Urbano service will be operated under contract by a Siemens-led consortium** and this contract will include performance standards and incentive/penalty clauses. Therefore, there is the temptation to think it is not important to understand the importance of service characteristics that will be covered by these performance standards. However, while care has been taken in designing these contracts, the level of enforcement of incentives and penalties remains to be seen. It is therefore important that the agency has a good idea of what is important to customers so that it knows which performance measures to pay particular attention to. Similarly, there may be instances when it is not worth jeopardizing the agency's relationship with a contractor in order to strongly enforce a penalty on an issue that is unimportant to customers.

Furthermore, the relative importance of various service attributes may be of interest to the contract operator in trying to meet their service goals. One would expect that the performance standards and incentive/penalty clauses have been structured to reflect service attributes that Tren Urbano believes to be important to potential customers. Consequently, the contractor's goals should parallel the agency's goals in terms of service quality. In fact, the contract includes incentives for the operator if ridership exceeds projected levels (Siemens Test Track Turnkey Contract, Operations and Maintenance Book, Article 4.5). Therefore, contractors may be interested in better understanding service attributes important to customers.

**Tren Urbano will be operating in a multi-transit agency environment.** These multiple transit agencies (Tren Urbano, Metrobus, AMA, públicos) will operate in overlapping districts and, currently, there is no formalized plan for coordinated decision-making. However, in the future, there will certainly be a need for these agencies to coordinate various aspects of their services. Market research can indicate to Tren Urbano which characteristics of the system are important to discuss with AMA and Metrobus. For example, if market research were to indicate that riders were concerned about schedule coordination for the different services, but were indifferent towards free transfers, it may be more constructive for Tren Urbano to focus its efforts on schedule coordination with the other agencies than with arranging free transfers. Additionally, because Tren Urbano is the new service and is attempting to provide a better level of service than the other agencies, it can be the one to "carry the torch" with respect to market research. In other words, if Tren Urbano is able to implement a successful market research strategy that helps them meet choice rider needs and therefore attracts a large number of choice riders, the other agencies may be influenced to alter their service in order to attract choice riders. Tren Urbano has the potential to change the perception of public transit in San Juan, and its success at accomplishing this may greatly affect the other agencies. It is important that Tren Urbano make a strong effort to meet potential choice rider needs and expectations so that these people will use the service when it begins operation.

**The system is not yet in operation, so there is some room for change.** The final point is that, although much of the service planning and contracting has been done, the fact remains that the service is not yet operating. Therefore, there is still some degree of flexibility to implement changes based on the outcome of market research studies. On other systems that are in operation, implementing such changes may require disruption of current service. Because Tren Urbano is still in the construction phase, disruption of service is not an issue and, although there may be institutional constraints to the amount of change that can be implemented, the opportunity still remains to make at least minor service adjustments.

## 6.2.2 Market Research Recommendations for Tren Urbano

Based on the current status of the Tren Urbano project and the lack of significant market research work to date, the following two market research methods are recommended for implementation in San Juan so that potential riders can be better understood:

♦ Focus groups

♦ The Kano method

The reasons for recommending these methods, the purposes for which they should be used in San Juan, and some implementation/distribution suggestions are described in the following paragraphs. Specifically, the recommendations focus on three aspects of the Tren Urbano system that are both of interest at the current time and may be important in attracting choice riders:

♦ The Plaza idea

♦ Fare structure and policy decisions

♦ Marketing efforts

Naturally, market research efforts could extend beyond these three issues. However, they were chosen because they are especially promising in terms of the importance of market research support. The section also describes how conjoint analysis could be used in the future to make decisions regarding specific trade-offs between different attributes.

*Focus Groups*

The use of focus groups to explore the perceptions of choice riders was the focus of Hoffman's thesis. In this study, four segments of the market for transit services in San Juan were targeted: secretaries and office workers from Hato Rey, students, and medical workers from Centro Médico. The research found service reliability and "composure" (the ability of a transit user to maintain personal neatness and comfort) to be important to these market segments. Additionally, the study noted the importance of peer or reference groups as well as the implication of culturally-specific social orientation (Hoffman, 1996). This research is an excellent start towards understanding potential choice riders and how they can be influenced to ride transit. It is also a strong indication that focus groups conducted in San Juan can provide valuable information about customer preferences.

The focus groups conducted by Hoffman provide valuable information about:

- why people in San Juan make the transportation choices they make,
- how they view public transportation, and
- what might be done to convince them to use transit.

However, they did not look at specific aspects of Tren Urbano or its related services (such as fare structure issues or aspects of park-and-ride). This is not surprising since the research was conducted more than 4 years ago and, at that time, these issues were not of immediate concern. However, as Opening Day draws near, it will become increasingly important to focus on such issues and focus groups can provide valuable information that can support more informed decision-making.

The advantages of using focus groups have been described earlier in this thesis. They are a way of gathering in-depth information about customer thoughts and perceptions at a relatively low cost. They are especially interesting for Tren Urbano because of the personal interaction that occurs during the sessions. Hoffman's thesis highlighted the importance of peer influence in San Juan, and it is therefore possible that interviewing people in a group setting provokes a more honest response than individual interviews or surveys. For these reasons, and because focus groups have proven to be effective in San Juan in the past, it is recommended that they be used again, but to explore more specific aspects of the Tren Urbano system.

The plaza idea being considered in San Juan is an especially interesting candidate for focus groups. The focus group conducted at MIT focused specifically on the idea of remote parking. Although other aspects of commuting and public transit were discussed, the key purpose of the session was to see what commuters thought about remote parking facilities such as plazas. The general consensus from this group was that remote parking (plazas) would not be an effective way to attract choice riders. Most participants indicated that the additional mode and transfer required with the use of this facility would strongly discourage them from using this service. If this were a service being considered for Boston commuters and additional focus groups had been conducted with similar results, the recommendation would be to re-evaluate the remote parking idea based on the reaction of the focus group.

However, because people in San Juan are different from Bostonians, it is possible that they will feel differently about the plaza idea. Therefore, it would be useful to conduct a few focus groups in San Juan that focus specifically on this idea in order to evaluate whether it is reasonable to pursue it further. In fact, questions similar to those included in the MIT focus group could be used (these are shown in Appendix B). If the focus groups indicate that plazas are an unpopular idea and commuters would never consider using them, it may not be worth pursuing the idea further. Of course, the focus groups could also include discussion of other aspects of Tren Urbano. For example, there may be questions about different pass programs the agency is considering or specific attributes of park-and-ride lots that are especially important to potential choice riders. Focus groups might also be used to test potential marketing campaigns (this is often done in the private sector), or to explore the best distribution methods for Tren Urbano information. The point is that, although focus groups are often used to gain a general understanding of customer perceptions, they can also be used to explore specific aspects of a service and Tren Urbano should consider their use for this purpose.

Hoffman's technique of conducting the focus groups at employer sights appeared to be successful and is recommended for future focus group implementations. As noted by Hoffman, conducting focus groups at these locations allows Tren Urbano to target the natural market for new transit service. The potential choice riders most likely to use Tren Urbano are those that work at companies along the alignment and it is recommended to include these individuals in focus group discussions. Also, targeting specific employer sites produces homogeneous groups of participants, which is desirable because "people who share relevant characteristics or experiences are more likely to be able to sustain a viable discussion; their base of shared meaning is that much broader" (Krueger, 1994).

*The Kano Method*

Marketing issues are extremely important for Tren Urbano since they have not yet been given serious consideration but must be considered prior to Opening Day. The information obtained from an attitude scale is inherently obtained through Kano analysis (this is essentially just the functional part of Kano analysis), and since Kano data can also help with marketing decisions it

is recommended that this method be used to explore potential choice rider perceptions of various service attributes.

As discussed earlier, the Kano method and attitude scales provide information about the relative importance of various service attributes. The general recommendations for transit agencies highlighted the fact that, in terms of planning and policy design issues, the Kano method does not provide additional useful information over that obtained with an attitude scale. The flip side of this is that the Kano method provides a level of information at least as detailed as attitude scales. Additionally, Kano analysis can provide valuable information for transit marketing decisions. For a transit agency that is not using these methods for marketing decisions, attitude scales would be more appropriate because of their simplicity. However, for Tren Urbano it may make sense to use the Kano method.

Kano analysis could be used for any of the three Tren Urbano issues mentioned previously, namely exploration of the plaza idea, fare structure and policy decisions, and marketing decisions. In terms of the plaza idea, the previous section recommended that this concept first be tested on focus groups in order to evaluate its validity and desirability. However, if the focus groups indicate that plazas *are* a good idea, it will be necessary to delve more deeply into their specific attributes so that design decisions can be made. Kano analysis is a logical next step for understanding which plaza attributes to focus on. In fact, the Kano survey used in the Boston implementation provides a starting point for a survey focused on plaza attributes. The information gathered with this survey would give planners and engineers an idea of what customers expect in a remote parking facility.

For example, although the Boston survey found safety and security to be unimportant, a survey conducted in San Juan might find these attributes to be very important. Consequently, planning of the plaza facility would definitely need to look at alternatives for providing safety and security measures. Similarly, the research might indicate that, unlike Boston commuters, people in San Juan are not willing to walk very far to get from their car to the facility (this is a possible outcome because of the climate differences between the two cities). Based on this information, the plaza design would want to focus on minimizing walking distance. These examples illustrate

the importance of understanding customer priorities and preferences when designing a new service or facility. The Kano method can provide this information for new services and facilities being considered in San Juan.

Much like the Kano park-and-ride survey in Boston, a survey based on the plaza idea in San Juan would not have to be focused solely on the facility itself. The questionnaire should also include other elements of the transit experience that might affect the customer's choice to use or not use transit. For example, although the frequency of Tren Urbano is not a function of the plaza operation, it may affect whether people choose to utilize the service. Therefore, it might be important to include in the questionnaire. By including such questions, the survey will provide information for the development of marketing strategies aimed at choice riders. For example, if the Kano study finds that free parking at the plaza is an "attractive" feature, a marketing campaign might focus on this aspect of the service. Similarly, a Kano analysis might indicate that comfortable seats are "attractive" (Tren Urbano will have extra-wide, cushioned seats), so marketing strategies might want to focus on that attribute. The categorization of attributes can be very useful for this purpose and is an advantage of using the Kano method rather than attitude scales. It is the primary reason Kano analysis has been proposed for Tren Urbano rather than the use of a simpler market research method.

The previous paragraph pointed to the fact that a variety of attributes could be included in the Kano survey. One aspect of Tren Urbano that has not been given much attention to date, but that is extremely important is fare structure and policy. The fare level decision for Opening Day has been made: the Tren Urbano fare is going to be $1. However, there are many other aspects of the fare system for which decisions must be made. For example, will there be free transfers between Tren Urbano and the buses? Will there be discounted multi-ride passes? Will there be peak-period pricing? The importance of these issues to potential choice riders can be measured with the Kano survey. The survey may include questions about the importance of free transfers or multi-ride passes. If they are found to be important to respondents, they deserve further consideration in fare policy decisions. Of course, this discussion can be expanded to other policy decisions, for which attributes could also be included in the Kano study.

In terms of implementation, there is one point that needs to be clearly highlighted in terms of Kano analysis, and that is the hedonic scale formulation. This type of scale is different from what respondents are accustomed to and may result in confusion or misunderstanding. Therefore, it is important to pay close attention to the wording of this scale. This is especially important if the Boston Kano questionnaire is used as a model for a survey in San Juan. Although the scale used in this survey worked well in English, there is no guarantee that a direct translation into Spanish will result in the formulation of an effective scale. Therefore, it is crucial to test the wording with native Spanish speakers to ensure its appropriateness and clarity.

