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Methodological Triangulation in Measuring Public Transportation Service Quality

Abstract

In order to develop successful marketing and management strategies, service marketers need to understand how consumers evaluate the quality of their services. However, customer evaluations of service quality are an elusive concept to measure with a single method. The existing literature suggests that triangulation, or the use of multiple methodologies and data sources, would produce more valid and reliable data. This study demonstrates how triangulation can actually be used in measuring transportation service quality. Data are collected from the general public as well as from transportation officials through surveys, critical incident techniques, and focus group interviews. The results identify the areas of transportation activities with which the respondents are currently satisfied or dissatisfied, and determine the relative importance and funding priorities of various transportation services. The consistencies as well as the inconsistencies of the results from the two groups of respondents and from two different methodologies are examined and discussed from a managerial point of view.

In the service marketing area, service quality has been the dominant issue for both researchers and practioners over the past few years (see Fisk, Brown, and Bitner 1993 for a review of the literature). For successful management of service quality, marketers need to understand how customers evaluate their services. Thus, the issue of managing and measuring service quality lies at the heart of the research area. Unfortunately, developing valid and accurate measures of service quality is not a simple task since these measures deal with abstract and intangible services and focus on such latent constructs as perceptions and attitudes in customers' minds. Researchers have attempted to develop such measures over the years, none of which has been completely successful. This lack of success indicates that there is no single best measure for service quality.

The existing literature suggests that triangulation, or the simultaneous use of multiple methods, would be ideal in a case such as transportation service quality (Campell and Fiske 1959; Denzin 1970; Hall and Rist 1999). The rationale for the triangulation is that different measures or methodologies are complementary to each other; weaknesses of one methodology could be overcome by strengths of another, and vice versa. The triangulation entails not only the use of multiple methods, but also the collection of data from multiple sources. The validity and reliability of data would be enhanced by incorporating opinions of people with different positions and from diverse standpoints.

The purpose of this article is to provide a methodological framework that can be used in measuring service quality. The study focuses on public transportation services, which is one of the most important factors in determining quality of life. The Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 ushered in a new era in transportation service planning (Smerk 1992). Since the 1960s, the mission of the Department of Transportation (DOT) has evolved from a very specific operations orientation to a broader, more diverse agenda of information management and long-range planning. ISTEA as a major milestone in this evolution. It opened up new challenges for

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planners to develop techniques and technologies to improve the responsiveness of transportation services to the public's needs. In fact, the past decade has witnessed major changes in traditional travel patterns, demographic patterns, and expectations of the public, as well as shifts in job location from city centers to suburbs. These changes and challenges require transportation planners to develop and adopt new approaches to the management of transportation service quality. However, management of service quality can never be successful without valid and accurate measurement of customers' quality perceptions.

This article reports the results of the two studies that were conducted with different methodologies. In Study 1, telephone surveys were conducted with households and transportation officials. While some research has been conducted specific to airlines and logistics (e.g., Young, Cunningham, and Lee 1994a, 1994b; Hopkins, et al. 1993; Lee and Cunningham 1996; Lee, et al. 1993; Gourdin and Kloppenborg 1991), little research has been conducted on transportation service quality issues by public transportation planning agencies (cf. Pullen 1993; Cunningham, Young, and Kroeter 1995). Thus, specific measures had to be developed for the purpose of this study. In Study 2, a series of critical incident analysis and focus group interviews was performed with several segments of the public and transportation officials to clarify and amplify the results from Study 1. This article explains the research procedure in detail. It also reports and compares findings from the two studies and discusses their implications for transportation planners.

Service Quality and its Measurement

Service Quality

There has been a controversy in the literature over the definition of service quality (see Cronin and Taylor 1992 for a review). The focal point of the controversy is whether perceived service quality is an attitudinal construct or a satisfaction concept; the former is a long-term and pre-purchase concept whereas the latter is a short-term, transaction-specific, and post-purchase concept. This difference in perspective is an important issue from a methodological point of view because the operationalization of service quality depends on its conceptual definition. Unfortunately, the debate over the definition has not been completely resolved. The dilemma stems from the fact that while service quality can be defined as a form of attitude, as many researchers suggest (Bitner 1990; Bolton and Drew 1991a,b; Cronin and Taylor 1992, Parasuraman, Zeithaml, and Berry 1988), it must be measured as a form of satisfaction because it is generally evaluated after purchase and consumption. In other words, service quality can be determined best when one has post-purchase experience with the service. This is why most services fall into the categories of so-called experience or credence quality products (Darby and Karni 1973; Zeithaml 1981). For example, the early version of SERVQUAL, or quantitative scales of service quality (Parasuraman, et al. 1988, 1991), took the form of a satisfaction measure based on the disconfirmation paradigm (Oliver 1977, 1980). According to this measurement paradigm, customers' satisfaction or dissatisfaction with a service is determined by the degree and direction of the gaps between their expectations and actual perceptions of the service provider's performance levels. In sum, the literature implies that service quality is defined as a form of attitude, but measured in the form of satisfaction.

