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User inputs: Importance of and satisfaction with attributes of the CAT bus system

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USER INPUTS:
IMPORTANCE OF AND SATISFACTION WITH
ATTRIBUTES OF THE CAT BUS SYSTEM

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ABSTRACT

Although studies of citizens' satisfaction with public services have been conducted in many cities on a variety of subjects, very limited empirical research has been conducted on mass transportation. Indeed, studies of financial impacts of mass transportation in urban areas do exist at length. Research on the environmental consequences of mass transit is quite abundant. However, studies on citizens' satisfaction of public transportation are limited.

This study is designed to provide empirical data focusing on the importance of certain characteristics of the bus system and satisfaction or dissatisfaction with said characteristics within the Citizen Area Transit system (CAT) in the greater Las Vegas area. With a population of approximately 1.6 million people (US Census, 2003) and a diverse range of needs, the Las Vegas Valley and Clark County serve as a good model of other cities around the country. It is the purpose of this research paper to gain knowledge and understanding of the value of consumer opinions on the CAT bus system.

In a descriptive study of this nature, it is sometimes difficult to determine actual levels of satisfaction. Without national norms or data from a comparable department, it is challenging to draw meaningful conclusions about the population as a whole. This study attempts to provide a baseline measure for use in planning city- and county-wide programs, and against which data collected in the future can be compared. The goals of this project are twofold: 1) to produce data that show an accurate representation of the citizens who utilize the CAT system and what they feel are the most important characteristics of the system, and 2) to study the general level of satisfaction with each major characteristic of the CAT system.

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INTRODUCTION

It would be a logical assumption to say that the riders of the Citizens Area Transit system, hereafter CAT, are utilizing and therefore must be pleased with the bus system since the Regional Transportation Commission, hereafter RTC, saw a jump in the number

or riders for the past 6 years in a row (RTC, 2003). So why conduct a study in satisfaction? Everything seems to be in order. Based on raw numbers, we can see the people are indeed using the CAT system and can assume they are satisfied with the service the RTC provides. If examined more closely, we see that the numbers are actually slightly inconsistent with the rapid growth in the Valley area, with growth in ridership numbers starting to lag behind population growth. With the addition of 6,000 residents each month and over seventy-five new vehicles registered each week with the DMV (Malone, 2003), much higher numbers should be reflected in growth statistics of both the Valley and the CAT bus system. Many studies have been conducted on travel mode choice and the reasons why people choose personal vehicles over mass transit. Goldstein and Moses' study (1975) on the spatial structure of urban areas explored several reasons including cost effectiveness, behavioral studies and urban sprawl. This paper does not intend to probe into the economics of mass transit nor does it attempt to take issue on environmental concerns. It does, nevertheless, gather qualitative input and examine it to understand why some feel the CAT system is not an attractive alternative to highway congestion. Are the people that choose to ride mass transit in Las Vegas truly happy with the service? Browsing current articles uncovers no opinion pieces from the citizens of Las Vegas. Nothing has been published expressing public opinion either in favor or displeasure of the CAT bus system. Exposing reasons behind the disproportional increase in ridership numbers will have to start with removing the muzzle from the silent masses.

Statement of the Problem

Conducting questionnaires on the subject of citizens' satisfaction and attribute importance of the current CAT system seems to be the best way to probe into riders' opinions. This information may be important to the formulation of public policies and programs. After all the goal of public service is to serve the public. It is hard to adequately serve anyone if you don't know what he or she wants. It is logical to expect that in organizations that provide clear justifications for their programs, individuals will express more positive attitudes toward them. Justifications would not be necessary, however, if programs more reflected consumers' wants and needs.

In 1991, The United States Department of Transportation (USDOT, 1991) conducted a study that focused on gathering opinions from individuals and organizations as a whole on satisfaction with national transportation services and the utilization of the information. The study concluded that departments needed to be more aggressive in gathering and analyzing consumers' opinions and applying them to the policy making process (Hamman, 1993). The study contended that more incorporation of public opinion is needed across the country.

Research Questions

Survey research was used to analyze and evaluate opinions of the citizens of Las Vegas and to determine if their input can be adequately incorporated into the policy making of the Regional Transportation Commission. The research questions used to guide this study include the following:

1. Which characteristics of the CAT bus system are of the most important to the riders in the Las Vegas area?

2. How satisfied are the citizens with each of the characteristics?

Significance of the Study

This research will analyze and evaluate which attributes of the system are most important to riders and how satisfied they are with each. In gathering these inputs, this study attempts to review the effects of consumers' inputs and their impact on decision making in the area of mass transit. The overall objective of future studies of these inputs is to ultimately improve the city's bus system and mold public transportation to the needs of consumers. In turn, the overall objective of the Regional Transportation Commission is to provide a needed service to the public. Therefore, input from riders and the analysis of these inputs are vital to the overall objective. Citizens must feel that their voice is heard and their opinions matter. These same citizens reasonably expect that their specific needs will be represented on an agenda in front of the Regional Transportation Commission. If the commission fails to embrace the needs of riders, they put themselves at risk of losing the confidence and support of the citizens.

The significance of this study is lies in the fact that the riders of the CAT bus system have yet to be heard. In a democracy, bringing people's opinion to the foreground is something that should be mandatory when undertaking policy making in the public sector.