As with the focus groups, it is recommended that Tren Urbano attempt to distribute the surveys at employer sites along the Tren Urbano alignment. In addition to allowing the agency to target people who are most likely to use the new service, this strategy may also encourage employers to provide subsidized transit passes or implement other policies that would promote employee transit use. In terms of gaining employer participation, it would be necessary to highlight some of the benefits of these types of programs, such as the decrease in parking supply that would be required by the employer. By involving employers in the market research process early on, they may be more inclined to recognize the benefits of encouraging transit use and will understand that the agency is willing to work with them in trying to cater to their employees' needs and expectations.

In summary, because Tren Urbano is currently in the position of being concerned with both planning and policy decisions as well as marketing decisions, the Kano method is recommended for use in San Juan to explore the importance of various system attributes to potential choice riders. The functional portion of the Kano survey provides the same information as attitude scales for the purpose of focusing planning and policy decisions. The dysfunctional portion allows the agency to gain a better understanding of which attributes to include in marketing strategies. Therefore, it is believed that the value added from Kano analysis warrants its use over simpler market research methods.

## Future Use of Conjoint Analysis

Because of the complexity of conjoint analysis and Tren Urbano's inexperience with market research, this method was not recommended for initial application by the agency. However, as Tren Urbano moves closer to making solid policy decisions, and becomes more comfortable with market research techniques, conjoint analysis may be a method to consider for more focused decisions than those described in the previous paragraphs. For example, once the agency has determined which plaza attributes to focus its efforts on, it may be at the point of making specific planning or policy decisions, such as:

♦ Should parking be provided free of charge or should security personnel be provided?

♦ If parking is not free, should it be $1 or $2?

♦ Should security personnel be hired or should electronic surveillance be installed?

In the first decision, Tren Urbano wishes to know whether customers would prefer to have free parking or security personnel. The agency is faced with a budgetary constraint and cannot provide security personnel without developing a new source of revenue. Parking fees have been identified as one potential source of revenue and the agency is trying to determine whether customers would rather have free parking or station security. By employing the conjoint technique, the agency can determine the customer's preference for these attributes in the context of trading-off between them.


The second decision involves the determination of the appropriate fee for parking at the facility. Because the decision involves specific parking fee levels, conjoint analysis is well suited to this situation. Through application of conjoint analysis, Tren Urbano planners could determine the parking fee that balances the agency's need for revenue with the customer's willingness to pay and use the service. The construction of a part-worth utility function for parking cost illustrates the levels at which users' perceptions of parking fees change.


The final decision illustrates the situation in which the agency has determined that security is a must-be attribute through the Kano analysis. Conjoint analysis can be used to determine the best method for providing the station security in terms of user perception (there are, of course, other

measures of effectiveness and cost trade-offs that must be considered in a decision such as this one). Through conjoint analysis, the agency can evaluate its customers' perceptions of two different means of providing an attribute. While it is unclear whether one of these means is more effective in terms of actual crime prevention, the conjoint method will help the agency understand which is *perceived* to be more effective.

# Chapter 7: Summary and Recommendations for Future Research

The first section of this chapter provides a brief summary of the research. The chapter then continues with a discussion of the general research findings and recommendations. Next, the general recommendations for market research on Tren Urbano are presented. The chapter concludes by listing a number of areas in which the research presented in the thesis might be extended in the future.

## 7.1 Summary of Research

In this thesis, three market research methods were selected and evaluated in terms of their potential in helping transit agencies understand choice riders:

- Attitude Scale Surveys
- The Kano Method
- Conjoint Analysis

The methods were tested by conducting surveys focused on park-and-ride at companies in Boston. Two qualitative research methods provided input for the questionnaires in terms of appropriate content and wording:

- Personal interviews
- Focus groups

All of the methods were evaluated in terms of the results provided and their ease of implementation in a public transit context.

Conjoint analysis is a market research technique in which the respondent is asked to rank a number of alternatives based on his/her preference. It is a stated preference technique, meaning that it is not based on actual behavior, but rather on hypothetical alternatives. Each alternative is a different combination of attributes and levels, and the respondent is forced to make trade-offs between different attributes. The result of a conjoint analysis is a set of part-worth utilities, which represent the contribution of each attribute level to the respondent's overall utility.

The Kano method results in a categorization of each service attribute according to the relationship between its functionality and customer satisfaction. These categorizations can be used to determine which attributes are considered to be a requirement to customers, which ones are simply attractive but not required, and which attributes customers are indifferent about. The results of a Kano study can be useful both for planning and marketing purposes.

The attitude scale is the simplest means of eliciting customer preference information. The customer is given a list of attributes and asked to indicate each attribute's importance. The overall relative importance of each attribute can then be found by averaging these responses.

The Boston implementation provided some interesting insights, both in terms of the importance of various park-and-ride attributes to choice riders and the implications of using the various methods at transit agencies. The following section highlights the survey results and the general recommendations for the use of these methods to understand choice riders.

## 7.2 Survey Results

In general, the results of the various surveys proved to be consistent across the three quantitative research methods tested. Travel time was found to be one of the most important attributes to choice riders, a result that was not surprising considering that all of the respondents were mid- to high-income professionals who likely have busy schedules. Consequently, it was also not surprising that travel cost was considered only moderately important to these respondents (low travel cost was considered to be attractive rather than a requirement) and that respondents placed a high value on having information about delays and changes in service. Another important attribute to the both the survey respondents and the focus group participants was schedule flexibility. For many commuters, it is important that their mode of transportation be adaptable to their varying schedules. The level of comfort on the train, represented by train crowding, cleanliness, and the ability to transport items, was not considered very important to respondents. This was somewhat surprising since the focus group had indicated this attribute to be a key factor in the participants' mode choice decisions. Since Boston is considered a fairly safe city, it was not surprising that respondents didn't place a high priority on personal security. However, they were somewhat concerned with the security of their automobile at the park-and-ride facility,

possibly indicating that they consider it more likely for their car to be stolen than for them to be personally harmed.

For most of the surveys, there was no significant difference in attribute perception between transit riders and non-transit riders. The only survey that found such differences was the general commuting attitude scale survey. This result not entirely surprising since the park-and-ride surveys were based on hypothetical questions and were therefore not closely linked to actual mode choices, whereas the general commuting questionnaire asked about the importance of various attributes in the respondents' commuting choices. In other words, the park-and-ride surveys did not ask how respondents' perceived current transit service; rather, they asked about the importance of various transit attributes irrespective of their current levels on the MBTA. If they had been asked whether MBTA services meet their needs with respect to these attributes, one would have expected to see a difference between the two groups.

## 7.3 Methodological Findings

For a public transit agency considering the use of market research, the choice of research method should primarily depend on the purpose of the study and the goals of the agency. All three of the methods explored in this research have the potential to be useful for transit agencies. However, because they all produce different types of information about customer preferences, the choice of method will depend on what type of information is desired by the agency.

At the start of any market research effort, it is always useful for a transit agency to collect qualitative data. At the very least, this information will indicate whether the agency needs to continue to the quantitative data collection phase. Based on the qualitative data, the agency may decide that they either have enough information to meet their market research goal, or that the idea they were exploring is not worth further study. Based on the Boston experience with two different qualitative data collection methods, it is recommended that transit agencies use focus groups rather than personal interviews. The interaction between respondents that occurs during a focus group session stimulates the flow of ideas and opinions and is especially interesting since the choice to ride transit or not is often thought to be susceptible to peer influence. Focus groups are also more economical, in that they collect data from multiple respondents simultaneously.

The attitude scale is the easiest of the three quantitative methods to implement and analyze and may result in the highest response rate, as evidenced in the Boston implementation. Therefore, this method is promising for agencies that have little experience with market research or have few resources available for market research purposes. The drawback of this method is that the results are not as detailed as those provided with other methods. However, there are a number of instances when transit agencies may not need extremely detailed information, such as:

- Developing new services
- Adjusting current service
- Identifying potential markets
- Developing initial ideas for new policies/policy changes

For these purposes, attitude scales can provide a general idea of attributes that the agency should be focusing on because they are important to customers.

For new services that are in their preliminary design stage, attitude scales can provide information about attributes of the service that should receive the most attention during design. By indicating the relative importance of current service attributes, this type of survey can also allow the agency to adjust existing services to better meet the expectations of its customers. Attitude scales can also help identify potential markets by helping the agency understand which attributes their potential customers value. Finally, this survey method can help agencies identify current policies that may need adjustment or new policies that may be explored to try to attract choice riders.

In terms of the research purposes described in the previous paragraph, the Kano method adds little value to the results obtained by attitude scales. Therefore, if an agency is conducting market research solely for the purposes listed above, the attitude scale is recommended because it is much easier to implement and understand, both from the agency's point of view and the respondent's. However, the Kano method has the advantage of being very useful in developing marketing strategies. The Kano categorizations can indicate which service attributes are attractive to potential customers and which are considered requirements. Although it is necessary for the agency to ensure that it is providing the required attributes, it may be more

effective to base marketing strategies on the attractive attributes since those are the ones that differentiate transit from other transportation modes. Consequently, if an agency wishes to use the results of a market research study to help in development of marketing campaigns, it is recommended that they consider using the Kano method.

Conjoint analysis allows the agency to understand the trade-offs between various attributes so more informed planning and policy decisions can be made. Conjoint results can help agencies make decisions at a very detailed level, such as deciding how much it can increase parking costs in order to be able to provide security guards at its park-and-ride facilities. Conjoint analysis would provide information about how much customers are willing to pay for a security guard, and this information could help the agency make this decision. The nature of conjoint analysis requires that a small number of attributes be included and that specific levels be determined for these attributes. Therefore, this type of survey can only be used when agencies are at the point of making specific attribute level decisions. Because conjoint analysis is complex and can be difficult to implement, it is only recommended for agencies that are making the type of decision described above and that cannot obtain the needed information from other market research methods.

## *7.4 Recommendations for Tren Urbano*

To date, there has been very little market research conducted for Tren Urbano, and there is no immediate plan for implementing a market research strategy. If the agency intends to attract choice riders, it is essential to better understand these potential customers so that services and policies can be implemented that meet choice riders' needs and expectations. Additionally, it is important to understand these potential customers so that marketing efforts can focus on attributes that are influential to their mode choice decisions. The thesis recommends a preliminary market research plan for Tren Urbano based on their current situation and the results of the Boston implementations. The market research strategy is focused on issues that are critical to the agency at this point in time.

Every transit agency has distinguishing characteristics that make it different from other agencies. Some of Tren Urbano's characteristics have important implications for market research:

- Currently, there is no rail system in San Juan,

- The public transit that currently exists has historically been inefficient and ineffective,

- The current public transit system has few choice riders,

- Tren Urbano will be operating in an extremely political environment,

- The Tren Urbano service will be operated under contract,

- Tren Urbano will be operating in a multi-transit agency environment,

- The system is not yet in operation, so there is some flexibility for change.

Because there is currently no rail system in San Juan, surveys conducted prior to the opening of the system must include a description of Tren Urbano. It is important that this description be impartial so as not to influence or bias the responses. Also, because the current transit system has few choice riders, it will be necessary to understand the extent of potential choice riders' knowledge of public transit characteristics and to describe these characteristics to them in an impartial manner. Additionally, the experience that these people have had with transit is based on a system that has historically been inefficient and ineffective, so the surveys must highlight the fact that Tren Urbano will be different.


Because Tren Urbano will be operating in an extremely political environment, it is important that market research be pre-emptive so that it can inform political decisions. The fact that Tren Urbano will be a contractually operated service does not mean market research is unimportant. It is still important for the agency to understand which attributes are valued more highly by customers so that it can effectively enforce incentives and penalties in the contracts. Additionally, the information gathered through market research techniques may be useful in helping contractors attain their goals in order to meet performance standards. Although many of the contracts have already been negotiated, Tren Urbano is not yet in operation so there may still be some opportunity to implement changes based on market research information.


