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# Transit Passenger Perceptions: Face-to-Face Versus Web-Based Survey

by Laura Eboli and Gabriella Mazzulla

*In this paper, face-to-face and web-based survey methods of collecting transit passenger perception data are compared using two transit customer satisfaction survey tools. Multivariate statistical analyses are applied to determine the differences between the two surveys. Some differences in behavior and attitudes of web survey respondents compared with those from a face-to-face survey are found. The results can help transit agencies manage their bus services to improve passenger satisfaction and service quality.*

## INTRODUCTION

Customer satisfaction surveys are tools for capturing consumer perceptions of service. To meet customer requirements, it is fundamental to provide good basic public services, such as public transport and social security, which are subject to different conditions and performance standards than private sector companies. Capturing passenger perceptions and evaluating customer satisfaction allow transit agencies to improve service quality and maintain passenger loyalty. Moreover, in a regulated market such as public transport, good management cannot be based only on service efficiency and effectiveness (e.g., fare revenues and the number of passengers), but, most of all, service quality as measured by different service attributes. In the first place, a transit service is characterized by frequency, travel time, and route characteristics such as length, number of stops, distance between stops and accessibility to stops, and reliability in terms of schedule adherence. Other important transit service attributes are information provided to users about departure and arrival scheduled times, boarding/alighting stop location, fares, climate control, seat comfort, ride comfort – including the severity of acceleration and braking – odors, and vehicle noise. Cleanliness of vehicles, terminals and stops, safety, and security are also important quality of service measures. Still others are the fare, personnel appearance and helpfulness, environmental protection, and customer services such as ease of purchasing tickets and administration of complaints. Each service attribute plays a part in determining the level of quality of service. As a consequence, passengers' perceptions of the overall service depend on how they perceive the different service attributes.

This paper focuses on the analysis of transit passenger satisfaction regarding an extra-urban bus service used by university students. Data gathering was based on traditional face-to-face interviews and the more innovative Web-based surveys. A comparison of these two different data collection methods is made to highlight the advantages and disadvantages of both surveys. Although Internet surveys using online panels are common, there are few studies that compare the two different surveys, and even fewer studies regarding transit passenger perceptions. Our work aims at the comparison between face-to-face and web-survey interviews, thus filling a gap in the literature. The relevance of this paper is certainly the lack of studies about the topic in the transport sector. In addition, the findings resulting from the comparison of the two surveys can be very useful for transit agencies to manage bus services.

## LITERATURE REVIEW

Traditionally, surveys are carried out by three main methods: face-to-face surveys where the interviewer conducts a personal interview by asking questions of the respondent; telephone surveys where an interviewer conducts a survey by contacting respondents by telephone; and mail surveys

where questionnaires are mailed to sampled individuals who complete and return them by mail (Fricker et al. 2005). Face-to-face and telephone surveys are interviewer-administered methods whereas mail surveys are self-administered (Biemer and Lyberg 2003). In addition, there are new technologies developed in the last decade for communicating and interfacing with respondents in their homes, at work, and during travel (Nicholls et al. 1997). Each method has advantages and disadvantages and its selection is often complex and depends on the objective of the survey, its characteristics, design and methodological issues, and the financial resources available (Biemer and Lyberg 2003).

Face-to-face interviews provide for the maximum degree of communication and interaction between the interviewer and the respondent. Therefore, it is often associated with good quality data and it is preferred by many researchers because it allows long and complex interviews to be conducted, and it is characterized by flexible questions. Owing to the presence of the respondent, the interviewer can gain cooperation, obtain personal information, make direct observations during the interview, record spontaneous reactions, and ensure that the respondent's answers are not affected by the presence of other persons. These surveys are characterized by relatively high response rates and elevated coverage of the general population. Its disadvantage is the tendency of respondents to be more concerned about the interviewer than in providing accurate answers. In fact, interviewers are an important error source in such surveys and tend to affect respondents in different ways. Another disadvantage is "misbehavior by interviewers" (Kiecker and Nelson 1996) and refers to activities that are dishonest. A face-to-face interview is usually more expensive than the other methods of data collection since it requires the interviewer to visit or meet the respondents at home, work, or public places. This fact usually requires more time and personnel resources.