Service Quality Measurement

Quantitative Approach. Perceived service quality, viewed as a type of attitude or a long-run overall evaluation (e.g., Bitner 1990; Cronin and Taylor 1992; Parasuraman, et al. 1988), is formed on the basis of piecemeal evaluation of individual service attributes and features that are integrated to form an overall judgement. This assumption is the basis for multi-attribute measures of service quality, such as the SERVQUAL model (Parasuraman, et al. 1985, 1988, 1991), which uses twenty-two attitude questions to measure perceived quality of tangibles, reliability, responsiveness, assurance, and empathy. Using SERVQUAL, researchers and practioners can determine how current service providers are evaluated by their customers and identify service areas that are relatively important or unimportant to the customers in specific, quantitative terms. In fact, SERVQUAL has gained popularity in measuring service quality in a wide variety of indus-

tries (e.g., Crompton and Mackay 1989; Fick and Ritchie 1991; Johnson, Dotson, and Dunlap 1988; Woodside, Frey, and Daly 1989; Young, Cunningham, and Lee 1994a).

However, SERVQUAL has several limitations (Asubonteng, McCleary, and Swan 1996; Buttle 1996). First, SERVQUAL measures are essentially generic rather than industry-specific. The five dimensions and twenty-two items cannot cover all the industry-specific service areas. Second, SERVQUAL measures focus on the quality of the service process, neglecting that of the service outcome. Third, the measures do not include service costs, which are one of the most important determinants of service value. Finally, the SERVQUAL model is built upon an assumption of multi-attribute evaluations; thus, it does not capture categorical product or service judgements made on the basis of product cues or service incidents (Fiske and Pavelchak 1986; Sujan 1985).

Qualitative Approach. One of the best known qualitative methods for assessing service quality is the critical incident technique (CIT) refined and adopted by Bitner and her colleagues (Bitner, Booms, and Tetreault 1990; Bitner, Nyquist, and Booms 1985). Bitner et al. suggest that service providers should focus on the "critical incidents" that make customers happy or unhappy. Using critical incident analysis, Bitner et al. (1990) categorized particular events and the related behavior of contact employees that caused customers to distinguish satisfactory service encounters from dissatisfactory ones. They proposed that the CIT could be an effective tool in assessing customer satisfaction or dissatisfaction in service encounters. They also pointed out that the technique could assists managers in isolating situations in which employees need various levels of control as well as in defining a range of action alternatives that employees can exercise in such situations.

Another technique that has been widely used is the focus group interview (FGI). A focus group is a meeting that brings together a small group of individuals in an informal setting to discuss a specific set of issues. The group typically consists of eight to twelve individuals who are invited to talk openly about the topic at hand. The back-and-forth nature of the discussion generates many spontaneous comments. From these comments, a great deal of insight can be gained concerning views of the topic.

Although qualitative techniques provide richer and more industry-specific data regarding consumer perceptions of service quality, they have their limitations. Major limitations include (a) the data are hard to analyze, (b) the analysis is susceptible to subjective interpretations due to the unstructured, non-standardized nature of the techniques, and (c) the study results are different to compare (Weiss 1968).

TOWARD A TRIANGULATION

A research methodology is analogous to a kaleidoscope. Just as a kaleidoscope reveals different shapes and colors of objects to the viewer depending on the angle at which it is held, a methodology provides different observations on phenomena for the researcher depending on how it is employed and implemented. That is why triangulation, or the use of multiple methods, has been highly advocated in the literature (Campbell and Fiske 1959; Dunn, Seaker, and Waller 1994; Hall and Rist 1999; Jick 1979; Seaker, Waller, and Dunn 1993). Triangulation can take many different forms (Denzin 1970). Here, we focus on the methodological and data triangulation that is used in the current study.