A final observation is that Tren Urbano will be operating in a multi-agency environment, in which there is currently no formalized agreement for cooperation. Market research may help Tren Urbano understand which aspects of the system are important to coordinate with these other agencies. Furthermore, by better understanding choice rider perceptions and expectations, Tren

Urbano has the opportunity to provide an example to these agencies as to how they can improve their service and potentially attract choice riders.

Based on the current status of the Tren Urbano project and the lack of market research to date, the following two methods are recommended for implementation in San Juan:

- Focus groups
- The Kano method

The specific recommendations with regard to these methods focus on the following issues, which are of importance to Tren Urbano at the current time:

- The Plaza idea
- Fare structure and policy decisions
- Marketing efforts

Although market research could extend beyond these issues, they are thought to be especially promising in terms of the influence of market research.


Focus groups were conducted for Tren Urbano more than 4 years ago as part of Hoffman's thesis. These focus groups were conducted with choice riders, and specifically dealt with the following issues:

- why people in San Juan make the transportation choices they make,
- how they view public transportation, and
- what might be done to convince them to use transit.

At the time this research was conducted, many of the issues that are currently of concern to Tren Urbano planners and policymakers were not important. Therefore, the focus groups dealt with general perceptions of transit rather than specific aspects such as fare policy and services like the plazas. Because such issues are more defined at this point in time and are becoming increasingly important to the agency, it is recommended that a new series of focus groups be conducted to gather information on customer perceptions of these issues.


Specifically, focus groups may be useful in determining the desirability of the plaza idea. The remote parking idea was not well accepted in the Boston focus group, and it is possible that a similar sentiment will be expressed in San Juan. If this is the case, it may not be desirable to continue exploration of the plaza idea. Alternately, the focus groups might find that potential

customers *would* use plazas, and the idea could be further researched. The focus groups can also include questions about other current Tren Urbano points of interest, such as aspects of fare policy and potential marketing campaigns.

For more detailed information about specific attributes of both plazas and Tren Urbano, the Kano method should be considered for implementation in San Juan. If marketing were not an issue attitude scales, which are easier to implement, could provide the same information as Kano analysis. However, marketing issues *are* relevant to Tren Urbano at this time, and since the Kano method can provide valuable information for this purpose in addition to information about general importance of attributes, it is recommended rather than attitude scales. The Kano survey could be similar to that implemented in Boston, although the attributes might be altered based on the outcome of the focus groups described in the previous paragraphs.

In terms of implementation, it is recommended that both the focus groups and the Kano survey be conducted at companies along the Tren Urbano alignment. The employees at these companies are the potential choice riders who are most likely to use the system since their final destination is close to a train station. Additionally, involving employers in the market research process may help them understand that the agency is trying to meet their employees' needs. This may influence them to consider measures such as employer-subsidized transit passes. Market research conducted at such companies has been shown to be successful in the past (as evidenced in Hoffman's thesis), and it is likely that this strategy will prove successful for upcoming market research efforts.

## *7.5 Suggestions for Future Research*

There are a few areas in which the research presented in this thesis could be extended:

- **Conduct surveys with choice riders in San Juan**: The surveys conducted with Boston choice riders provided insight into how these individuals perceived different aspects of public transit and commuting attributes. However, it cannot be assumed that these results are transferable to San Juan because the two cities are very different and therefore San Juan choice riders may have completely different perceptions and priorities. Therefore, it is recommended that focus groups and the Kano method be conducted in San

Juan in an attempt to understand how to attract choice riders to Tren Urbano. This thesis has laid the groundwork for Tren Urbano planners in terms of their initial market research efforts.

- **Explore subjects other than park-and-ride:** Park-and-ride was chosen as the focus of the Boston surveys because they are services that are specifically geared towards choice riders, namely those who have an automobile. However, the methods could clearly be extended to other services besides park-and-ride or could be used to explore attributes of transit services in general. For example, planners at Tren Urbano might consider providing shuttles between large residential communities and Tren Urbano stations instead of relying on the automobile as an access mode. The market research methods described in this study could be applied to this shuttle idea in order to help planners decide how the service should be designed and marketed.

- **Explore the use of the market research techniques to measure customer satisfaction:** The specific focus of this research was to evaluate a few market research method in terms of their use in helping transit agencies understand choice riders. However, it is possible that these techniques could also be used to measure customer satisfaction (specifically the attitude scale technique), and it is recommended that this aspect of transit market research be looked at in more detail.

- **Explore other market research techniques:** Although the methods selected for this research were thought to be the most promising, it is possible that other existing market research methods could also be used by transit agencies to understand choice riders. As an extension of this research, it is recommended that other methods be tested in a public transit context in order to evaluate their potential usefulness and appropriateness for transit agencies.

# References

Aaker, David A. and Day, George S. (1990), Marketing Research, 4th Edition, John Wiley & Sons, New York, NY.

Ambruso, C. (1991), "Tualatin Park-and-Ride Lot Program Evaluation", Transportation Research Record, 1297, 32-39.

American Public Transit Association. (1999), Transit Fact Book, American Public Transit Association, Washington, D.C.

Ben-Akiva, Moshe and Lerman, Steven R. (1987), Discrete Choice Analysis, MIT Press, Cambridge, MA.

Bolger, D., Colquhoun, D., Morrall J., (1992), "Planning and Design of Park-and-Ride Facilities for the Calgary Light Rail Transit System", Transportation Research Record, 1361, 141-148.

Center for Quality Management. (1993), "Kano's Methods for Understanding Customer-Defined Quality", Center for Quality Management Journal, 2, 4, 2-28.

Charles River Associates. (1987), Setting a Ridership Goal for New York City Subways, Final report prepared for the New York Metropolitan Transportation Authority, Boston, MA.

Churchill, Gilbert A. (1999), Marketing Research: Methodological Foundations, 7th Edition, Dryden Press, Orlando, FL.

Deka, Devajyoti. (1996), "Public Transit in a Social Marketing Framework," Journal of Public Transportation, 1, 1, 65-86.

Dickins, Ian S.J. (1991), "Park-and-Ride Facilities on Light Rail Transit Systems," Transportation, 18, 1, 23-36.

Elmore-Yalch, Rebecca. (1998), TCRP Report 36: A Handbook: Using Market Segmentation to Increase Transit Ridership, Transportation Research Board, National Research Council, Washington, D.C.

Elmore-Yalch, Rebecca. (1998), TCRP Report 37: A Handbook: Integrating Market Research into Transit Management, Transportation Research Board, National Research Council, Washington, D.C.

Foote, Peter J. (2000), "Chicago Transit Authority Weekday Park-and-Ride Users: Choice Market with Ridership Growth Potential", paper presented at the Transportation Research Board Meeting, Washington, D.C.

GMAEC Consultants. (1996), Tren Urbano Final Environmental Impact Statement, San Juan, PR.

Green, Paul E. and Krieger, Abba M. (1993), "Conjoint Analysis with Product Positioning Applications", Handbooks in OR & MS, 5, 467-515.

Green, Paul E. and Srinivasan, V. (1990), "Conjoint Analysis in Marketing: New Developments With Implications for Research and Practice", Journal of Marketing, October 1990, 3-19.

Hoffman, Alan. (1996), Toward a Positioning Strategy for Transit Services in Metropolitan San Juan: An Initial Typology of Public Perception of Transit Options, Master's Thesis submitted to the Tren Urbano Project, Massachusetts Institute of Technology, Cambridge. MA.

Khattak, Asad and Polak, John. (1993), "Effect of Parking Information on Travelers' Knowledge and Behavior", Transportation, 20, 4, 373-393.

Klein, Gary. (1998), Sources of Power: How People Make Decisions, MIT Press, Cambridge, MA.

LaBelle, Sarah J. and Stuart, Darwin G. (1995), "Diverting Auto Users to Transit: Early Lessons from CTA's Orange Line", paper presented at the Transportation Research Board meeting, Washington, D.C.

Lehmann, Donald R. (1989), Market Research and Analysis, Irwin Press, Boston, MA.

McCollom, Brian. (1999), Data from report produced for the Federal Transit Administration and the American Public Transit Association, McCollom Management Consulting, Darnestown, MD.

Messinger, Paul R. (1995), The Marketing Paradigm: A Guide for General Managers, South-Western College Publishing, Cincinnati, OH.

Moreira, Joana, Bergman, Stacy, and Brown, Chris. (1999), "The Boston T System: Listening to the Passenger", unpublished paper submitted to the Sloan School of Management at the Massachusetts Institute of Technology, Cambridge, MA.

Morgan, David L. and Krueger, Richard A. (1998), The Focus Group Toolkit, Sage Publications, Thousand Oaks, CA.

Payne, John W., Bettman, James R., and Johnson, Eric J. (1993), The Adaptive Decision Maker, Cambridge University Press, New York, NY

Pisarski, Alan E. (1996), Commuting in America II, Eno Transportation Foundation, Inc., Lansdowne, VA.

Planck, Charles F. (1998), Transit Marketing: Strategies for San Juan, Puerto Rico, Master's Thesis submitted to the Tren Urbano Project, Massachusetts Institute of Technology, Cambridge, MA.

Plous, Scott. (1993), The Psychology of Judgement and Decision Making, McGraw-Hill, Inc., New York, N.Y.

Prelec, Drazen. (1999), Notes on conjoint analysis, prepared for a course at the Sloan School of Management, Massachusetts Institute of Technology, Cambridge, MA.

Reed, Thomas B. and Levine, Jonathan C. (1997), "Changes in Traveler Stated Preference for Bus and Car Modes Due to Real-Time Schedule Information: A Conjoint Analysis", Journal of Public Transportation, 1, 1, 25-47.

Rieck, Dean. (1999), "Psychology in Direct Marketing", Direct Marketing, 61, 16-17+.

Rutherford, G.S., Frank, L.D., and Tull, A.F. (1991), "Development of Private Services at Park-and-Ride Lots in Central Puget Sound", Transportation Research Record, 1308, 101-111.

Siemens Test Track Turnkey Contract, Operations and Maintenance Book, Special Provisions (Ridership Incentives).

Stein, Ellen and Iansiti, Marco. (1995), "Understanding User Needs", case prepared for the Harvard Business School, Harvard Business School Publishing, Boston, MA.

Turnbull, Katherine F. (1995), NCHRP Synthesis 213: Effective Use of Park-and-Ride Facilities, Transportation Research Board, National Research Council, Washington, D.C.

Urban, Glen L. and Hauser, John R. (1998), Design and Marketing of New Products, 2nd Edition, Prentice Hall, Englewood Cliffs, NJ.

Weinstein, Aaron S. (2000), "Customer Satisfaction Among Transit Riders: How Do Customers Rank the Relative Importance of Various Service Attributes?", paper presented at the Transportation Research Board meeting, Washington, D.C.

# Appendix A
# Interview Guide and Transcript from
# Personal Interview

This appendix contains the interview guide and transcript from the personal interview conducted as part of the qualitative research phase.

## *Interview Guide*

### *INTRODUCTION*

First, let me thank you for taking the time to talk with me today. I and two of my classmates are trying to explore ways in which the T can be improved to better serve your needs as a transit rider. Ultimately, we would like to know what ideas you have for MBTA system improvements.

We are conducting research for our Listening to the Customer class. However, one of our team members is involved in the public transit field and it is therefore possible that your answers will be used as suggestions to the transit planning process. Naturally, your name and identity will remain confidential if this information is shared, and we therefore ask that you be as candid as possible.

With that in mind, let's get started. Let's begin by looking at the images you brought with you.

### *ZMET ACTIVITY*

1. Let's start by looking at the images you brought with you today.
   For each image ask the following:

   A. How does the image relate to the T?

   - Is the image simple or complicated?
   - Do the colors have significance to you?
   - What kind of emotions does the image evoke?
   - Is there anything hidden in the image?

   B. Widen the frame of the picture in any direction.
   Imagine the image continuing in any direction.
   What do you see once the image is expanded?

2. Are there any images that you could not locate that capture your feelings

about the T?