History of Public Transportation Studies

The nineteenth century city in America relied upon rail transportation, the horse drawn streetcar, as the primary mode of travel to get people to and from work. In the twentieth century the automobile replaced the streetcar as the dominant mode for commuters (Horton, 1973). Traffic congestion, air pollution, noise pollution, and wasteful use of gasoline can be logically attributed to the growing use of automobiles. Transportation polices that would encourage the use of public mass transportation relative to the private automobile have been proposed by public interest groups and government agencies, such as the Environmental Protection Agency, in order to alleviate the problems of congestion and pollution (Horton, 1973). The overcrowding of highways and smog concerns have led administrations around the country to consider improved mass transit systems in order to increase ridership and in turn reduce overuse of the automobile (Momon and Marshall 1977). However planning and design sometimes fall short of the actual opinion of citizens. Misused generalizations of what people want might lead to under-utilization of the system. The few studies that have attempted to gather public inputs have fallen short of expressing specific feelings of the citizens of the community. Studies done in the past, as expressed in the literature review, are sometimes focused on aspects such as financial and budgetary concerns and overlook citizens' personal opinions. Controls for pre-existing conditions and spurious factors have been under-utilized or are all together non-existent.

LITERATURE REVIEW

Researchers are keenly aware that the vitality of the metropolitan area depends, in part, on its system of transportation (Merewitz, 1972). According to the United States Department of Transportation (2003), a "necessary condition for health in an urban economy is the efficient performance of its internal circulatory system." It is also the opinion of the USDOT (2003) that the existing auto-dominated travel networks of the United States' urbanized areas are proving to be increasingly inefficient in terms of both personal and social costs. Excessive fuel consumption, balance of payment problems, deterioration of urban air quality, and peak hour congestion all can be related to an urban network form which must support a person-to-vehicle ratio that has incessantly moved toward unity. For example, today nearly 75 percent of all work trips are made in single-occupant automobiles.(Guanthier, 1981)

Why are so many people making the decision of clogging highways, polluting the air and pure inefficiency? As expressed extensively throughout this study, research is somewhat limited in the area of the gathering and analyzing public opinion on public transportation. Some of these studies have focused on why people make the choice of automobiles over mass transit. Others analyze the cost-benefit of choosing to take the bus. Very few, indeed, use individual inputs as the focus of the study.

Wish Fulfillment

Early research on the matter of mass transit did probe into what people wanted out of a mass transportation system. Leonard Merewitz set out to investigate what the people of San Francisco wanted. He focused on public transportation and, in particular, the San Francisco Bay Area Rapid Transit system (BART).

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In 1949, the San Francisco area was overwhelmed with the automobile. Clogged city streets sent local and state government into a scramble over designs of super highways and rail systems (Merewitz, 1972). As explained by Merewitz (1972), engineers love fixed structures such as dams, highways or rail transit to solve problems. Often, a range of other solutions are missed by the narrowness of these visions. This is the question that Merewitz (1972) set in front of him: is BART what people in the San Francisco area want? He used only a straight numbers analysis to determine if BART was the answer to the area's transit problems. Ridership, cost-benefit analysis and adequate land use were the areas of focus.

Merewitz found that, according to financial and participation numbers, the people of San Francisco were being overcharged for an underutilized mass transit system. He alludes to the fact that if the city had gathered public inputs perhaps planning mistakes could have been avoided. Unfortunately, individual responses to satisfaction were not gathered. Furthermore, Merewitz (1972) himself failed to gather inputs and viewed the citizens of San Francisco as sheer numbers on paper. Still his study shows the importance of establishing a foundation of public needs and utilizing those needs as an important aspect of mass transportation planning.

Attribute Importance and Mode Satisfaction

Gunthier and Mitchelson (1981) investigated reasons behind increased automobile usage in and around American urban areas. Gunthier and Mitchelson (1981) viewed individuals as an "information processor" who inputs learned attribute evaluations and outputs an overall evaluation. The article contends that an individual's overall judgment

of a particular mode is a function of characteristics, or *attributes*, of that mode relative to modes of transportation alternatives. In other words, people chose alternatives by weighing certain features of each and making a decision based on the most positive attributes. Here, they are expressing the importance of not only individual inputs, but evaluating single elements as an effect on the overall output.

Gunthier and Mitchelson (1981) questioned bus patrons on levels of importance on each attribute they identified. They hypothesized that a relationship would exist between importance of each attribute and the general satisfaction of each. A trend analysis was used to test their hypothesis. Analysis of variance using satisfaction scores as the independent variable were computed on the importance scores. The scores obtained for 6-point scales of satisfaction provided them with a criterion to divide importance into six categories. Guthier and Mitchelson (1981) found that indeed, a relationship did exist between importance and satisfaction, indicating that there was indeed a relationship between what attributes riders deemed important and at what level of satisfaction each attribute ranked. This finding seems to lay the ground work for studies claiming that improvement to only a few, largely-regarded attributes could greatly improve satisfaction to the overall system.

Travel Mode Choice

Exploratory research on the matter is extensive. People want to know why we make the choices we do, especially where our decisions as a whole have a rather harmful effect to the environment. Once again the focus has turned to an environmental issue. Although my study does not converge on such matters, this study shows an interest in

public opinion and assembling these inputs. Furthermore, Momon and Marshall (1977) draw out the implications of their analysis on public policy.