Methodological Triangulation

Every methodology or approach to a research phenomenon is potentially biased and susceptible to validity threats. The rationale for the methodological triangulation is to use dissimilar methods in measuring the same unit so that weaknesses of one method can be overcome by strengths of another. For instance, researchers using surveys will gather a large amount of data from a variety of respondents within a relatively short period of time. However, one of the common criticisms of survey data is that it does not penetrate very deeply below the surface; breadth is often emphasized at the expense of depth. Such a weakness can be overcome by qualitative methodologies such as in-depth or focus group interviews. For instance, with an in-depth interview, by not constraining the respondent to a fixed set of replies and through careful probing, an experienced interviewer can elicit a more

accurate picture of the respondent's true opinion about a certain issue.

Data Triangulation

This article deals with the perceptions (or evaluations) of service quality. Such evaluations are subjective assessments of an object that can vary across individuals. Moreover, service quality judgements are subject to errors and biases due to the limited capability of human cognition. In fact, over the past few decades, many behavioral decision researchers have examined human judgement and choice and have investigated the factors that cause such biases (see Nisbett and Ross 1980 for a review). One of the types of biases that pertains to the current research is so-called outcome bias, which occurs when an evaluator takes the outcome of a decision into account in a way that is irrelevant to the true quality of the decision (Baron and Hershey 1988). Mowen and Stone (1992) examined the situation where consumers made their judge on the performance of public policy makers. They found that consumers tended to evaluate the decision makers based on the outcomes of the decisions rather than on the quality of the decision per se, especially when the outcomes turned out to be negative. Such an outcome bias can be a source of discrepancy between public policy officials and constituents in their perceptions of decision outcomes. Thus, in order to minimize such a bias and resulting discrepancy, it is important for policy makers to effectively communicate to constituents the process through which their plans were made and carried out.

Transportation service is an outcome of decisions made by public policy officials. This study triangulates not only by methodology but also by data sources. Specifically, data on transportation service quality are gathered from government officials as well as from consumers. Any inconsistency between the perceptions of the two groups of respondents is further analyzed. On the other hand, consistency between the groups is expected to enhance the generalizability of the study results. By incorporating a broader view from two different groups of respondents, the results of the study provide significant methodological and practical insights for researchers and practitioners alike.

Study 1: Surveys

Study 1 employed survey methodology and was conducted in a rocky mountain state. First, transportation services issues were identified via (a) literature search of current concepts and theories, (b) examination of activities by the Department of Transportation, and (c) focus group and personal interviews with public, metropolitan, and regional transportation officials and officials at the state level. These components led to the development of two parallel questionnaires to be administered to households and transportation officials.

Questionnaire Development

A preliminary questionnaire reflecting contemporary transportation issues was developed from a literature search of databases and publications. Other state DOTs were contacted about techniques for measuring public perceptions. Two focus groups and fourteen personal interviews were conducted to critique the questionnaire. After a series of pilot tests, preliminary results were presented to the members of the statewide transportation steering committee for review and comment, and the questionnaire was presented for suggestions. The questionnaire was further refined to a format that could

Table 1. Scale Measurement

Construct	Measurement Scale
Satisfaction	5-point Likert: 1=strongly disagree, 5=strongly agree
Quality of the system	5-point scale: 1=very poor, 5=excellent
Importance of activities	5-point scale: 1=not important, 5=very important
Funding priorities	5-point scale: 1=decrease spending, 3=maintain at current levels, 5=increase spending
Input into decision making Process	5-point Likert: 1=strongly disagree, 5=strongly agree
Air quality issues	5-point Likert: 1=strongly disagree, 5=strongly agree
Carpooling	5-point Likert: 1=strongly disagree, 5=strongly agree

Table 2. Comparison between the Public and Officials in Terms of Their Perceptions of Transportation Services and Issues