3. {If There Is Time}
   Collect the images, shuffle and present them face down to the interviewee.
   Have the interviewee choose three of the images.

      A. Looking at these three images, how are two of the images similar and yet different from the third?

      B. How does the identified similarity relate to the T?

## DEPTH INTERVIEW

## DESCRIBING THE IMAGE AND MEANING TO THE CUSTOMER

1. Describe the environment while you are waiting at your local T stop.

2. What are your general feelings/impressions when you are on the T?

3. Describe a typical passenger on the T.

      ➤ Outside of transportation, what role does your current mode of transportation play in your life?

## DESCRIBING THE CONSUMPTION EXPERIENCE

1. What do you enjoy the (most / least) about your current mode of transportation?

2. What do you typically do while riding the T?

## DESCRIBING THE CUSTOMER RELATIONSHIP

1. What are your required expectations of your mode of transportation?
         ➤ What advantages do you feel you have by using your current mode of transportation?

2. Describe a (bad / good) experience you have had with your current mode of transportation.

## DESCRIBING THE DECISION ENVIRONMENT

1. Describe a typical day and how your mode of transportation fits into it.

> What aspects of your travel lead you to select one type of transportation over another?

2. Describe an "extreme" day and how your mode of transportation fits into it.


## DESCRIBING THE MOST IMPORTANT FUTURE ENHANCEMENTS

1. What characteristics are 'must have' in a form of transportation?

2. What characteristics are 'nice to have' in a form of transportation

3. What things would you fix about the current T system?

4. What new services could the T provide to better serve your needs?

> Payment system
> Environment
> Safety
> Schedule

5. What would be your ideal form of transportation?


## WRAP-UP OF INTERVIEW

## _Interview Transcript_

_Note: This customer takes the T from Providence, RI to Watertown, MA daily. He starts on the Attleboro commuter rail line, which he takes to South Station. He then boards the Red Line and takes that to Harvard Square, where he boards a bus that takes him to his final destination, Watertown._

**Interviewer (I):** First, let me thank you for taking the time to talk to me today. I and a couple of my classmates are trying to explore ways in which the T can improve to better serve your needs. And so ultimately what we're looking for is your ideas of improvements that the T could make that you feel would be useful.

So I'd like to start off with the pictures you brought. Let's sort of go through them individually. So let's start up here (points to picture of traffic). So how does this image relate to the T to you?

**Customer (C):** The image is one of bumper to bumper traffic. It represents to me the alternative to me from taking the T, taking the commuter rail specifically. It's the congestion on 128 between the MassPike and the Braintree split that I'm most trying to avoid. So anytime I'm feeling a little down about how long the T takes, I think of my alternative of sitting in bumper to bumper traffic.

**I:** OK. Does it bring any emotions to mind, or feelings?

**C:** Yes, and I'll try not to sound like too much of a radical freak. To me, time spent like this in bumper to bumper traffic is just time wasted and it makes me feel like I'm sitting in a steel coffin and that I'm, my life is just flying by as I sit in traffic day after day. I did that drive from Providence to work here in Watertown every day for the first four months and it was time just lost...time that can't be regained. So as far as emotions, it's not a happy, warm feeling when I look at pictures of bumper to bumper traffic.

**I:** Now, is there anything sort of hidden in this image that sort of relates to the T or have you pretty much...

**C:** The only thing I would say is that relates to the T, and it's an image I have when I'm on the subway, and I guess you're already aware that I take the commuter rail to the subway to the trolley, the 71, every day...so this image to me is a picture I get frequently in the afternoon as I'm on the Red Line approaching the Charles Street station. And it's just when you come up, back above ground for a little while. I look to the right, and that part of the road is always bumper to bumper cars and yet people on the subway go right by. So my travel time is much quicker, and so I can almost imaging right here in the medial strip the commuter rail or the subway going much more quickly.

**I:** And that was going to be my next question. If you widen the image what do you see beyond the edges of the actual picture?

**C:** I definitely see some kind of dedicated right-of-way transit vehicle going much more rapidly...in congested peak-periods like that.

**I:** Let's go onto the next one...that watch.

**C:** The watch is...there's so much to the watch. Sadly, when, the days I take the train, which is usually four days a week, sometimes five days a week, I feel very tied to a schedule, tied to my watch. I look at my watch all day long and as I get closer and closer to when my train is, I look at it more and more frequently. So that's part of it. One is getting out of work on time to catch the train and because my last leg is on commuter rail which has decent headways, but they're still 40-45 minutes apart and I don't want to miss it. I always have this concern, I always end up buckling as fast as I can to catch the bus. And a lot of times, this is a frustration you've probably heard frequently, you get to the bus stop and you don't know if the bus just came, you don't know when the next bus is coming, things like that. And then, it's the schedules of, I guess the schedules that I'm tied to. It's what the clock reminds me of. There's a big clock in South Station that when I come up the escalator from the Red Line, I make sure my watch says the same thing as the clock, make sure that the train isn't going to leave without me.

**I:** Let's just go through all of the pictures. The fare card...

**C:** My T pass to me represents really a lot of flexibility, I'm really impressed, I've lived in other metropolitan areas and I'm really impressed with the way the T allows seamless transfers between commuter rail and subways to the bus. If I had to pay, if there were different systems, that would be a big barrier to me. If I had to carry, and I've even thought about it, if I start working part time at the Providence office which might happen, would I then switch to a 10 punch card or a 12 punch card but that would mean I would have to cary $2.60 in change every day for the subway and the bus and there's no, as far as I'm aware, there's no free transfer between the bus and the subway back and forth. So the farecard, the multipass, is really great for flexibility. The other thing I take advantage of is on Sundays you can bring along someone for free, so my wife and I do that a lot. We just go to South Attleboro, we park for free, and we go into Boston for the day. The only thing is that the schedule on Sundays is so limited that it restricts you a bit. The earliest train on Sunday is at 11:45 and that doesn't get you into Boston until almost 1:00.

**I:** So you've lost most of the day...

**C:** Right, I mean if you're meeting people for lunch or whatever, that's tough to do. Saturday is better, but you don't have the passenger for free.

**I:** Now in terms of the fare collection system, you seem to be pretty happy with it...are there any improvements that you can think of or does it pretty much satisfy your needs?

**C:** It satisfies my needs. The only thing, it's more a level of maintenance, I guess, the system itself, the design of it, seems to work fine. The only thing is there are days when the turnstiles don't work and there are days when...and then the people in the booth, this only happen to me once, but the people in the booth were not friendly or helpful at all. I was swiping a brand new

card, it was the first day of the month, I was swiping it through the turnstile and the turnstile wouldn't unlock. I thought there was something wrong with the strip on the card. And then the guy just, he never uttered a word actually, he just waved me through the gate for the wheelchairs and I went through that way and I didn't know until I got to the next day that it actually *was* working. Otherwise, it works great. I'm always concerned because my pass is worth $136. If I lost it I'd be up a creek. But otherwise the system seems to work well.

**I:** OK, let's go onto the books.

**C:** OK. The books, and actually I started keeping a list when I started taking the train, one of the biggest advantages to me of taking the train, it does take longer, but I feel that I enjoy the time much more than sitting in traffic getting really frustrated. So I've read 33 books since I started taking the train in February, which is, like, 32 more books than I read last year when I was in grad school. So that to me is great. There are a lot of times I wish the train was a little bit faster. There are a lot of times I just get to tired of reading I just sit there and sort of stare out the window and I wish that it wasn't an hour commuter rail ride. But I've been able to read a lot and sleep occasionally a little so it's been good.

**I:** Well I actually, and this is a bit of an aside, but I visited the CTEC facility at South Station (this is where they dispatch all of the Amtrak and commuter rail trains) and they were saying that with the opening of the new high speed rail line they were considering speeding up the commuter rail trains on that line. Apparently they can go a lot faster than they do, so they were considering doing that.

**C:** You remind me of a very interesting point, getting back to the watch. The, I'm on the Attleboro branch, which goes to Providence, which I've heard is the highest ridership branch on the system. And it has certain benefits being on the Northeast Corridor but the big weakness of it, and they actually just revised the schedule four or five weeks ago so that all the trains that leave during the AM or PM peak, they leave about 8 or 9 minutes earlier, which I thought was great. I'd get to Boston 10 minutes earlier, get to work 10 minutes earlier, and all that. But what's been happening is because we are dependent, we're dependent and secondary to the Amtrak trains, frequently we'll leave Providence, I'll get on at Providence, and then we'll sit on the track outside and wait 5, 6, 7 minutes until an Amtrak train passes us. So I would definitely say that one thing the MBTA could do to improve customer service would be for schedules to be a lot more realistic. Faster would be great, but certainly more realistic. It's like flying in a plane, no one likes to leave the gate on time and then sit on the runway for 20 minutes. And when you do that every day, which has been happening, it is frustrating. So I would say if they could coordinate better with Amtrak and, who knows, some people think it's going to be an even bigger issue when Acela is implemented because that train is going so fast that you need to leave a lot more time between signals.

**I:** It's interesting because Amtrak actually runs the commuter rail service and they deal with dispatching and everything, so I don't know how they, if they give their trains more priority in dispatching or what...

**C:** I think Amtrak trains have priority over the commuter rail regardless. I think they're just higher on the food chain. I think because they're intercity and long-distance and everything else, but it's unfortunate because Amtrak trains are notorious for being late and the commuter rail *could* run very regularly. There's not much to make commuter rail trains late except for signal problems, and we've had that. So I think better communication with the customers, and even *on* the trains, when I first started riding, once a week or at least twice a month we would stopped for almost half an hour at one point because they had signal problems. And then there was also one day, it was a circus at South Station, all of the signals between, I believe, Philadelphia and New London, CT went down and they wouldn't dispatch anybody so we just sat and my train left about an hour and a half late.

**I:** So you sat at the station?

**C:** Yeah, we hadn't even gotten on the train. I came running as I usually do from here, come running around the corner and I just saw that there were a couple thousand people standing at South Station. There were lines that were 35 people long for the pay phone.

**I:** Now, were they telling you what the problem was, what the estimated time for it to be fixed was...anything?

**C:** No

**I:** No information at all?

**C:** No information at that point. And then you started hearing stuff spread among people. And eventually we heard there were signal problems. And signal problems to a train rider can mean anything. And that was as specific as it got. And then eventually the trains started running again.

**I:** OK. Let's go to the next picture, the runners.

**C:** When I saw that, this picture cracked me up. Frequently I feel like I'm running for the train. It's funny because there such, like a juxtaposition. Once I'm on the train, the commuter rail, it's relaxing. It really is. It's frequently crowded, my train is standing room only, but I usually get a seat because I get there, you know, early enough. But I frequently end up running either to the commuter rail, well to the commuter rail in both directions, and part of that is just little glitches in the system, you know the more modes the more things that can go wrong. I've sat on the red line, the subway, which should be a 20 minute ride from Harvard, I've sat there and I've sat there and just watched my train, as I'm watching my watch, and my train kind of just comes and goes as I'm sitting between stations. So that's the unfortunate thing is that it's kind of stressful. Not like driving stressful, but stressful and then you get there and you try to calm down. I try to make a point of not truly running. Every now and then you see people get on the train and they're just sweating, panting.

**I:** OK. what about the last one, throngs of people.

---

**C:** OK. This is a crowd. South Station can be really crowded. We get to the point where you try and guess which train is yours so you can get a seat. And I've gotten pretty good so I know that the 5:40 usually comes in on track 8, things like that. But I don't know why they wouldn't communicate that. Why, when the train is sitting at the station, with the doors open, and they know it's going to be Providence, why not just put it up on the board. They usually wait until 10 minutes before or 15 minutes before. And so if you want to get a seat, you know, you take a gamble. And then the crowds, the commuter rail is the most, the commuter rail and the bus are the two nicest of the modes. The subway is usually a lot more crowded, much less relaxing. Usually I'm standing for most of it until we get past Charles MGH or Central Square and then it opens up. So that's not productive time, that's just time holding onto a pole.