A telephone interview has not always been accepted as a good data collection method for social and economic research. The increased interest in this approach, however, is its lower cost and the increased coverage of the targeted population (Biemer and Lyberg 2003). Groves and Kahn (1979) show that it can provide comparable quality data to those from face-to-face surveys. Indeed, both face-to-face and telephone interviews have very similar characteristics in that they can create interviewer variance and social desirability bias which describes the tendency of respondents to reply in a manner that will be viewed favorably by others. However, the literature suggests that these effects are somewhat less in telephone surveys than in face-to-face interviews and that social desirability bias might be less in telephone interviews than in face-to-face interviews because of the anonymity of the interviewer. Also, telephone interviews are less complex and considerably shorter than face-to-face interviews, with most lasting 30 minutes or less. Typically, their response rates are lower than in face-to-face surveys of comparable type and size (Biemer and Lyberg 2003).

Today, face-to-face and telephone interviews are increasingly conducted using CAI (Computer-Assisted Interviewing) technology and its variants, CAPI (Computer-Assisted Personal Interviewing) and CATI (Computer-Assisted Telephone Interviewing), where the interviewer asks questions and enters the respondent's answers using a computer program. As discussed by Groves and Tortora (1998), the theoretical and logical advantages associated with CAI are not always supported by data. Nevertheless, studies show clear reductions in indicators of measurement error and item non-response rates in such methods.

The major advantage of the presence of interviewers is that it ensures respondents understand the questions and a uniform interpretation of the question leads to more accurate responses (Conrad and Schober 2000). However, its major disadvantage is the possibility of having biased results (Beatty 1995) unless each interviewer handles and interprets each question in exactly the same manner. Interview methods such as mail and Web-based surveys that do not use interviewers have different features. For example, in a mail survey, because there is no interviewer, the questionnaire and instructions are made easy to understand. To a much greater extent, the quality of data from non-interviewer surveys hinges on the quality of the questionnaire design. However, mail surveys may have some advantages in terms of lower cost and reduced risks of social desirability bias associated with self-administration caused by the privacy involved in completing the questionnaire. In addition,

the response rate to mail surveys can vary considerably depending upon the experience, skill, and knowledge of the survey organization. Also, the response rates are lower than in interviewer-assisted surveys, they have a greater risk of considerable item non-response rates, and require a long time to get acceptable response rates. In addition, it is not possible to ensure that the intended people complete the questionnaire or that the respondent does not collaborate with others.

The increasing popularity and wide availability of World Wide Web technologies provide researchers with a new data collection method called web survey. This method uses the internet to collect data from sampled populations (Al-Subaihi 2008) by interactive interviews or by questionnaires purposefully designed for self-completion. For example, electronic one-to-one interviews can be conducted via e-mail or chat rooms. Questionnaires also can be administered by e-mail (e.g., using mailing lists), postings to newsgroups, or using fill-in forms (Eysenbach and Wyatt 2002) on the Internet. Over the last 10 years, Web-based surveys have become widely used in the social sciences and educational research (Couper 2000), and a further increase is expected since it allows access to a large number of potential respondents (Couper 2000, Loosveldt and Sonck 2008).

Web survey design focuses more on programming ability and web page design rather than traditional survey methodology (Couper 2001). As Al-Subaihi (2008) reports, the effects of variables related to web survey on response rates and data accuracy have been of interest to researchers and applied statisticians and continue to receive considerable attention in the survey methodology literature. (See, for example, Coomber 1997, Cook et al. 2000, Couper 2000, Dillman and Bowker 2001, Ganassali 2008, Converse et al. 2008.) Web surveys, however, have been suggested to be far from perfect (Gorman 2000). That is, their non-response rates and coverage errors may be high (Couper 2000) and respondents may falsify their demographic information. The use of panels specifically recruited for online research though can mitigate these weaknesses (James 2003). Like mail surveys, they are cheaper to do and less time consuming than interviewer-administered surveys.