Transportation Services/Issues	Public	Officials	*t*-value	*p*-value
Overall Satisfaction	**2.98[a] (1.41)[b]**	2.22 (1.18)	6.97	**.000**
Quality of the System				
Snow removal	3.50 (1.14)	**3.76 (0.82)**	-3.44	**.001**
Convenience	**3.34 (0.98)**	3.16 (0.82)	2.34	**.020**
Safety	3.34 (0.98)	**3.39 (0.87)**	-0.60	.547
Air quality	3.10 (1.17)	**3.16 (1.09)**	-0.61	.542
Parking	2.96 (1.10)	**3.07 (0.92)**	-1.27	.208
Congestion	**2.90 (1.12)**	2.65 (1.08)	2.48	**.014**
Planning and design	**2.89 (1.07)**	2.86 (0.90)	0.36	.721
Road conditions	**2.74 (1.01)**	2.31 (0.74)	6.38	**.000**
Repair and maintenance	**2.71 (1.10)**	2.54 (0.89)	2.08	**.039**
Importance of Activities				
Repair roads	4.39 (0.91)	**4.62 (0.70)**	-3.54	**.001**
Improve air quality	**3.93 (1.32)**	3.36 (1.28)	4.90	**.000**
Synchronize traffic lights	**3.87 (1.39)**	3.57 (1.54)	2.21	**.029**
Incentives for carpooling	**3.60 (1.31)**	2.86 (1.23)	6.59	**.000**
Increase highway capacity	3.20 (1.31)	**3.55 (1.08)**	-3.57	**.000**
Improve bus system	3.05 (1.45)	**3.19 (1.16)**	-1.31	.191
Develop new light rail transit	**3.01 (1.61)**	2.52 (1.37)	3.96	**.000**
Build carpool lanes	**2.93 (1.48)**	2.40 (1.31)	-3.57	**.000**
Funding Priorities				
Potholes	4.15 (0.99)	**4.21 (0.85)**	-0.76	.450
Transportation for elderly/handicapped	**3.99 (0.99)**	3.60 (0.81)	5.18	**.000**
Improve highways	3.70 (1.12)	**4.08 (0.82)**	-4.95	**.000**
Timed stop lights	**3.47 (1.20)**	3.25 (1.21)	2.02	**.045**
Courtesy patrols	**3.38 (1.10)**	3.03 (0.94)	4.04	**.000**
Expanded bus service	3.38 (1.19)	3.38 (0.96)	-0.02	.985
Snow removal	**3.36 (0.96)**	3.32 (0.65)	0.57	.570
Sanding	**3.30 (1.04)**	3.26 (0.78)	0.58	.561
Rail	**3.27 (1.37)**	2.79 (1.27)	4.16	**.000**
Carpool lanes	**3.13 (1.26)**	2.51 (1.03)	6.51	**.000**
New roads	3.02 (1.24)	**3.07 (1.22)**	-0.43	.667
Electronic message on highway signs	**2.83 (1.25)**	2.78 (1.10)	0.00	.718
Input into Decision-Making Process				
Would like more input	3.77 (1.17)	**3.91 (1.04)**	-1.48	.140
Officials provide opportunity to express opinion	3.23 (1.31)	**3.77 (1.23)**	-4.82	**.000**
Air Quality Issues				
Air quality - greater concern than congestion	**3.69 (1.34)**	2.35 (1.15)	12.46	**.000**
Restrict cars and trucks that pollute	3.56 (1.50)	**3.73 (1.18)**	-1.61	.109
Would be willing to pay more for cleaner air	**3.26 (1.54)**	2.91 (1.24)	2.97	**.003**
Drive less because of air pollution	**2.66 (1.42)**	1.76 (0.81)	11.13	**.000**
Carpooling				
Increase carpool incentives (importance)	**3.60 (1.31)**	2.86 (1.23)	6.59	**.000**
Carpool lanes (spending)	**3.13 (1.26)**	2.51 (1.03)	6.51	**.000**
Build carpool lanes (importance)	**2.93 (1.48)**	2.40 (1.31)	4.44	**.000**

[a] mean
[b] standard deviation

be administered as a ten-minute telephone survey.

The questionnaire for the household survey dealt with such issues as (a) overall satisfaction with the transportation system, (b) evaluation of the quality and condition of the system, (c) the relative importance of different transportation aspects and activities, (d) funding priorities, (e) input into the decision-making process, (f) air quality issues, and (g) carpooling. The survey of transportation officials included the same set of questions modified to assess officials' perceptions of how the public felt.

Sampling Frame

The state was partitioned into fifteen transportation planning regions. A disproportionate stratified sampling technique was used that insured a minimum of 100 respondents from each planning region. Regions with higher populations were proportionately represented. A total of 2,020 households were surveyed. During the survey, repeated attempts were made to contact each of the individuals selected for inclusion in the study to minimize not-at-home sampling frame error.

For the transportation officials' survey, a combination of state transportation officials, regional officials, regional elected officials, and regional transportation providers was selected. The state DOT provided a list of transportation officials at the state and regional level, from which a sample of state officials and regional directors was selected. This list was further segmented into the respective state transportation regions. A minimum of two elected individuals, two transportation officials, and two representatives from providers, carriers, and associations were interviewed for each of the fifteen planning regions. A sample of 135 transportation officials was interviewed.