**I:** So when you say "nicest", are you talking more about your experience in terms of crowding or the environment of the vehicles?

**C:** No, I mean the environment is, they're all fairly clean, it seems like they do a good job with maintenance, and the subway cars themselves are usually air conditioned. The stations themselves usually aren't. But I was used to that in New York City also. The buses are never air conditioned, but, you're right, it is sort of my feeling that the commuter rail and the bus are kind of relaxing. There much easier environments, not as stressful, not as much hustle-bustle. You jump on a subway car the moment before the door shuts and everyone wants to get off at the next stop. You have to fight your way through. Frequently on my way to South Station the cars get to crowded that I start maneuvering towards the door before I get to Downtown Crossing just so that I'm one or two people away from the door so, yeah, the bus and the commuter rail are the nicer ones.

**I:** OK. Let's, we'll put these (pictures) sort of aside, and I've got some other questions. Can you describe for me the environment when you're waiting at a T stop?

**C:** Which mode?

**I:** That's a good question because it's drastically different, right?

**C:** Exactly.

**I:** Let's go with the bus stop. Now, do you wait for the bus out here?

**C:** I wait for the bus on Mt. Auburn. I leave the building, I go get on Walnut Street to Mt. Auburn. And actually that is, as silly as it sounds, a stressful, getting to that bus stop is stressful for me every day. And every day I say it's not a big deal because the buses have really good headways, I mean, they're 6 or 8 minutes apart. So it's not that big a deal, but there are a couple of times, if I miss that bus am I going to miss my train, and that's like 45 minutes. So I'm always hustling down the street and, unfortunately, with the way the houses are set up. you can't see if the bus is coming until you're 15 feet from the corner. So it's, like, a 5 minute walk and 25% of the time as I'm going down that street. there goes the bus.

**I:** Now, are there times when you're actually standing there waiting at the bus stop?

C: Yes.

I: And what's that like?

C: That's not bad because fortunately there's a big tree right there at the bus stop that provides shade. It can be really hot in the summertime just standing out there. And there's one narrow band of shade that I usually stand in. There's no shelter, there's no bench, there's nowhere to sit.

I: Is that something you think would be useful, or no because you're not actually waiting that long?

C: For me, it's not a big deal. There are a significant number of older people who use that bus stop, who use that line, and that might be good. A lot of times they end up sitting on the steps of, there's an Armenian community center there, and they sit on the steps there and then when the bus comes they walk over. The other thing with the bus is, and this is sort of an aside, but there are a lot of stops on that line. And the bus driver knows which ones are valid, but first-time passengers don't and so you pull the bell and you think they're going to stop and they don't stop.

I: So again, it's sort of a communications issue...

C: Right. And also the bus stop just says "Bus Stop." It doesn't say what line it is or anything. So more information. Anytime you can give the customer information it's a good thing.

I: So let's talk a bit about, you talked about the bus stop and a bit about South Station, let's see, you get off at Harvard?

C: Harvard's a very nice station. It's, I'm impressed with how nice Harvard is. I've been in other stations. The other day, the day we had the hurricane, I was at Central Square, which is not as nice. It was pouring rain, I ran down the stairs, and then I was right on the track. Which I guess was convenient. I'm very impressed with Harvard. I like the vendors. I rarely buy anything, but I like that they're there. It gives it a nicer, sort of urban feel and I like that the vendors play music, classical music, and it gives it a nice feel.

I: OK. Can you describe for me a typical passenger on the T, specifically on the subway?

C: The typical passenger on the subway is someone going to work, some people are really determined. They sit there and read a book with people crowded up to them, they sit there with the book in their face. Typical passenger is not extremely rich, but certainly all kinds of middle-class, working-class, I would say most are Boston residents and I would guess most have been in Boston their whole lives or at least a good part of it. I'm actually impressed with the diversity on the T compared to other cities. Lots of cities only, you know, from middle-income class down, ride the subway. And that was one of the things that impressed me when I moved to Boston a couple years ago was how many people ride the T.

I: Now what about the buses? Is it similar?

C: No, the buses are lots of older folks who probably don't have any other way around. The buses are much more suburban. They're, and I should say I've only ridden the 71 so I don't know what the city buses are like, but the 71 is very suburban. It reminds me a lot of bus systems that I've ridden on in Montgomery County, MD. It deals with smaller, more affluent communities and connects to a bigger system. So those people I would say are people who don't have a car. The people on the subway, a lot of them have cars, they just can't drive. A lot of them are going to work.

I: And the commuter rail? Typical passenger?

C: Typical commuter rail is people working downtown. Lots of bankers. When the whole Fleet-Bank Boston thing hit, that was all the talk on the train. Because a lot of people on my train are going to lose their jobs. The commuter rail is funny because the New York commuter rail is much more social. Much more vocal. Like people talk to each other. And the commuter rail in Boston, people don't. If you're sitting in a 2 person seat and someone sits down next to you, people don't even acknowledge you. They just keep their eyes forward. It's kind of a funny thing to get used to.

I: What do you enjoy most about riding the T?

C: Overall, what I enjoy most is that I'm less stressed at the end of the day. Even with booking for the train and waiting in the rain and everything else, at the end of the day when I get home to Jennifer I'm less stressed than if I had just spent the last hour and a half racing down 128 fighting traffic.

I: What do you like least?

C: Least I have to say, is the total duration. On a good day, it takes me an hour and 40 minutes. On a bad day, 2 hours each way. So there are a lot of days I leave at 6, I catch a 6:30 train, I get back to my house at 7:30-8:00 at night. It's a long day and it's a long day spent looking at my watch to make sure I'm on schedule. That's what I like least about it.

I: I guess you talked about how you normally read when you're on the commuter rail. What do you normally do when you're on the buses or subway?

C: On the subway, there's not much to do. I people watch, I read the overhead banners, frontwards, backwards, you know. And then on the bus if someone left a newspaper on the seat I'll read it. Otherwise I just pretty much sit there. The bus, because it doesn't have such distinctive stops, unless I'm really engrossed in a book I won't read because it's easy to miss a stop. The subway is not a problem and on the commuter rail I get off on the last one so it's never an issue. But the bus and the subway are the less productive times. You sort of just, travel.

I: What are your required expectations of your mode of transportation?

**C:** I'm flexible. Of course, you want it to be safe, safe both physically and crashes or something like that. Clearly you don't want to get mugged, you don't want to wreck. My other expectation is, I'd love to say that it keeps to its schedule. Whatever its schedule is, it keeps to it. But this is not always the case and you don't have a whole lot of recourse. And the thing is either, the alternative I always go back to is sitting in traffic, so I'm willing to put up with a lot because I want to avoid that.

**I:** Could you describe to me a particularly bad experience you've had on the T that really stands out to you?

**C:** It would have to be, actually, it has to be the day I worked late here, so I was catching the 6:25, the train from South Station that would get back to Providence around 7:30, and I was on the Red Line and it stopped between stations. Even if it had stopped at a station, like Downtown Crossing, I would have gotten off and walked. But it didn't, it stopped between stations, and we sat. And then it sat for a good, a long time, like 8 or 9 minutes or something like that, which was enough, I missed the 6:45 train. And then there's no 7 anything train so I had to wait until after 8 to catch the next train. So I ended up getting home at 9:30 at night to get up at 5 the next morning. So that would be a bad experience. Part of the frustration of, and I just missed the 6:25. I sprinted up the stairs. So it's sort of a combination of a lot of things. The subway stopped between stations, they didn't give you any information. They didn't give you any estimated time of when it would resume. And then the commuter rail left without me.

**I:** Could you describe for me a typical day and how your mode of transportation fits into it?

**C:** Typical day is I wake up at 5:00 in the morning, tired, every day. Get up, eat breakfast, make lunch, I'm out the door around, well it depends which train I'm catching, I should say where I'm catching it. But normally I'm out the door a little before 6. I drive to South Attleboro station, I park there, I fold up my dollar bill and shove it in the pay slot and then go up the stairs, across, down the stairs, wait for the train, the train's usually late, picks us up, sit down, read, arrive at South Station, and then join, sort of this mass of sheep working our way through South Station. I don't actually go downtown. I go down to the Red Line, wait for the Red Line. The nice thing for me is that I don't have to worry about whether it's a Braintree train or whether it's this train or that train. That's just pure luck, I can catch anything. So I take the subway to the bus and then I walk down the street to where I work. I work all day and then, it's tough, I usually try to leave here around 4. Well, I used to leave at 4 to catch a 5:30 train. Now I leave usually at 4:45 to catch a 5:40. And then I do it all in reverse. And then I get home. If I take the 5:40 I'll get home around 7:00. My wife will be getting home from work right around then, we'll eat dinner, we'll go to sleep, and I'll get up again.

**I:** What about an extreme day for you, and "extreme" can be defined any way you want, how does that work?

**C:** If I know I'm going to be working late or if I know I have to do something afterwards, I'll drive. And that, in order to drive, I actually drive an old junky car that I drive to and from the train station. It's perfect like that. If I'm going to drive, I have to switch cars with my wife, she'll take the old, junky car to the hospital and I'll get the less-junky car. But a day that I take

the T, and usually it's stress here, like we're trying to get a document out or trying to do something, and I keep looking at my watch, looking at my watch, so it just adds to the stress. Everyone here knows I take the T. A lot of time, you know, it's not part of their calculation when they're like, "I need you to do this." And I'm like, "Oh, I've gotta go." It's tough coming all the way to Watertown. If I worked downtown it would be much different and a much more benign experience, I think. I think it's when you start adding the different modes and the different transfers, there's just so much that can go wrong.

I: What characteristics for you are a "must have" in a form of transportation?

C: I guess my "must-haves" are sort of my expectations as well. And I should preface this with when I started working here I looked at the transit and said, "There's no way I'm going to take a train to a bus, you know." And actually, what tipped the scale was that we had a bad snowstorm in February and it took me 5 hours to drive from here to Providence. It actually took me 4 hours to get from here to the Braintree split and that forever tipped the scale in favor of the T. Um, must haves I would like it to be comfortable, I would like it to be on-time. The cost isn't that much of a factor, although, I'm sure you've studied elasticities and all. It's funny. The parking at Attleboro is a buck a day and there's nothing in the world to stop them from charging 2 bucks a day, but for some reason they only charge 1. It's funny. There are two parking lots close to the station and those fill up really fast. Then there's another parking lot that's a 5 minute walk away. And that further one charges the 2 dollars a day. It's completely counter-intuitive. So what's even worse is that if I'm trying to catch the 6:58 and I get there and all the spots are gone, then I actually have to pay more to park farther away. So the money, my company pays for almost half of my T pass, money's not an issue. And definitely, I feel that I'm saving a lot more money, the only thing that I'm really expending greatly by taking the T is time. Everything else is a benefit. I'm saving money because every time I don't drive that's 100 miles I don't put on my car and I've taken the T over a hundred times so that's 10,000 miles I haven't put on my car. And it's more productive time, I read, so there are a lot of pluses like that. What do I expect? I expect it to be safe, comfortable, on-time, and then to keep trying to improve. I think that transit systems sort of get into, "OK, this works." And they just go and they never think that times have changed and they can make things better. So I'd like to see improvement and maybe with these schedule changes that they did implement, maybe they're trying to improve. And they do upgrade the cars, the commuter rail cars occasionally, and they're nice.

I: What things would you fix about the current system?

C: I would definitely have, provide, more information. That to me is the biggest thing. And maybe some people don't care, but I guess since I'm so tied to a schedule I would like to see at all the stations, the next blank will be here in blank minutes. And they do that on other systems. Atlanta, they did their demonstration project as part of the Olympics. But I would love to see that certainly at commuter rail stations and then certainly at subway systems. Certainly it's harder at the bus stops. But they could do that. And they are improve the commuter stations on my line. They're doing some work on Attleboro. But at South Attleboro, it's a dumpy piece of asphalt next to the track. And there's a median that some people use to sit on, but there are no benches, nowhere to sit, it's a little, not rural, but it's just nothing. Part of it is underneath Rte. 1 and all these pigeons live there, so you don't want to stand under that. Most importantly, though,

they could improve the information. It would be nice to see it on the vehicles. Actually, the subway's doing that now with, "Next stop blank." The more information you can give the consumer the better.