Mamon and Marshall (1977) looked toward a causal model for the use of public transportation in urban areas. In their study, they analyze determinates of the choice of the automobile for the work journey rather than alternative modes, such as public transportation. The data is drawn from an origin-destination study conducted in the city of Indianapolis. Their general hypothesis is that mode of transportation chosen, i.e. personal automobile vs. mass transit, is a function of a number of interdependent variables; i.e. cost of travel mode, convenience of travel mode choice and travel time of mode. They furthermore propose a model specifying these interrelationships and evaluate them by assigning numeric values to each variable. Their research is unique because they utilize individual-level data. They were able to avoid problems that come up when attempting to draw inferences about individual behavior on the basis of the aggregate data as Merewitz did.

While their findings were mixed, they found considerable evidence that supported their hypothesis that structural variables, such as schedules of the bus system and route coverage, were critical determinants of modal choice. Mamon and Marshall (1977) also find that public policy itself lends to the over use of automobiles. They argue that despite benefits of mass transit, local and state governments funnel money into highway construction and away from public transportation alternatives, ignoring data from cost-benefit analysis and most important, citizen input.

Individual Response Data Inputs

Perhaps the most relevant study was conducted by Horton (1973). Horton's study reflected all of the key elements: individual inputs, satisfaction study, questionnaire utilization and policy impact. His research represented an initial step in the development of alternative public policy planning. His study focused on individual reports on changes in satisfaction as a direct effect on changes in various characteristics of the Indianapolis public bus system. He monitored changes in both satisfaction responses and overall ridership patterns for what he believed to be a representative sample of individuals in the study area.

Most applicable to this study, Horton was concerned with the value of choice in a society. He thought that policy makers should approach urban transportation issues from the perspective of specifying various alternatives from which society can choose through democratic mechanisms. Horton was interested in the results of an information gathering procedure to monitor public feelings toward an improved mass transit system. His model involved the results of two surveys taken before and after the introduction of a new bus system. Horton focused on the explicit changes in characteristics of the system.

It was Horton's belief that large sums of money have been invested in transportation planning with little knowledge of the possible effects of popular alternatives. Furthermore, he feels that the urban transportation planning process been a "costly learning experience (Horton, 1973)."

Horton's rigorous experimentation revealed that there were certain attributes that the public felt strongly about. Among these attributes were "bus fare," "route coverage," and "wait times for bus." Once these attributes were identified, Horton focused on them and closely monitored changes. He found that when demands were met on the characteristics riders felt most strongly on, overall satisfaction increased and, in fact,

other unchanged attributes received more favorable results. Horton explains that the procedure used, with additional refinement, appeared to offer promise of being a "useful devise for monitoring public responses to ongoing changes in public transportation (Horton, 1973)."

Summary

Research does indeed exist on the matter of public opinion and its effect on public transportation. The above studies are only an initial attempt, however, to bring citizen input to the foreground of public transportation policy making. While one study was occupied with the task of gathering and analyzing public inputs, the other was concerned with the application of general levels of satisfaction to the planning process. Still others were interested in why we choose to do what we do and still more studied the economical and environmental impacts of our choices. It seems that research has indeed been conducted in the past, but with a different agenda. For example with Gunthier and Mitchelson (1981), the goal was not to improve on a mode of travel, but to investigate reasons why people make choices that are cost-inefficient.

METHODOLOGY

The purpose of the study is to identify the riders' perspective of key characteristics and evaluate the satisfaction level of the riders of the CAT bus system in the Las Vegas Valley. This research will analyze and evaluate the input of riders as an impact of future decisions about area transit. The literature provides an overview and a rationale for its

effectiveness on implementing change based on extensive economical research. However, the literature offers little information of the effectiveness of such change initiated by public opinion supported by empirical data. This research seeks to meet its objective by examining what individuals feel about what the Commission has accomplished. Furthermore, the intent of this study leads to the evaluation of how the inputs gathered can be incorporated into the planning process of the Commission. This study does not assume that the Commission has failed to meet citizens' needs, rather the study is designed to simply uncover the opinion of CAT bus system riders.

Research Question and Hypotheses

The following research questions and hypotheses were used to guide this study in data collection and analysis:

1. <u>Which attributes of the CAT bus system are of the most important to the riders in the Las Vegas area?</u> Gauthier and Mitchelson (1981) and Horton (1973) have identified certain characteristics, or *attributes*, that have the most impact on overall satisfaction with a transit system. My hypothesis is that the most important attributes will be characteristics of wait time and on-time service. Patience is a virtue, one that I myself do not possess. I assume that riders of the CAT bus system have a schedule to keep, and meeting certain obligations in a timely matter could prove to be on the top of the riders' list. The attributes of travel time, cleanliness and safety on the bus might emerge as some of the more important characteristics.

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2. How satisfied are the citizens with these attributes? The research hypothesis is that people love to complain. No matter what the current status is, riders will demand improvement. Although it is important to evaluate overall satisfaction, Identifying individual attributes that riders feel strongly about and analyzing pitfalls in the system is most relevant. After reading Horton's study, it is logical to assume that with improvements to the attributes with the highest importance score, overall satisfaction will rise. The dependent variable in this case is satisfaction. The independent variables are the twenty identified attributes of the bus system discussed later.

RESEARCH DESIGN: SURVEY

Surveys are the most popular form of social research because of their versatility, efficiency and generalizability. Survey research is "a type of social science method in which survey questionnaires are used for the purpose of making assertions about some population and discovering the distribution of certain traits and attitudes of that population (Shutt, 2001)." Survey research will be conducted on randomly selected routes to make assertions about that population in the valley as a whole. The primary purpose of the survey is to gather inputs on the effectiveness of the CAT bus system to provide satisfactory service and meet the needs of its riders. The data will then lend to empirical tests of hypothesis regarding levels of satisfaction.