Results

The results of the survey were compiled into the findings organized in the above listed issues. Data were analyzed based on weighted and unweighted means. For weighted means, the proportionate weights are used to adjust for the sample size to population size of each of the regions. The pattern of results based on weighted means was almost identical with that based on unweighted means. Thus, for presentation purposes, the results based on simple, unweighted means are discussed in this article. The public was compared to transportation officials in terms of its perceptions, attitudes, and opinions about the various transportation issues mentioned earlier.

A comparative analysis was performed on selected characteristics of the two groups. Transportation officials were more predominantly male, older, with a higher education level and more average years of residence. These differences were to be expected by the nature of the samples selected. The survey did not ask for the officials' personal opinions or perceptions. Rather, the officials were asked for their evaluation of the public's opinions and perceptions. This is the heart of a gap analysis as developed by Parasuraman, Zeithaml, and Barry (1985).

Table 1 summarizes how the variables in each of the issues were measured, e.g., satisfaction, quality, importance of activities. Table 2 presents means compared by household and public officials. Included is the mean and standard deviation (in parentheses), t-value, and significance test for difference of means. For each pair of variables, the higher mean and significant differences less than .05 are highlighted.

Overall Satisfaction. Overall, the average response to the survey suggested the public was divided evenly into two groups of satisfied and dissatisfied respondents. The officials rated the public's satisfaction significantly lower than the public's perception.

Quality of the System. One of the purposes of the survey was to evaluate the public's view of the current condition of the state's transportation system. For most of the system components, the public's perception and the officials' estimation of the public perception were similar. However, the officials significantly overestimated the public's perception of quality in snow removal. The officials underestimated the public's perception of quality to a significant degree in four areas: convenience, congestion, road conditions, and repair/maintenance.

Importance of Activities. This section of the questionnaire determined the relative importance of transportation service activities. A strong consensus was demonstrated for the repair and maintenance of roads as the state's chief priority. A substantial majority (61.2 per-

cent) felt that this was very important to the state's agenda.

The officials' estimation of the public's perceptions was significantly different from the actual responses in all areas except one: developing a new or better bus system. Officials overestimated the importance to the public of repairing roads and increasing existing highway capacity. In addition, the officials underestimated the importance the public attached to improving air quality, increasing carpool incentives, and developing light rail.

Funding Priorities. Funding priority questions were essential to finding out what system users wanted. The public was most likely to support increased spending on potholes across the state. This was consistent with the importance of repairing roads in the previous section of the survey. The officials' perceptions of the public's spending priorities were generally accurate for potholes, expanding bus service, snow removal, sanding, and electronic message signs. Improving/widening existing highways was the only area that the officials overestimated the public's priorities to a significant degree.

The public was more supportive of rail and carpool lanes. The officials thought the public would like to see funding in these areas decrease. Other areas for which the public would like to see funding at higher levels than the officials anticipated were for timed stop lights, courtesy patrols, and in particular, transportation for the elderly and handicapped.

Input into Decision-Making Process. Two questions on the survey dealt with the public's willingness to have input into the transportation system decision-making process. The public's perception of their opportunity to offer decision-making input was significantly different from what the officials estimated it to be. There was a clear indication that the public did not feel it had as much of an opportunity to express its opinions as the officials thought.

On the average, respondents indicated that local officials provided adequate opportunities for them to express their opinion about transportation issues. The officials' perceptions about the public opinion on this issue were much higher.

Air Quality Issues. A number of questions dealt with how the public perceived air quality. The officials were quite different in their estimate of the public opinion on air quality being a greater concern than congestion. The public strongly agreed with this statement, while the officials indicated they thought the public would disagree. Some consensus existed between the public's response and the officials' views of that response towards restricting polluting vehicles on high pollution days. However, the officials appeared to think there was stronger public consensus on this issue than might actually exist.

The officials underestimated the willingness of the public to pay more taxes for improved air quality. The officials also underestimated the degree to which the public made fewer trips because of air pollution.

Carpooling. As previously shown in the sections on important activities and funding priorities of activities and services, there was support for increasing carpool incentives. However, building carpool lanes was not viewed as an important activity, nor did the pubic seem to want to increase spending on this item. In all cases, public support for the various aspects of carpooling was higher than that perceived by the officials.