**I:** Are there any new services that the T could provide to better serve your needs?

**C:** One that I was impressed with and I only used it once until my company did it internally, was passes by mail. I know that they've been doing that for years, but I would definitely commend them on the convenience on that. Using it as a business commuter, anything they could do to improve convenience. The transition between the commuter rail and the subway at South Station is terrible, but I know it's under construction and I haven't seen any plans for this, what it's finally going to look like. That bottlenecks really badly. They could, places like that, where you have changes in modes they could definitely look at pedestrian circulation issues. Park Street can be a mess. Sometimes if I have enough time I get off at Park Street and walk to South Station. I go up the stairs and it's a free for all. So they could do that and then, try and make it more comfortable. They do a pretty good job with maintenance of the interiors of the cars. The buses are old, but they're old, I won't argue that. Buses, as an aside, there are a lot of people who don't pay when they ride the bus, and I find that curious, I guess, more than anything, it doesn't really bother me. I figure that I don't look at them as free-riders. I figure they have their own issues. But when you get on the buses, when you get on the trolley, when you get on at Harvard, you pay when you get off. You get on at a back door and you pay at the front when you get off. And some people just walk off and the drivers never do anything. The only time I ever saw the driver say anything was with a young black passenger, who I had actually seen pay. He swiped his card and walked off and the driver was like, "Hey, what are you doing?" But overall I would say I am happy. There's a lot of good service. I would like to see a lot more service to Providence. I know there's a lot of politics involved with that. It restricts my options because there are only a set number of trains that go all the way to Providence. The rest stop at South Attleboro. So if I get on at Providence, I have to make sure I get a train home that goes all the way through. I think the last one is at 6:25 and there's nothing else that goes down there. The other thing, I guess, and I guess I'm fortunate compared to the other lines, is that if I get to South Station, I can always take a Bonanza bus. I never had to, but it's there and that's nice because I'm never really stuck. The other thing is there was actually one day, and it was that day I missed the 6:25, there was an Amtrak train leaving in about 12 minutes so I went to the booth and said, "Hey look, I have a T pass and I'm trying to go to Providence. Can I use it?" And the guy said, "No." so I said, "So how much is a ticket?" and he said, "17 dollars." I said, "One-way?" So I ended up sitting and waiting. And I don't know why I thought of that. It sticks in my mind that there's some place where there's some kind of reciprocity, but I guess it's not Boston. On a system-wide thing, of course I find it silly that North Station and South Station are not connected. Again, I'm just lucky that, by the grace of God, how my route works out. You know, that it's easy. It could have been a lot worse. And I'm also lucky that the Red Line goes to South Station and not to Back Bay because the people that get on at Back Bay stand. Everyday, my train's filled up. I guess they could put more cars on a train, although I guess there's an issue with platform length. Other than that, I guess just put more trains out there.

**I:** Last question, what would be your ideal form of transportation?

**C:** My ideal form of transportation would be walking. Absolutely. I've walked to jobs, I've bicycled to jobs, I've driven, and now I'm taking the T, and to me walking is just the greatest flexibility. It doesn't matter weather, it doesn't matter anything. You know, God gave you two feet and you just walk. Following that the next best would be to walk out of my front door to a train station and get on a train. Not having to drive to a train station. Trains to me are the next best. Trains or subways…anything on a dedicated right-of-way because they're the most predictable and I like predictability in schedule. So I would say that. Certainly not driving a car. That's definitely not my favorite way to go to work.
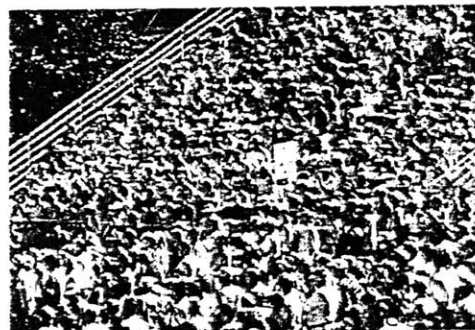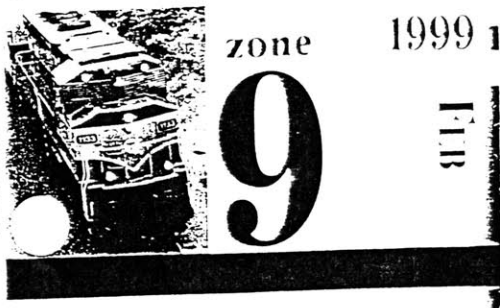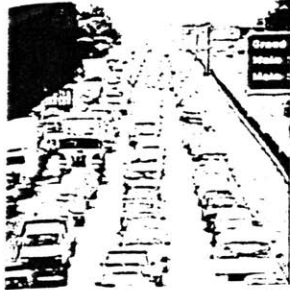
# Appendix B
# Discussion Guide and Transcript from Focus Group

This appendix contains the discussion guide and transcript from the focus group conducted as part of the qualitative research phase.

## Discussion Guide

### Introduction

- *Tape session*
- *Who am I?*
- *Reason for focus group – gain insight into commuting behavior*
- *Survey design*

First, I would like to thank you all for coming today. I would like to make sure it's ok with all of you for me to tape this session. As you all know from our previous correspondence, I'm a second year Master's student in the MIT Transportation program. The reason for this focus group is to gain insight into commuting behavior of people who have a choice of modes to get to work. What I learn from all of you in this focus group will then go into the design of a survey that will be distributed at MIT and some companies in Cambridge and Boston. All of this information will be used for my master's thesis. So in general, I'm interested in your ideas and opinions about various commuting issues. On that note, let's get started...

### Opening Questions

This question is meant as an ice-breaker to make everyone feel more at ease. I actually have this information already, but it may be interesting for the members of the group to know how the other members get to MIT.

*QUESTION 1*   5 minutes

> *MAIN POINTS (Flip chart):*
> - *Introduction question*
> - *Name, town, travel to MIT, alternatives, perception*
> - *Things listed on flipchart, residences on map*

> I know most of you probably know each other, but let's go around the table and have everyone introduce themselves. Please tell us your name, what town you live in, how

you normally travel to MIT, what other transportation alternatives are available to you besides the mode you utilize, and how you perceive these other alternatives?

*Have a list of these things on the flip chart so respondents can remember them. Each person's residence will be marked off on a map of Boston and surrounding areas. This map will also show commuter rail routes and major highways so we can see what alternatives are available to the participants.*

## Introduction Questions

These questions have the purpose of introducing the general topic for discussion and allowing the participants to relate experiences they have had with commuting. They will provide interesting information, but are not the most critical questions to have answered. They still serve to "open up the conversation" a bit.

### QUESTION 2  | 5 minutes |

*MAIN POINTS (Flip chart):*
- *What do you like about way of getting to work?*
- *Most important?*

What we're going to do now is make some lists on the flipchart. My first question to you is what do you like best about your current way of traveling to work? FOLLOW UP QUESTION: Of all the things listed here, which do you feel are the most important?

### QUESTION 3  | 5 minutes |

*MAIN POINTS (Flip chart):*
- *Barriers to using transit (drivers)?*
- *Inconveniences of riding transit (riders)?*
- *Most important?*

Those of you who drive to work, what things do you see as barriers to you using transit? Those of you who use transit, what are the biggest inconveniences of riding transit to work? FOLLOW UP QUESTION: Which of these are the most important?

## Transition Question

> This question serves to transition into the real topic of discussion – remote parking or plazas.

### QUESTION 4    10 minutes
*MAIN POINTS:*
- *Driver – live walking distance to commuter rail station?*
- *Consider driving to commuter rail station (park-and-ride)? Why?*

Those of you who drive…do any of you live walking distance from a commuter rail or subway station? Have you ever considered driving to a commuter rail station, parking, and then taking commuter rail (or any other type of public transit) into the city? Why or why not? (Examples: Alewife, Wellington, Woburn)

## Key Questions

These are the questions that will deal directly with remote parking and be crucial in identifying key attributes.

**Present idea of remote parking**. What I would like to do now is present an idea to you and get some feedback. The idea I would like to discuss is remote parking. Basically, a remote parking facility is one, such as a shopping mall, that is located in a suburban area. People can drive to this facility, park their cars, and then take a shuttle to the train, which will then take them into the city. Is that idea pretty clear?

### QUESTION 5    10 minutes
*MAIN POINTS (Flip chart):*
- *Characteristics/attributes that would influence using it (flipchart)*
- *To start conversation: shuttles frequent, other services there*
- *More or less likely to use than park-and-ride?*

What characteristics/attributes of the remote parking facility would influence your decision to use it? (Write on flipchart) Would you be more or less likely to use this instead of driving to the station and parking there…why?

### QUESTION 6    15 minutes
*MAIN POINTS (Flip chart):*
- *Ranking exercise – 1 most important, 12 least important*

PROBING QUESTION TO #5: In front of you, you have a sheet of paper with various aspects of this remote parking facility listed. I've also written these down on the flipchart here. I would

like you to go through these different items and rank them in order of importance to you, 1 being the most important and 12 being the least important. Take a couple of minutes to do this and then we'll have a couple of people share and discuss their answers. (Maybe use flipchart for this one).

## QUESTION 7    | 5 minutes |

*MAIN POINTS (Flip chart):*
♦ *What else could be done...what missed in ranking?*

What else could be done to encourage you to use remote parking? What has been left off of the list from the last discussion?

## Ending Question

This question is meant to summarize and make sure nothing was missed.

## QUESTON 8    | 5 minutes |

*Is there anything else we missed that you would like to share with us?*

## Wrap-up of session

## *Interview Transcript*

My name is ███████, I live in Concord and I drive to work. I have the option of driving to Alewife station and then taking the T from Alewife to Porter and then the red line to Kendall Square. So I guess it would be the T from Alewife to Kendall Square. The other alternative would be to take the commuter line from Concord into Porter and then take the T. In order to do that I really have to walk. I really have to walk to the train station. But it takes about 20 minutes to a half hour to walk to the train station and another...well the cycle time is about an hour and a half doing that. Driving is as short as 21 minutes when there's no traffic to as long as 45 minutes with traffic, and it's like that now with the construction down the street. As far as my perception of the alternatives, I think that they are not...the trade-off is really extreme. A couple of years ago I had to get the car fixed and my wife needed her car and I had to walk to the train station and so forth back and forth and it literally took, like, 2 hours to get here. And I almost thought that if I just started walking from Concord I would actually get here quicker. (Other participant: Which parking lot do you Park in, Jim, when you get to MIT?) West Garage...yeah, so that takes another 10-15 minutes walk to get here.

My name is ███████. I actually just moved to Cohasset a couple of weeks ago. I used to live in South Boston and from there I basically took the T... I did a lot of walking. Now in Cohasset I have a lot of options. I moved about 2 weeks ago and I've actually explored a lot of the possiblities. I have about a 5 minute drive to the commuter boat, and the commuter boat is great. It takes about 35 minutes. And then I walk about 5 minutes to South Station and then take the T to Kendall. The alternative to that is that I have about a 20 minute drive out to Braintree and then take the subway. And that takes about 45 minutes to get to Kendall. Actually, the boat, the whole commute taking the boat is about an hour and 15 or 20 minutes. And actually the subway is quicker...it only takes an hour or so. The problem is that you can hit traffic and you have to pay to park. Also, there is a commuter rail option but I haven't tried that out. Actually, right now I like the commuter boat better because it's a little more relaxing, it is longer and requires more walking, but the 35 minute ride in is much more relaxing. So those are my alternatives unless I find a different way home. My initial feeling is that even though it takes longer, I feel that the boat is much better for me.