The data was obtained from a self-report survey questionnaire that was offered to the population of riders that ride during the randomly selected time and day of the week over a six-week period. The questionnaire will be utilized to evaluate the level of satisfaction of each attribute with accordance to each attribute's order of importance. This

survey queries patrons on reasons of travel mode choice, importance of attributes and ability of these attributes to meet the needs of riders.

The survey questionnaire was distributed on the bus ride from randomly selected routes over a six week period. Allowing for six weeks of data collection was chosen as a goal in order to meet a time-table for completion of this research study in six months. Each rider on the randomly selected routes were given the opportunity to voice their opinion by completing a survey while they rode to their stop. Attached was an informed consent letter explaining the purpose of the study as well as give instructions as to completing it (see Appendix A). The total distribution and collection process took approximately 7 weeks.

The questionnaire was developed by integrating questions used in previous research and questions developed by the researcher in order to access the variables under investigation. The survey followed this order:

1. Respondents were first exposed to a list of ten questions that help identify characteristics of riders (see Appendix B).

2. Next, respondents in the survey situation were exposed to a list of representative mode attributes.

3. Each subject rated each attribute in terms of its perceived importance. This was accomplished by ranking each attribute onto a Likert-type categorical rating scale with five response cues (see Appendix C).

4. Finally, each subject evaluated attributes relative to their level of satisfaction with the attribute. Again, a Likert rating scale is used (see Appendix D)

<u>Participants</u>

The CAT bus system falls within the boundaries and jurisdiction of Clark County. Bus service is incorporated into the city of Las Vegas, the city of North Las Vegas, Summerlin, Green Valley, the city of Henderson, Boulder City, the city of Laughlin and the city of Mesquite. Due to the specified nature of people utilizing mass transit, examining the county's total population demographics would grossly misrepresent the demographics of the riders of the CAT system.

Although these people fall under the jurisdiction of different municipalities, all CAT bus issues are governed by the Regional Transportation Commission. Therefore, even though they are in different geographic locations, and operated under entirely different governmental structures, they are subject to the decisions of one entirety.

Based on utility numbers within the Las Vegas Valley and proximity to the researcher, only the riders in the Valley were surveyed. The Valley provides a good demographic range and is the home of 93% of CAT's total riders (RTC 2003). Clark County is a vast county and a team of researchers would be necessary in order to study all of the areas incorporated in the CAT bus system.

METHODOLOGY OF COLLECTION

As the literature reviewed for this study suggests, the issue of incorporating individual-level data from the users of pubic programs, such as mass transit, are of particular interest for public administration theory. Therefore, this study is intended to gather data specifically addressing the issue of public opinion and its potential

incorporation into public policy making. Data collection for this study was divided into two distinctly separate research segments: usage survey and importance and satisfaction. The first part of the questionnaire packet consists of collecting data that outlines and helps characterize who is using the CAT bus system, more specifically who is participating in the survey. This information will be gathered for the purpose of demographic identifiers in order to better segregate the citizen's needs. The second part will be the collection of data, utilizing a self-report questionnaire (survey) distributed to the individuals selected for the study, will focus on the selected attributes to be outlined later (see Appendix D). The data will be analyzed as part of a comparison of attributes that riders deem important followed by a self-report sheet as to satisfaction with each.

QUESTIONNAIRE PACKET DESIGN

As discussed above the packet that was distributed to participants consisted of four parts: the informed consent letter, the usage survey, the attribute importance survey and the satisfaction survey. Each part of the questionnaire packet was designed for the purpose of both meeting protocol requirements (informed consent [1]) and developing scientific methods of gathering useful inputs (surveys).

Usage Survey

The usage survey was designed to act as an identifier for the people who use the CAT bus system. More specifically it was designed to identify certain characteristics, i.e. when respondents ride, length of trip, etc., of the people participating in this survey.

The main purpose of this section of the survey was intended to answer the who, what, when, where, why and how questions that arise when trying to understand the participants. Questions one, two and ten identified the participant as to who is riding the CAT bus. Questions three and four were designed to discover why the participants chose to ride the CAT bus. Questions five, seven and eight helped identify travel purpose and distance of participants' ride. Questions six and nine asked participants when they mainly traveled and how they paid for their ride.

Attribute Importance and Satisfaction

Included in the attribute importance and satisfaction surveys are twenty identifiable attributes derived from Horton's study. These attributes where chosen for their relevance to the riders of the CAT bus system. Each one of them represents a

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concern or need that an average rider of the CAT bus system might consider when choosing to ride the bus. The attributes were selected from a larger number of attributes that Horton out lined for his study. Some of the attributes, such as protection from cold and protection from rain were combined into one attribute named "protection from weather (shelters)." The attributes were:

1. Bus Schedules and Times	11. Location of Stops
2. Wait Times for Bus	12. Dependability of On-Time Arrival
3. Bus Fare	13. Personality of Bus Drivers
4. Route Coverage	14. Information About the System
5. Overall Bus Appearance	15. Nighttime Bus Service
6. Inside Appearance	16. Comfortable Seating
7. Temperature on Bus	17. Low Noise Level
8. Safety on Bus	18. Smoothness of Ride
9. Crowding on Bus	19. Fewer Stops
10. Travel Time	20. Protection from Weather (Shelters)

The format of the importance survey is contained in appendix C. Using a Likert scale the levels where coded from the number *five* down to *one*. The corresponding levels of importance were *Very Important, Important, Neutral, Somewhat Unimportant* and *Not Important,* respectively. This format was designed in the Likert scale fashion to provide a range to the participants in order to identify strong feelings and segregate them out for comparisons to the satisfaction portion of the survey.