Study 2: Critical Incident Analysis and Focus Group Interviews

In the second phase of the research project, a series of respondent group meetings was conducted in each of the state's fifteen transportation planning regions. The purpose of these gatherings was to meet with those who participated in the telephone survey and to explore significant findings in greater detail. In an informal group setting, respondents were asked about critical service incidents that made them satisfied or dissatisfied with the public transportation system, leading them to discuss other relevant issues. Thus, the methodology utilized in this study was a combination of the critical incident technique and focus group interviews. In addition to the public, samples of elected and appointed transportation officials participated in the study. Transportation officials dealt with a set of issues similar to that discussed by the public.

Procedure

Respondents who were involved in the original telephone survey were invited to participate.

Typically, the meetings lasted from one and a half to two hours and were attended by eight to twelve individuals. The questions, discussed in the public's focus group interviews, were derived from the responses to the previous survey and covered topics such as the ratings of transportation service quality, system satisfaction, the importance of transportation activities, funding priorities, decision-making input, air quality, and carpooling. These question items were modified for the transportation officials. At the meeting, participants were presented with regional survey results on these and other topics and asked if they agreed or disagreed with the regional results. The members of the group were asked to explain the regional responses and asked if the responses seemed significantly different from what they had expected. The purpose of these questions was to determine if the survey responses were valid and to find out why residents from a given region placed more emphasis on one issue over another.

Data Analysis

Because of the subjective nature of analyzing the critical incidents and the focus group proceedings, each of the meetings were evaluated and summarized by separate individuals, in an iterative process, to ensure reliability of ratings. The results of each of the regional group proceedings were viewed by three members of the research team. Each evaluator then developed a list of key issues brought up in the meeting. From this list of key issues, a summary report of the meeting was prepared. After preparing the regional summary report, each of the three reviewers evaluated the summary of the other team members. The group then met to review the findings and to reconcile any discrepancies in the individual summaries. From these data, a final report was prepared.

Results

Overall Satisfaction. This issue was brought up only in the citizen focus groups. One of the primary considerations in satisfaction was effective use of state resources. Participants were most satisfied when they saw the state identifying a problem, allocating resources, and implementing a solution quickly and effectively. A prime consideration was that the state should not have to readdress the same issue year after year; participants believed that doing the job right the first time would free up considerable amounts of transportation revenue and significantly reduce waste. Generally, respondents indicated they were satisfied with most aspects of the system, but were dissatisfied with a few specific items.

Quality of the System. This issue was also dealt with only in the citizen focus groups. Each group was asked to review the transportation system quality results of its regional survey and to comment on the results. In the telephone survey, residents were asked to rate the quality of items such as snow removal, parking, road conditions, planning and design, and convenience, to name a few. The overall agreement of focus group members with the ranking of important items from the survey was remarkable. Discussions of system quality tended to center around four major topics: repair and maintenance, congestion, air quality, and safety.

Reactions throughout the state favored much better repair and maintenance of the existing road system. The respondents suggested that less money would be spent on repairs in the long run if more effort were spent on making repairs properly in the first place. Rather than taking the approach of making less expensive but shorter-lasting repairs to roads, participants indicated they would like to see repairs done right the first time, even if it increased short-term costs. The opinions on repair and maintenance were particularly strong in the more rural areas of the state.

Another issue that arose concerned how increased congestion was affecting the transportation system. Increased congestion was the primary reason for calls to widen and improve existing highways in the state. Congestion was viewed as a contributing factor to safety and air pollution problems. Such concerns about increasing congestion were expressed in the major urban areas as well as in smaller towns that were experiencing growth problems. It is interesting to note that building new roads was not seen as important.

Safety was also identified as a specific problem. While tied to proper maintenance and increasing congestion on the highways, safety

was mentioned several times as a specific concern to system users. On a positive note, there was widespread support throughout the state for the quality of snow removal. With very few individual exceptions, focus groups in all the regions indicated that the state did a good job of clearing snow from the roads quickly and efficiently. The only concern raised was the contribution sanding made to air pollution problems.

Importance of Activities and Funding Priorities. Consistent with the survey results, group discussions suggested that the primary areas of public concern were maintaining and improving the existing highway system, better traffic light timing, and better transportation services for the elderly and persons with disabilities.