Hi I'm ███████. I live in Wilmington and I drive to work and I've been coming here since '82. I've only taken the commuter rail a few times...out of desperation, basically. I did that a couple of times and I said, "Never Again." It's definitely takes me an hour and a half to two hours to get to MIT that way. When I drive at night it can take 25 minutes. Now when I drop my kids off at about a quarter of 8 I can be here at 8:30. If I leave at 8:30 it usually takes until about 9:30 to get here. I need the flexibility, with the kids and everything. I actually thought about carpooling before, but my schedule didn't allow me to commit to that.

I'm ███████ and I live in Waltham and I usually take the bus to get here. I take the 70 bus from Waltham to Central Square and then walk from there. It usually works out pretty well, depending on the day. It usually takes a minimum of 40 minutes door to door taking the bus. This morning the driver decided to go by the stop at Waltham without even thinking twice about the people waiting there so I had to wait another half hour to 45 minutes. Other times if there's a lot of traffic it can take an hour door to door. Alternatives are driving in the car, which

sometimes I do. It can take, depending on the time, at 1 in the afternoon it can take 25 minutes, which is pretty quick. The other alternative I have is to take the commuter rail from Waltham to Porter Square and then taking the red line here and either getting off at Central or Kendall, but it only saves me about 5 minutes because there's additional walk time from either of those stations. And there are a lot of changes. So even though the commuter rail is shorter it's not really very relaxing standing somewhere on a platform waiting for the red line to show up and especially if I have to go all the way up the escalators at Porter. But most of the time the bus is the best thing...it's usually a pretty relaxing ride.

My name is ███████ and I live in Weymouth. I drive about 10-15 minutes to the Braintree red line station and I take the red line in to Kendall. The alternatives would be to drive all the way in, but I choose not to because I just don't want to deal with traffic. The time for the two modes that I could take is about equal. The other alternative is to take the commuter rail, but it doesn't really make sense because I have to travel further away from the direction I'm going to get to the commuter rail station.

My name is ███████. I live in Malden and I drive to work. The alternative is that there are two buses that would take me to Malden Station where I could take the Orange Line to Downtown Crossing and then take the Red Line to Kendall Square. In the morning the drive really varies. It can take 45 minutes or less depending on the day. The bus would take longer than that so that's why I drive.

My name is ███. I live in North Weymouth. I come to MIT by car. I do have an alternative. I can take the bus, but it takes just as much time as driving. I use the backroads to drive. I think I would take the bus only it's a matter of safety on the way home. It's really dark where I have to walk. We have a lot of animals out there. Besides that I wouldn't have a problem with it.

I'm ███████. I live in Acton. I've lived there for 15 years and before there I lived in Arlington. I've always driven. I have gone through periods of taking the T. When I was pregnant I was falling asleep everywhere and taking the T was nice because I could zone out. But the reality is that driving the car is cheaper. I really decided I have to have a car anyway...I have to get a child to school, so I have to have that flexibility. I usually leave around 7:30 in the morning and I get in about 8:30. But every 15 minutes after that adds about a half hour onto the drive. I thought about carpooling, but I don't like that option because I don't have the flexibility. I don't have the reliability of schedule to say that's an option for me. I've had bosses who get really upset if I come in a 5 minutes past 9, but they'll notice that I stay until 5:30. And I've had bosses who don't really care. But I've gotten into the habit of saying I have to get to work within a certain period of time and I can't count on...you know commuting has to take less than an hour and a half. I have to be selfish because I have to be at work on time and everything just fits together if I drive.

## Question 2: What do you like best about your way of getting to work?

- Having my own radio
- Reading on the bridge
- Quite time to myself

- **Freedom to come and go as you wish (freedom, flexibility)**
- No road rage
- No weird people on the subway. (Hey that's me)
- My car...I have it set up so that it has, like, water and food, everything I need within reach. Car has everything you need (participant has his Dunkin' Donuts coffee, for example)
- Actually, the boat that I take has all those things...it has bagels, it has newspapers. It's got beer. They've got a lot of different options if you want to eat. Boat has these conveniences ( eat, drink, newspaper)
- Not having to walk to the T in the cold weather.
- That's the good thing about the commuter rail is that it runs regardless of the weather, whereas with driving and traffic you just don't know if you'll get there.
- What I think, actually, is that coming in underground and coming in on the boat...I have a totally different perspective being able to see the city coming in. It's totally different having to go down in the subway and getting on a boat. I don't know if it's a different feel because it's a different comfort level, but it's a totally different feeling.
- Comfort
- **Less time**
- The other issue is if you have to walk or travel to get to a bus station. If it's right outside your door it's great, but if it's not you have to get there.
- **Cheaper**
- I don't know if this is a good thing or a bad thing, but running into colleagues. Frequently on the subway I run into people I work with and it's nice to not just be there with a bunch of strangers.
- I can also do errands

**So which of these is the most important?**

- Flexibility – (many participants agreed with this one)
- I value time. Less time.
- Money is an issue

**Question 3: Barriers/Inconvenience of transit**

- **Inflexibility with taking transit**
- It's more expensive (Another participant: Actually, for me it's less expensive to the T and have only one car with two drivers than to have two cars.)
- It's multi-modal
- Limited schedule of the public transit – after hours or before hours you know that if you don't make the train you're cooked because you gotta wait another 60 minutes.
- Comfort
- When I used to live in Quincy I used to drive all the time. And the reason is because I didn't want to have to deal with taking the bus and being jostled all the time. But now that I get on at Braintree I can just get on and stick my nose in the paper and then I'm there. So that's a big factor.

- Especially if you have a big load that you have to carry to work, you can't take it on the train. (Another participant: Yeah, especially during rush hour when the trains are crowded.)
- Parking. We have a huge parking lot in Acton, but it's always full.
- It's actually cheaper to park here on campus than to park at a T stop.
- A barrier of transit for me is that it's not suitable for picking off and dropping off kids. Key thing.
- For errand running, it's bad.
- The T is also not very good in terms of technology. Like sometimes you can be waiting for an hour and you don't know what's going on. Or even sometimes you're stuck on the T and there's no announcement to tell you what's happening.
- In relatively rural towns it's not necessarily so easy to get to the train station. If I take public transit because I don't have a car, and if I don't have a car that means I have to walk to the train station. Well, if I've gotta walk, it makes that commute all the longer. There isn't any other public transportation in and around town.

So which of these are most important...what is the biggest barrier or inconvenience?

Inflexibility – when you're in your car you can go wherever you want, but transit is a fixed route so if you need to do errands you can't. You're stuck to a T schedule.

**Question 4: Do any of you who drive live within walking distance of a commuter rail station?**

A mile and a half.

I live about a half mile, maybe ¾ of a mile from the station. There are two options for me. The further away one has the better schedule.

I have about a 2 ½ mile walk to a station, and I've done it in the winter when the weather's really bad and I don't want to drive or when my car's been in the shop. But it's still an hour walk, which is impossible to do if you have bags and papers to carry back and forth.

Have you ever considered driving to the station and using the park-and-ride facility? Why not do that instead of driving all the way into work?

Because it's a lot more expensive. Parking at the commuter rail facility every day costs a lot more then just driving all the way.

Because it takes a lot more time.

There's never parking free. At 7:30 the lot is full, full, full, and it's a big lot.

**Question 5: Now I'm going to present an idea to you, and this is specifically what I'm getting at. The idea is that of remote parking so this would be a facility that you would drive to, and this can be something like a shopping mall. You park there and then take a shuttle to the commuter rail station and take the rail into the city. So for example, if**

**there's no parking available at the commuter rail station this is another option. But the thing is that there is an extra transfer there because you're parking, getting onto the shuttle, getting off the shuttle and getting onto a train.**

So it's similar to the airport shuttle?

Yes, somewhat similar to that idea, only the airport shuttle takes you directly to the airport whereas this one would take you to the train and then into the airport. So what are the characteristics of this idea that would influence you using it or not using it?

The added mode would have to cost less. In fact it would almost have to be free in order to attract people.

It would need to have a frequent schedule.

A tax break might work. (Other participant: Yeah, in fact, you can get a tax break for using the T, or an insurance break.

There is nothing that a remote facility would help for me because in Concord there's adequate parking at the local parking mall. They have a big old parking lot and you can just park your car there and walk to the station.

**So you can just walk...there's no need for a shuttle?**

Right.

For someone who has to take a lot of modes, the T, walk, etc. For me, that would just add ANOTHER mode.

Yeah, you would have to replace one or more of the modes.

Actually, if there were a shuttle bus that were convenient from my house to take me to Alewife, then I would consider that. Then I wouldn't necessarily have to own an extra car and it would be one mode. Then I don't have to walk to the train and take the train and schlep up the stairs.

The Hanscom bus goes from Hanscom directly to Alewife. So if there were a way to be dropped off, say at Lincoln and then take a shuttle to Hanscom directly to Alewife and do that.

Yeah, that would work, except from where I'm dropped off it's another two miles to Hanscom.

That's going in the opposite direction of traffic.

Yes.

If I weren't picking up my kids I would consider it if I could get to Hanscom conveniently. As it is now, Hanscom is probably a three mile walk.

**So actually getting to the facility is an issue, because it has to be convenient to get to?**

Well, you know, some walking's ok, but if you're dragging bags around, or particularly if you've got kids in that case, you're not gonna do that?

So, would you be more or less likely to use this than a park-and-ride?

For me it's the part after the bus that prevents me, that discourages me, from taking the bus.

I wouldn't use it.

Everywhere, except when I'm in my car, I'm surrounded by people. I like being in my car alone.

A lot of it has to do with where MIT is situated, especially where we are and where the T winds up. I mean if you work downtown and you come into South Station and you can just walk outside and be at your office it's easy to take the T. But there's no easy way unless you take the red line and work on that side of campus. It still adds another 15 minutes of walking. No matter what way you do it.

When I worked in Building 54 I was more likely to take that train and get off at Kendall. But working here Kendall or Central is at least 15 minutes.

For people who work in the city and it's $20 a day for parking the T is great. But here it's pretty inexpensive.

## Question 6: Ranking Exercise

I'm not sure how to do this because there's virtually nothing you could do to make this attractive.

In that case, let's do it as hypothetical. Assuming you are going to use this, rank the items. I'm going to have a few people share their answers.

The following table shows the answers of respondents who shared with the group:

| Attribute | Respondent Ranking | | | | |
|---|---|---|---|---|---|
| | R1 | R2 | R3 | R4 | Avg. |
| Free Parking | 5 | 5 | 1 | 5 | 4 |
| Token Purchase | 10 | 12 | 9 | 10 | 10.25 |
| Short drive from home to the facility | 4 | 3 | 4 | 7 | 4.5 |
| Free Shuttle | 7 | 5 | 2 | 3 | 4.25 |
| Lighting | 3 | 10 | 8 | 9 | 7.5 |
| Covered area | 2 | 8 | 12 | 12 | 8.5 |
| Security Personnel | 1 | 9 | 10 | 8 | 7 |

| | | | | | |
|---|---|---|---|---|---|
| Short Shuttle Ride | 6 | 11 | 3 | 2 | 5.5 |
| Frequent Shuttles | 7 | 2 | 5 | 1 | 3.75 |
| Amenities at Facility | 9 | 6 | 11 | 11 | 9.25 |
| Long Hours | 1 | 1 | 7 | 6 | 3.75 |
| **Short walk from parking to facility** | 8 | 7 | 6 | 4 | 6.25 |

*Respondent One:* Security is important because none of the other stuff really matters to me. Even hypothetically, I have a hard time thinking that any of these things would be important to me. It's been so long since I took the T and lived in downtown Boston and when I did security wasn't an issue for me because, you know, it was the subway. But now that I moved out of town security is much more of an issue for me.