This exact same format was used in duplicating the satisfaction portion of the survey (see Appendix D). The same twenty attributes were again tabulated with the Likert scale ranging from the number *five* down to *one.* However this time the identifying levels read *Very Satisfied, Satisfied, Neutral, Dissatisfied* and *Very Dissatisfied,* respectively. As before, a range was provided in order to identify extremes and make use of them in comparisons.

DATA COLLECTION

Gathering input from participants involves many intricacies. After the survey was designed, distribution was the next thing on the list. Random selection is important in any good survey design. In order for a study to be valid and have the ability to be adapted to a larger scale (generalizability), selection of the participants must be truly random. This is difficult in most situations, especially in a setting outside of a controlled lab environment. Random selection of routes coupled with convenience sampling of riders was my attempt at getting as close as possible to a scientific experiment.

Random Number Generator

Random Number Generators, or RNGs, can range from simply drawing numbers out of a hat all the way to complex mathematical equations and computer programs. For the purpose of this study, I chose to use a simple computerized RNG that I found on-line at *random.org*. The site claims to use strict mathematical guidelines in the process of generating the numbers. On the main page of the random number generator, empty fields prompt to input ranges and field parameters. I obtained a list from the RTC that outlined every route within the Las Vegas Valley. CAT bus routes are numbered by the RTC and no coding was necessary. The stops range in numbers from 101 to 808, with big gaps within the range. I inputted these numbers as my range and asked to computer to produce a total of 500 numbers. I had previously decided that I would need to sample the first fifteen routes. I chose fifteen routes based on a twenty survey per route estimate. I

estimated that in four hours of riding, at five surveys per hour, I could average twenty per ride. Twenty surveys times fifteen routes would yield my target 300. I chose to use 500 outputs because I assumed that large of a number would yield at least fifteen numbers that match CAT route numbers. Out of the 500 numbers that were generated, there were only seventeen that matched corresponding CAT route numbers. Two of those were duplicates (104 and 106). By eliminating those two, I had exactly fifteen routes on which to collect data from.

Sampling Strategy

As expressed above fifteen routes were chosen based on a five survey per hour estimated average. Now that I had my fifteen route numbers I decided when I would ride the routes. I wanted a good mix of riders from different times of day and different days of the week. I wrote down on little pieces of paper the route numbers and put them in one hat. In another hat I placed three little pieces of paper with 8am, 5pm and 12am on them. In a third hat, I had written the days of the week on pieces of paper. To start, out of the first hat I drew a route number and wrote it down, discarding the paper when I was finished. Secondly, I drew a time and wrote that down, replacing the piece of paper when it was complete. I repeated this step for the last hat, choosing a day of the week. In some instances routes were weekday only or daytime only and I had to choose again. On two occasions I drew a 12:00am ticket on routes that were not 24 hours. I began selection on Tuesday, October 14 2003 to begin riding on Monday, October 20, 2003. The results were as followed:

Route Number Draw	Time of Day Draw	Day of Week Draw
209	5:00pm	Sunday
115	12:00am	Tuesday
102	8:00am	Tuesday
214	5:00pm	Monday
403	8:00am	Saturday
202	12:00am	Wednesday
111	8:00am	Sunday
204	5:00pm	Thursday
114	8:00am	Friday
218	8:00am	Thursday
716*	8:00am	Tuesday
106	5:00pm	Friday
104	5:00pm	Wednesday
117	5:00pm	Tuesday
402	8:00am	Wednesday

*Route only runs on Tuesdays and Thursdays between 9am and 2pm

Before the riding was to begin, I had to first speak to the RTC to gain clearance. I spoke with Sue Christensen, a research representative with the RTC. Sue provided me with route information and gave clearance to ride the bus and distribute surveys. She did not, unfortunately, provide me with a monthly pass. I purchased one on my own. She explained that the RTC themselves were conducting a survey of satisfaction with the CAT bus system.

I started my data collection on Monday October 20, 2003 at 5:00pm on route 214 running between D street and H street. I continued for the next 6 weeks whenever my schedule permitted, following protocol. My last ride was Wednesday, December 3, 2003 on the 104 running between Valley View and Torrey Pines. I collected 284 surveys, which fell slightly short of the goal of 300, but was sufficient for the study.

APPLICATION

The data alone are not enough to initiate change and highlight the purpose of this study. After analysis, conclusions can be reached and inferences can be drawn as to what attributes are of most importance and which ones the riders are satisfied with or dissatisfied with. The information was then categorized and listed in order to illustrate, in report form, what the riders of the CAT bus system deem vital and of chief importance. This report will then be administered in a final, professional form, to the Regional Transportation Commission. The responsibility then falls into the hands of the commission's planners to incorporate these inputs into the planning process.

RESULTS

It was important to find out whom I was surveying. The usage survey was designed to supplement the satisfaction and importance surveys in order to provide logical explanations on way people feel the way they do. While the research was limited to the 284 people I surveyed, the surveyees where randomly sampled to ensure generalizability and therefore can be used as a measure of what bus riders citywide feel about the said attribute.