In the telephone survey, respondents were asked if they would like to see spending increase or decrease for various individual spending items. These items included performing pothole repair, providing transportation for the elderly and persons with disabilities, improving existing roads, building new roads, timing stoplights, providing courtesy patrols, expanding bus service, providing sanding and snow removal, installing electronic highway signs, and installing carpool lanes. The result was a list of eleven areas in which respondents indicated funding should be increased. However, group discussions showed that, when presented with such a ranking of items to be given increased funding, residents would give much higher priority to the top two or three items on the list. Therefore, transportation planners should focus on the top few items on the list when evaluating a region's funding priorities.

In most regions, the top funding priorities were either improving/widening existing roads, providing transportation for the elderly and persons with disabilities, timing stoplights, or performing pothole repair. However, in many cases, when pressed to choose the spending alternatives that should receive priority, respondents rated pothole repair below the other top concerns in the region. Even though, ideally, they supported spending increases for many items, they knew they could not afford the new taxes necessary to increase funding for more than a few of the options. One exception to this general observation was the response from a few smaller locales. In these locales, conditions of most items were viewed as being so bad that residents wanted increased spending in nearly every area. The respondents from these locales did not indicate from where they thought additional revenue would be obtained to fund these large spending increases.

With the exception of pothole repair, the other major funding items remained as priorities upon further investigation. This tendency was especially evident regarding increased spending for the elderly and persons with disabilities. The reason for the strong support was that people tended to view transportation for the elderly and persons with disabilities as an important service that should be made available by society. It should be noted, however, that citizens generally did not understand the real costs associated with making significant upgrades in the transportation system for these individuals.

Other items that were consistently viewed as being top funding priorities were improving and widening existing highways and providing better traffic light timing. Improving existing highways was identified as a priority to alleviate congestion and to improve safety conditions. Better timing of traffic lights was given priority because it was viewed as a low-cost solution that could be implemented quickly and easily to alleviate congestion problems.

In major metropolitan areas, in addition to strong support for spending for the elderly and persons with disabilities, one additional priority was increased funding for mass transit projects. In these areas, mass transit was viewed as one of the best ways to reduce congestion and mitigate existing or projected pollution problems.

Similar to the opinions expressed in the citizen focus groups, transportation officials indicated that one of the state's top transportation priorities should be maintaining the existing highway and road system. They expressed concern that maintenance had been deferred and roads were beginning to deteriorate. They feared this would lead to even higher maintenance and repair cost in the future. However, officials tended to agree that the state's major transportation problems are primarily caused by a lack of available funding.

Input into Decision-Making Process. Citizens wanted more input in the decision-making

process if they could be confident that their concerns would be heard. Many indicated a reluctance to get involved in the process because they felt their input would not be taken seriously by transportation officials. From the comments of discussion group members, the best way to increase the amount of public input into decision making seems to be to ensure that people feel their participation in the process actually makes a difference. Rural areas felt left out of the planning process. Citizens in these parts of the state generally felt that state planners ignored their problems and that the state's transportation resources were allocated on an unfair basis. Feeling persisted that urban areas received an undue share of the state's transportation planning and funding resources.

In rural areas, there was a perception that decision makers on the state level were not really concerned with their problems and that too much attention was given to the major urban areas. This feeling was also widely held in an isolated area where the public felt disenfranchised from the political and decision-making process. There were also calls for the DOT to visit the rural areas of the state and solicit public input. People in such areas even suggested they would support a tax increase to station a DOT representative in the area.

Throughout the state, there was a consensus among the transportation officials in the focus groups that better ways needed to be found to increase public involvement in government decision making. The traditional public meeting was widely viewed as a process that focused only on special interest groups and did not provide decision makers with a clear view of the general public's perspective on important issues.

Officials also noted that it was important to obtain public input early in the decision-making process. The public needed to feel they are having a real effect on decisions and are not being brought in to rubber-stamp decisions that have already been made.

Education programs were brought up as an important aspect of obtaining better public input. The public needed to have a better grasp of the issues surrounding transportation decisions in order to have a more meaningful effect on the planning process. Officials suggested another part of this educational process was to make the findings of public research widely available. A final sentiment was that if citizens felt government was being proactive and was listening to their concerns, they would have a stronger stake in the outcome of the decision-making process.

Air Quality Issues. Air quality was often a significant issue during the group discussions. It was linked to concerns about growth, congestion, and support for mass transit. While the level of concern over air quality varied across the state, this issue was raised to some degree by all regions. The participants' judgement of the air quality throughout the state varied, depending on whether they resided in urban or rural population centers. In the principal metropolitan areas, there was a strong feeling that mass transit needed to be more fully developed to prevent local air quality from deteriorating further. In other urban areas, the perception was that air quality was not currently a problem. However, group members were very concerned that, as their areas grew, air quality would degrade significantly and problems would develop. These concerns were so strong that some participants from these areas supported increasing taxes to pay for air quality programs or improving mass transit to keep additional cars off the roads.