*Respondent Two:* I was the opposite in terms of thinking of what Janet was thinking in that I didn't put a very high priority on security and lighting and all that, although I can see how that would be important for the population over all. (Other participant: That's because you're a guy *(laughing)*) I'm thinking that getting there is more important, frequency. Provides the flexibility.

*Respondent Three:* I was, you know I'm more concerned with how much it costs. That's a big thing right now. Some of the things...covered area, security, shopping, you know, I could care less. I just want it to be cheap and I want to get there. You know, the flexibility, you kinda expect that...it has to be there. I wouldn't take it otherwise, but basically the cost has to be low.

*Other Participant:* Can I make a comment? Some of these things you just have to have. Covered area, I mean, if there's going to be any wait time at all you can't expect people to be waiting out in the pouring rain. It's just not going to happen. I would expect some of the other things would be that way too. I mean if you have a place that's not well lit and it's in the woods, you know there's just some things that you have to have without even getting started with the base requirements.

**OK, so then which other things would you see as "must haves"?**

Security personnel have to be there.

Security has two dimensions. There's security at the waiting area and then security at the parking lot...getting to the car.

I would think that you have to have a short walk from the parking to the facility or it's kind of silly.

Purely hypothetical, mine is very similar to R2.

*Respondent Four:* This is especially relevant for me because there is no parking available at my T station. Ideally, I would like to club four things as most important, but let me give you my list.

**Where's your break point of the most important things?**

It would be around 5 – free parking. Yeah, my kids would go crazy if I left really early or really late, so I think 6 is less important. Of all the things I liked least...I think of a covered shuttle area, well I have an umbrella in my car. I don't really care about the shopping and coffee shop. Purchasing T passes, I think that's another thing you should think of ahead of time. Lighting, I don't know, it just didn't bother me. I guess what I want is the frequency. I want the next train to be in, like, 5 minutes. I mean you need the flexibility.

(Other respondent) I think the remote parking is sort of a last resort for a commuter rail that has no parking. Because if a commuter rail station has parking, you're not going to need this. You would just park there. If someone's going to drop you off, I don't think they're going to drop you off at the shuttle, they're going to drop you off at the commuter rail. So it just seems to me that it's a last resort for an area you can't park at. Maybe it's a subway station, maybe it's a boat. If there's no parking then it may be the only viable method.

What's interesting is that Foxwoods Casino does shuttle their employees. Their parking is 20 minutes away from the casino. They can't park in the casino parking lot. They park 20 minutes away and they shuttle them.

### Question 7: Is there anything else on here that I might have forgotten that you might think about with this facility?

I'd like to be not necessarily surrounded by people and crowded. I was on a subway over the weekend that had television sets on it and the seats were pretty wide open and some other public transportation mode that provided a clear amount of space and seclusion. If there were a way to combine that so that you didn't feel like you were a sardine and maybe there were some other things you could do with your time, so television or some other type of active media might be forward-thinking and a good alternative.

The other thing is that it would be good to have bi-weekly passes or debit cards so that you could buy, like, $50 worth and use it whenever you want. People would rather drive than paying for a monthly pass and only using it twice a week.

Actually, really important for folks who have kids and there are two working parents because in my case I'll drop my kids off, like two days. So those are the days I probably wouldn't use public transport, but the other days I would. So if you have a binary instead of buy 30 days or don't buy it at all it would be better.

Something that is convenient is in Germany you put money into this card and you can pay for your bus and your subway and then you don't have to pay when you get on the subway, which is clean and comfortable and runs very frequently. And if you go on without your ticket the police will stop you and you'll get a fine. I think it works.

It's like in DC...and it gives you flexibility.

The thing is the T pass is subsidized.

The annoying thing is when someone in front of you has a pass that isn't working and you just have to stand there and watch your train go by.

Another thought that comes to mind is it would be useful for me if the system were designed for people who have children and have to shuttle them to and from school , to and from childcare facilities and that sort of thing. For it to be really useful in my family and my existence it would have to take into account that I'm picking up my kids, I'm dropping them off, and so forth. I don't think the system is designed and suited for that.

What about the idea of having childcare at the remote parking facility?

No. I wouldn't use it. It's just too big.

On the other hand, if there was a little cottage industry of family run daycare centers that were around that particular area, it could be a transportation or commuting center where you could drop your kids off. Then it starts looking like something that makes sense. But I think that Ginny's initial reaction is similar to mine...you think of some giant factory where you're going to consider dropping your kids off? No way!

The thing with daycare centers is that they're more connected with our lives and our towns that our commute to work.

I know there are some people who work here that choose to bring their kids here and have them taken care of near MIT, so they make the commute with them. But that would still be someone who drove in and dealt with it that way.

**Along those lines, we haven't really discussed having other things there besides daycare, such as dry cleaners...what do you think about that?**

You know what would be useful would be grocery drop-off and pick-up. You know, integrated with something like Peapod and Homeruns. Some of them don't deliver to places like Concord, but if there were a central drop spot they might. It changes the way we start thinking about our group and our community. I mean right now I think of my community as who is my kid going to hang out with, but maybe we could start thinking of our community as the people we travel with. I know it's kind of a weird thought, but maybe the travel center becomes a place where a lot of our life activities transpire.

For me it's becoming more and more of a suburban depot. You know, it has everything. But it would definitely have to be within walking distance of the train station. But I mean, if you're going to have all this stuff at the remote facility why don't you just route a bus there that will go directly to work?

I think this really has to be a place where parking is really an issue at the station. Somewhere where there's obviously a need for more parking.

If you have all of these amenities, like a coffee shop right at the station then you wouldn't really need these things at the remote parking area.

**Wrap up of session**

# Appendix C
# Survey Respondent Comments

This appendix is a compilation of respondent comments received while the surveys were being conducted.

## _Conjoint Survey_

That WAS a hard survey!!! I tried so hard, but I think I was still inconsistent with my choices... good luck with it. :)

---

Can you explain why I need to fill this out? It would all be made up, because my current commute is 5 minutes.

---

Thanks for asking me to take the survey. I have a couple of comments.

1.    On the second half of the first form I could not read the headings with the last entry so I had to scroll back and forth.

2.    The number of combinations was overwhelming. It was difficult to sort out which options were more preferable because of the variations in different factors. I felt that I was not able to rank the combinations according to what was most important to me and if someone did a careful analysis of my responses, I think they might find some serious inconsistencies. This is because I had difficulty keeping track of all the differences in the 18 options.

Hope these comments are helpful and that the survey goes well.

---

Public transport has to be cheaper - it has to be comfortable - and the timing has to be reliable- frequency probably won't be a factor - Something which may need to be factored in is the length of the ride - a crowded subway or bus thats a short ride  is okay - but a long rail commute in a crowd sucks -

Currently though I live 4 miles from work -  there is no single mode public transport available -  I have to change buses atleast once - there is no rail or light rail option , and the connection time at the bus transfer is too unreliable- and the whole trip is about 45 minutes.

When I lived in Medford and worked in West roxbury and traveled early - the trip was much more pleasant despite the bus-rail-bus transfers and toook about the same time as the my current public transit option -  It also wasn't much longer than driving-

# *Kano Survey*

You have selected an interesting topic: What are the variables that influence
the demand for Park and Ride facilities? Presumably, you are also examining
the variables that influence their supply such that you will be able to put
your arms around the economic as well as non-economic drivers (no pun intended)
behind the utilization of the facilities and resultant decrease in traffic.

You have, of course, leapt to the conclusion that Park and Ride facilities are
a viable option for all survey respondands. In other words, your survey can
only be completed by individuals who:

1. "Work" at a location accessible by "train." This excludes students and
others who may commute from home to a specific destination other than work
regularly. It excludes individuals who do not work near a "train" station,
presumably commuter rail or subway.

2. Have the option of driving to a Park and Ride facility. It may be worth
knowing what portion of the population would not use Park and Ride facilities
no matter how brief their search for a parking space, inexpensive, or the
likelihood of securing a seat. Perhaps you are planning to focus on responses
from individuals who currently drive from home to work to determine the factors
that may cause them to change their behavior. If that is the case, perhaps the
survey should only be completed by that segment of the population. Your survey
cannot be completed by those of us who do not have the option of using a Park
and Ride facility because we either do not have a vehicle or do not drive.

Your survey only permits stratification of respondants by economic condition
indirectly, through home address zip code. The elasticity of demand with
respect to price may be quite different for different income brackets.

Perhaps another factor influencing an individual's decision to use a Park and
Ride facility is their certainty of finding a parking space. For example,
spending 15 minutes finding a parking space and having a 5 minute walk to the
train may be one thing, but driving to the facility and seeing the "Lot Full"
sign may be another matter. As we all know, several MBTA parking lots fill
very early in the morning. The lots at Oak Grove, Malden Center, and
Wellington are usually filled by 7:15. There are probably hundreds, if not
thousands, of commuters who would take the T if they knew, with a certaintly,
that when they drove to a lot, there would be space. The fact that there may
be a few spaces left at 8:00 doesn't matter. Many commuters don't waste their
time looking.

This raises the interesting dynamic between expanding the availability/use of
Park and Ride facilities and the availability/use of buses. Perhaps there is a

correlation between the quality of bus service and the demand for Park and Ride facilities. Would expansion of convenient, inexpensive access to Park and Ride facilities reduce traffic on some roads? Probably. Would it increase traffic on others? Sure, especially the access roads to the facility. Would it induce people who currently take a bus to the subway station to drive to the station instead? It may depend on the quality of the bus service.

I enjoyed the opportunity to participate in your survey and would be interested in seeing the results. A couple of personal thoughts about other variables:

I have been working for 30 years. For the first 5 I rode a bike and took the T; for the next 20, I drove to and from work. I am now able to take the T again because (a) I live and work at opposite ends of the Red Line so the trip-time is viable and (b) my children are finally old enough that dropping them off, picking them up and being able to get home quickly in an emergency are no longer key decision factors in my own commuting decisions.

I take the T nearly every day, even though I have free parking at work. I use the T (in descending priority) because: It takes roughly the same length of time as driving; I ALWAYS get a seat going both directions so it is far more pleasant and productive than driving - I can read or sleep; parking is free or expensive ($2) depending on where I park; the service is frequent at rush hour and pretty good off-peak (it runs).

I drive on days when I have mid-day appointments (that require me to get home and then back to the office - modday service is pretty slow) or know I will be working late (this is a security not a frequency of service concern).

My one serious gripe about the park-and-ride experience is the quality of management of the lot. I park in one of the Mattapan trolley lots in Milton and the management of payment is terrible! The system requires that you pay $2 into a box identified by your slot number (marked on the payment). When it snows they don't manage to clear the pavement so it is impossible to read the numbers - then they leave a payment envelope fining you for not paying. When you use the payment envelope the information often does not make it into their system at which point they threaten to tow the car. And of course the MBTA's response is that this service is contracted out! Also parking capacity is inadequate. Experience has taught me that if I'm not there by 8:30 I'm doomed to drive to Cambridge - all the lots are filled.

I'm a little confused by the survery... the weakest statement stronger than "this would not affect my decision" is "this would be a basic requirement..." How do we code "it would have *some* positive impact on my decision?"

Glad to help with the survey. Even though I live too close for park & ride to
be of interest to me, the survey itself was quite interesting (and well done,
both in terms of content and in terms of its use of the web). I answered it as
I would if I lived further away, so that park & ride was an option.

A note about your survey-

the rankings were a bit confusing. at first glance, it appeared to me that
from left to right you wanted us to rank the importance to us. i found that
this was not the case. on the very left your box said that something would
be "very helpful". while the box to its right said "basic requirement." to
me, having something be a "basic requirement" means that i'm not using the
service if that's not there, while if something is "very helpful" than sure,
i might use it, but its not as vital as a basic requirement.

know what i mean? it seems to me that you should have put basic requirement
all the way to the left, and requirement next to the right.

3429-12