The results of the usage survey were as follows: "Often" was the most popular response to the question "how often do you ride the bus?" with 71 people out of the 284 surveyed (25%) choosing that option. "Work" was the most popular response when asked, "why did you ride the bus today?" with 109 responses (38%). 183 people

responded that they did have a vehicle (64%). The most popular choice for the question

"why did you chose the bus today?" was "avoid traffic" with 82 people (29%). The

highest rated choice was "less than 5 miles" when asked how far respondents traveled

today with 100 hits (35%). Most people paid cash for their ride, 124 to be exact (44%).

80 people reported (28%) that they made exactly one transfer. 50% (141) respondents

claimed they walked 4 to 6 blocks to get to their stop. Although pretty evenly distributed,

the "morning" response was the highest rated when asked when the primary time of

travel with 87 out of 284 (31%), and only 5 people (less than 2%) responded that they

have utilized the ParaTransit system. See appendix G for complete results.

Initially I had intended to separate out patrons who have used the ParaTransit

system and analyze their responses as compared to the rest. However five people are too

few for analysis.

Importance and Satisfaction Results

The next step was to find out what riders considered the most important attributes

of the CAT bus system. I ran means for the importance results and were ranked as

follows: schedule 4.21; shelters 4.20; fares 4.11; on time arrival 4.08; wait time 4.07;

fewer stops 4.05; noise on the bus 4.05; over appearance of the bus 4.02; coverage 3.98;

crowding on the bus 3.97; personality of the bus driver 3.96; inside appearance of the bus

3.96; smoothness of the ride 3.96; travel time 3.93; comfort of the ride 3.93; location of

stops 3.92; temperature on the bus 3.88; nighttime service 3.84; info about the system

3.84; safety on bus 3.80. See appendix F.

For the purpose of this paper I chose to focus on the top five attributes riders felt to be most important. They are "schedule", "shelters", "fares", "on time arrival" and "wait time" respectively. Schedules is rightfully ranked number one. The most important attribute of any transportation system is to meet the needs of the riders and to coincide with schedules. Right behind schedule is shelters. Las Vegas is in the unique position to have most of its days sunny. The need for shelters here goes beyond mere protection from rain or wind. The sun is dangerous at times and protection from it is not only a comfort issue, but a safety one as well. The riders of the CAT bus system have this view in mind as one of their top concerns when choosing transportation alternatives.

Rounding out the top five are fare issues, on-time arrival of buses and wait times at stops. We all know that time is money and numbers three, four and five in the importance rank deal with both.

These five attributes were then compared to the mean satisfaction score. See chart below.
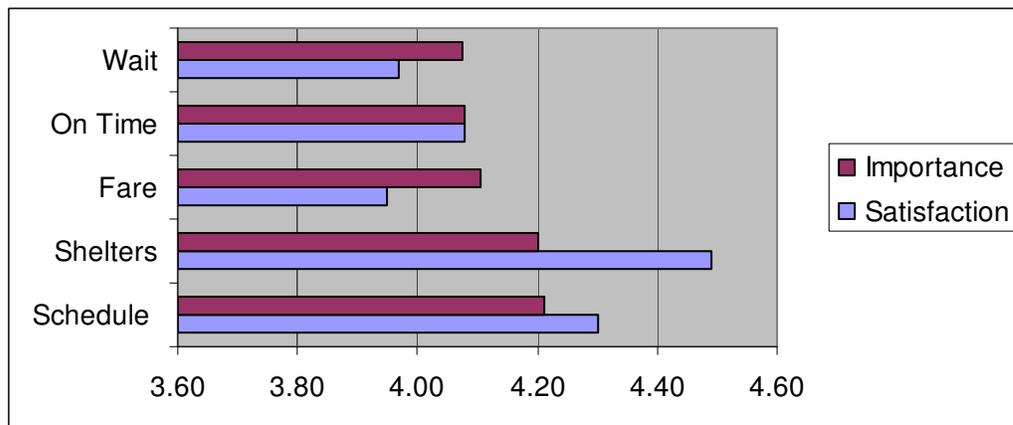
Much to the credit of the RTC, it is clearly seen that the two most important attributes are being met at a more than satisfactory level as compared to their importance rank. Studying the chart above, it is noted that the two highest ranked attributes for importance ("schedule" and "shelters") are also ranked relatively high in respective satisfaction. The attribute "on time arrival" seems to match up well in both importance and satisfaction. The two attributes that ranked higher in importance than in satisfaction were "wait time" and "fare". Below is a table illustrating in detail the paired means of the top five importance attributes. Attributes of the CAT bus system were coded. A lower case "i" before the attribute code indicates it was ranked for importance. A lower case "s" before the attribute indicates it was ranked for satisfaction. See appendix H for correlations and paired samples test.

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	iwait	4.07	284	.543	.032
	swait	3.97	284	.432	.026
Pair 2	iontime	4.08	284	.870	.052
	sontime	4.08	284	.630	.037
Pair 3	ifare	4.11	284	.547	.032
	sfare	3.95	284	.505	.030
Pair 4	Ishelters	4.20	284	.677	.040
	Sshelters	4.49	284	.701	.042
Pair 5	Ischedule	4.21	284	.580	.034
	Sschedule	4.30	284	.635	.038

For the purpose of this paper it is important to concentrate on the results for "wait time" and "fare". This paper intends to discover what people feel is most important when riding the CAT bus in order to analyze their satisfaction with important attributes. The

information gathered would hopefully lead to improvements to certain characteristics of the CAT bus system. In the case of "wait times" and "fare," we see that the riders surveyed felt that these two attributes were high in importance but lower in satisfaction. Below is the paired samples test for these two attributes. The test shows that there is a significant difference between the way riders feel on importance and their respective satisfaction for these two attributes.