The residents of some of the rural regions also cited air quality as a specific concern. They expressed strong concern that air quality would degrade as traffic and congestion increased with growth and increased tourism. Because air pollution was viewed as being on the increase in these regions, there was also support for increased taxes to pay for air quality improvements or emission inspection programs.

Transportation officials tended to rank air quality as a high priority item. Concerns about air quality were centered on quality of life issues and the attainment of federal standards. For example, in some outlying areas, focus group participants indicated a feeling that such federal air quality standards were not really appropriate in rural settings and placed an undue burden on limited local resources.

Carpooling. Consistent with the findings from the telephone survey, many participants supported the idea of carpooling as a way to alleviate congestion and pollution problems in the more crowded urban centers. However, the support for carpooling was less strong when

addressing specific ways to get more people to use carpools regularly.

In the more rural areas of the state, the perceived benefits of carpooling did not outweigh the additional costs in terms of reduced freedom and personal flexibility. In the urban centers of the state, carpooling was seen as a viable way to reduce congestion problems and to help reduce vehicle emissions.

Most of the suggestions for carpooling incentives centered around tax breaks for businesses that encouraged their employees to use carpools or that provided carpool vans.There was much less support for the building of carpool lanes. Though specified lanes were viewed as an incentive to carpool, the high cost of their construction was the principal reason for the lack of support. This was especially true when the high costs of building carpool lanes were compared with the less tangible benefits of increased carpooling.

Overall, the respondents viewed the primary incentive for carpooling to be the savings in time and money it would provide users in crowded traffic areas. They did not feel that other incentives would increase carpooling aside from the personal rewards of reduced vehicle costs and commute times.

CONCLUSION

This research employed a multiple step, multiple methodology, and multiple data source approach to measuring customer perceptions of service quality in the transportation system. The results from the telephone survey and the qualitative research provide significant insights for transportation planners. They also confirm that quantitative and qualitative research techniques should be used in combination for a more accurate picture of customer perceptions and evaluations of service quality.

The results of Study 1 showed that overall, the public was more satisfied with the current system than officials thought. As expected, however, a number of perceptual gaps were found between the public and transportation policy makers on more specific service aspects and issues. The officials overestimated the public's satisfaction with some areas while they underestimated its perceived importance and funding priorities for others. They also underestimated the public's concern with air quality and carpooling issues in particular. Transportation planners should pay special attention to these areas because such discrepancies will eventually bring about public dissatisfaction and complaints.

Another intriguing finding of the research was that the public wanted to have more input into transportation decision making than it had, and felt that it was not provided as much of an opportunity to express its opinion about transportation issues as the officials thought. The implication of this finding for transportation planners is self-evident: The time is ripe for this type of user survey as a communication channel between the public and the planners. The perceptual gaps observed in the study will be narrowed when the public's needs and wants are communicated clearly to the service designers, and the services, in turn, are adequately provided to the public (Mowen and Stone 1992). In addition, the present type of research should be conducted periodically, so planners can keep track of the trends and changes in the public's transportation needs and perceptions.

Study 2 found that the respondents' general level of knowledge about transportation systems might not always be as high as their level of interest in building or using such systems. This study also found that there was a substantial lack of understanding among the public regarding the state funding allocation process in terms of where the funds for transportation came from or how they were allocated. There was a strong reluctance to pay additional taxes until it was clear that the money would fund special projects.

Respondents in both studies indicated that they would like to have more input into the transportation decision-making process. Transportation planners should consider educating the public on topics such as transportation technologies, building and operating costs, and funding processes. As the public is better educated on transportation issues, they are better able to make meaningful input into the decision-making process and, at the same time, take ownership in the overall process. Thus, transportation officials and decision makers should make every effort to identify and incorporate public needs and opinions into the planning processes. By using the methodologies developed in this research to measure and track transportation service quality, transportation officials can build a true customer-based system.

In conclusion, the methodological/data triangulation approach in measuring service quality offers public policy makers and marketers the opportunity to better understand the customer perceptions of the services they provide. It also allows decision makers to determine the relative importance of the various service dimensions. Armed with this information, service marketers can develop better strategies to make the customer aware and convinced of the quality of their services.

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