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	iwait - swait	.106	.705	.042	.023	.188	2.524	283	.012
Pair 2	ifare - sfare	.158	.693	.041	.078	.239	3.854	283	.000

From the information above, it is logical to say that the riders of the CAT bus system feel that the attributes of "wait time" and "fare" are among top priority and need improvement. It is not enough, however, to just understand which attributes need improvement. In order to make inferences as to why riders feel a certain way, it is important to compare results with characteristics of the rider who is responding. I compared the attributes of "wait times" and "fare" and their respective satisfaction ranking with relevant responses from the usage survey.

The first independent variable I chose was the response indicating how often riders ride the bus. I feel the perspectives of all attributes of the bus system can be affected by the familiarity with the CAT bus system of each rider. I compared the satisfaction score of the top five responses for importance with the variable "how often." I found that all five attribute satisfaction scores had a significant difference between groups when compared to the variable "how often." Three of the attributes had a significance of 0. Below is a table illustrating the results. Appendix I contains complete descriptives from the test.

How Often

		Sum of Squares	df	Mean Square	F	Sig.
swait	Between Groups	2.341	4	.585	3.241	.013
	Within Groups	50.374	279	.181		
	Total	52.715	283			
sfare	Between Groups	12.280	4	3.070	14.292	.000
	Within Groups	59.928	279	.215		
	Total	72.208	283			
Sschedule	Between Groups	5.612	4	1.403	3.613	.007
	Within Groups	108.345	279	.388		
	Total	113.958	283			
sontime	Between Groups	11.024	4	2.756	7.593	.000
	Within Groups	101.272	279	.363		
	Total	112.296	283			
Sshelters	Between Groups	11.596	4	2.899	6.349	.000
	Within Groups	127.390	279	.457		
	Total	138.986	283			

Riders who rode the bus for the first time had the lowest score in three of the top five attributes, including "wait time" and "fare." Riders who experience the CAT bus system for the first time are generally unfamiliar with the system and therefore might be more impatient or less tolerant with fare prices as there more experienced counterparts. The only attribute out of the top five most important that ranked lowest with more

experienced riders (riders that reported they rode "often" or "almost everyday") was

satisfaction with shelters. The next independent variable I tested was the response to the

"purpose of trip" question. The purpose of a riders' trip might offer clues as to attitudes

to certain attributes of the bus system. Once again I compared the satisfaction score of the

top five responses for importance with the variable "purpose." This time I found that only

2 of the top five satisfaction attributes had a significant difference between groups when

compared to the variable "purpose." However the two attributes that did show a

significant difference were none other than "wait time" and "fare." Below is the table.

Purpose

		Sum of Squares	df	Mean Square	F	Sig.
Sschedule	Between Groups	1.369	4	.342	.848	.496
	Within Groups	112.589	279	.404		
	Total	113.958	283			
swait	Between Groups	2.264	4	.566	3.130	.015
	Within Groups	50.451	279	.181		
	Total	52.715	283			
sfare	Between Groups	5.499	4	1.375	5.750	.000
	Within Groups	66.709	279	.239		
	Total	72.208	283			
sontime	Between Groups	1.502	4	.375	.945	.438
	Within Groups	110.794	279	.397		
	Total	112.296	283			
Sshelters	Between Groups	1.360	4	.340	.689	.600
	Within Groups	137.626	279	.493		
	Total	138.986	283			

According to the table, there is a difference between why they rode the bus and how they

ranked there satisfaction with "wait time" and "fare." Appendix J lists the complete

descriptives.

Riders who rode the bus to work or for shopping ranked in the average for all five categories for satisfaction. The group that reported that they rode for the purpose of recreation consistently ranked low in all five of the satisfaction attributes. Students, or the riders that indicated they where traveling to or from school, were the happiest of the bunch ranking satisfaction highest for all five attributes. The two attributes of "wait time" and "fare" should be the only attributes compared, however, since they were the only attributes in the top five importance ranking to be impacted by the purpose of the ride. The highest rankings both "wait time" and "fare" came from students while the lowest for both came from people utilizing the bus for recreation. This might be explained by younger people being more tolerant and complacent with things in general while people riding for recreation are slightly more reluctant to pay and perhaps a little less patient.

The final comparison I made was for the variable "time." This variable from the usage survey asked what time of day do riders primarily travel. This variable can have several impacts on how riders ranked attributes for satisfaction. Comparing the variable "time" with the satisfaction score of the top five responses for importance, I found that three of the five had a significant difference when comparing groups. Below is the table.

Time

		Sum of Squares	df	Mean Square	F	Sig.
Sschedule	Between Groups	14.692	3	4.897	13.813	.000
	Within Groups	99.266	280	.355		
	Total	113.958	283			
swait	Between Groups	2.647	3	.882	4.935	.002
	Within Groups	50.068	280	.179		
	Total	52.715	283			
sfare	Between Groups	3.622	3	1.207	4.929	.002
	Within Groups	68.586	280	.245		

	Total	72.208	283			
sontime	Between Groups	2.403	3	.801	2.041	.108
	Within Groups	109.893	280	.392		
	Total	112.296	283			
Sshelters	Between Groups	4.223	3	1.408	2.925	.034
	Within Groups	134.763	280	.481		
	Total	138.986	283			

The attributes of "wait time" and "fare" were found to be significant again along with schedule. Complete discriptives for this comparison are found in appendix K.

The highest raking for "schedule" and "wait time" came from people who ride primarily in the afternoon while the lowest for all three came from riders who ride mainly in the morning. This might best be explain by people having a euphoric feel from going home in the afternoon while the low ranking might be a result of the opposite. Riders might feel less judgmental and more lenient when heading home from work. On the other hand, riders who haven't had a chance to get their morning coffee might be more irritable and rank satisfaction with more scrutiny. The highest raking for "fare" came from people who ride primarily late night/early morning. Perhaps the $1.25 charge for the CAT bus ride seems slight when compared to alternative transportation costs during the late night/early morning hours.

Conclusion of the Results

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It is the conclusion of this paper and the researcher that the attributes that should be the focus of improvement are "wait times" and "fare." Both of these attributes ranked higher in importance and lower in satisfaction. When compared to certain variables gathered in the usage survey, it was clear to see that some attributes rated in satisfaction were ranked differently when compared to the variables of how often they ride, what the purpose of the ride was and when the primary time of day traveled. Approval or disapproval of characteristics of the CAT bus system can now be highlighted and inferences drawn. These inferences can guide planners and help focus improvements to the system.

LIMITATIONS AND FUTURE RESEARCH

This study has several limitations. First, typically studies that lack true random sampling also lack generalizability. Likewise, the use of this study to draw inferences about causality has been approached from diverse points of view. Second, there is always an implicit tradeoff in experimental design between maximizing causal validity and generalizability (Mamon and Marshall, 1977).

Mainly, as with all self-reported survey, this study was limited by the ability and willingness of riders to participate. It seems that in many cases, the effort to retrieve a pen from one's purse is too much to be dedicated to a survey. Furthermore, respondents sometimes lack the willingness to disclose their true feelings, concerns or perceptions.

Most importantly, there was no attempt made in this study to record the number of riders who refused to participate. Perhaps an analysis of the ratio of riders who agreed to take the survey versus the ones who refused might be useful in future research.

Secondly, the time of year the survey was conducted might have had a direct effect on how riders answered. I conducted this survey in the late fall and the early winter. How riders ranked "wait time" or "shelters" might have been directly effected by the outside temperature. In future research one might consider administering surveys in all four seasons to compare and to control for seasonal effects.

One of the most evident limitations is the use of a convenience sample. Riders were approached as they boarded the bus. Although everyone was asked to participate in the survey, the large number of people that boarded at some stops did not allow for the time needed to explain the survey and its purpose to everyone. Convenience sampling degrades the value of the study by lacking applicability to other areas of the country. True random sampling of riders is needed in future studies.

Another limitation is the missing demographics of riders. Questions on gender, age, sex or race might rove useful in future studies. Demographic information of riders would allow comparisons to similar regions with similar demographics. Along those lines, the survey should also be offered in Spanish. The demographic make-up of the riders in the Valley calls for a bilingual researcher along with an optional Spanish survey. Future studies should include both a voluntary demographics section and Spanish and English surveys.

Given the limitations, it is incumbent upon the researcher to report an effort in regard to the criteria for maintaining credibility, dependability, and transferability of the data and subsequent conclusions (Hoover, 1965). These criteria are similar to the

concepts of internal and external validity, reliability and objectivity (Schutt, 2000). An attempt was made to gain credibility and dependability of the data through triangulation of questions, through validation of the data with the respondents and through interpretations of the data via analysis.

CONCLUSION

The research literature supports the need for ongoing studies of citizen satisfaction and implications on policy making. The research design was exploratory utilizing quantitative measures to address two questions: 1) which attributes of the CAT bus system do citizens feel are most important and 2) how satisfied are the riders with each of these attributes.

This paper represents a study of the public transportation system under the jurisdiction of the Regional Transportation Commission. The study is primarily exploratory in nature. Availability and convenience sampling was used on selecting the participants due to the large sampling frame and the time dedication of a census. The patrons selected expressed general satisfaction with their public transportation system and showed only a slight need for improvement.

For the first research question of which attributes will riders feel are most important, I selected wait time and on-time arrival of the buses as my hypothesis. In fact "schedule" and "shelters" were ranked one and two in importance respectively. Even though my hypothesis was incorrect, the two attributes of "wait time" and "on-time

arrival" did appear in the top five. I did not take into account Las Vegas' hot, sunny weather. "Schedule" was reasonably ranked number one in importance. Before a rider takes any attributes into affect, such as "wait time" and "on-time arrival," the rider must first feel that the bus will match his/her schedule and coincide with daily activities.

The second research question delivered a bigger surprise. Earlier I hypothesized that when asked about how satisfied patrons are with certain characteristics of the CAT bus system, riders might feel the need to rate satisfaction lower, perhaps to "get something off their chest," or to initiate change. However, I did not experience this. Overall, riders of the CAT bus system responded favorably.

On the surface this study was intended to generate information and hypotheses concerning the satisfaction of riders of the CAT bus. Thus this study is a contribution to the area's understanding of the citizen's transportation needs. However, just beyond the scope of the study lies a simple purpose. Throughout this paper, a common theme seems to take shape. It is the idea of people as individuals with needs, each unique and relevant. For the most part decisions are made for us and for the most part that's a good thing. Qualified individuals have been elected to the Regional Transportation Commission through a democratic process and have been charged with the task of making decisions. However it remains important to gather input from the people. Riders of the CAT bus system have a close and intimate relationship with and more importantly knowledge about their bus system. The riders are a unique, invaluable and indispensable resource when it comes to planning for a city's or county's mass transit system.

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