In addition to web-surveys, a number of computerized versions of self-administered interviews have been developed, such as Disk By Mail (DBM) and Electronic Mail Survey (EMS), Touch-tone Data Entry (TDE) and Voice Recognition Entry (VRE), Computer-Assisted Self-Interviewing (CASI) with its variants Audio CASI (or ACASI), and Telephone Audio CASI (T-ACASI). A description of these methods is in Ramos et al. (1998) and an extensive literature review of web surveys is reported in Schonlau et al. (2002). Al-Subaihi (2008) also presents an interesting literature review based on technical factors (method of presentation, graphics, or colors), methodological factors (cost, coverage sampling, and validity), and social factors (social behavior variables such as age, gender, ethnicity, level of education).

Some studies compare different survey methods. For example, Bonnel and Le Nir (1998) compare face-to-face and telephone interviews; telephone and mail surveys are compared in Walker and Restuccia (1984) and Coderre et al. (2004). Al-Subaihi (2008), Braunsberger et al. (2007), and Fricker et al. (2005) compare telephone interviews and Web surveys while Cobanoglu et al. (2001) and McDonald and Adam (2003) compare mail interview and Web surveys. While these comparisons provide useful information, except Heerwegh and Loosveldt (2008) and Bayart and Bonnel (2008), little research has been done to compare Web-based and face-to-face interview surveys. And the only such work regarding transport services is by Elmore-Yalch et al. (2008) who analyzed passenger perceptions collected by telephone interviews and compared them with similar data collected by Web surveys. Because not much has been done on this comparison in transport, this study fills a gap in the literature.

## **METHODOLOGY**

### **Survey**

In this paper, customer satisfaction data about transit are collected by face-to-face and Web-based interviews. A face-to-face survey was conducted in 2006 using a sample of users of an extra-urban bus line connecting some towns in the province of Cosenza located on the Tyrrhenian coast with the University of Calabria in Cosenza, South Italy. Bus service is supplied by one of the largest transit agencies operating in the province. The bus line covers a distance of about 103 km, and the route has about 40 stops. The service spans 12 hours, from 6:00 a.m. till 6:00 p.m. and service frequency is less than one run per hour. The price of a one-way ticket varies with distance, from a minimum of about 1.50 Euros to a maximum of about 4.50 Euros. Rail transit services are not available in the study area and mode choice is very much inclined toward the private car. In 2006 the transit agency sold about 280,000 tickets and 2,400 weekly or monthly travel cards. About 1,000 University students daily reach the campus from the Tyrrhenian coast by bus service.

The Web-based survey was conducted in 2008 and was addressed to all students of the University of Calabria who lived in the province of Cosenza and used the extra-urban bus services to access the campus. While some students used these transit services daily, others used them to go home on weekends.

### **Questionnaire Design**

The questionnaire is made up of about 50 items grouped into three sections (see the Appendix). The first section aims to collect some socio-economic data about the passengers interviewed, such as age, gender, major course of study, post graduate classification, place of residence, family income, number of family members, car driving license and number of owned cars, car availability, etc. The second section collects data about boarding/alighting, access/egress transport mode, access/egress travel time, waiting time, time on board, bus ticket and fare. In the last section, respondents were asked to rate the importance of and their satisfaction with 16 service attributes, in addition to a request for them to rate their satisfaction of the overall service. The service attributes are availability of a bus stop near home, route, service frequency, reliability of runs in terms of schedule adherence, reliability of runs in terms of on-time service, availability of shelter and benches at bus stops, availability of seats, cleanliness of vehicle interior, seats, and windows. Others are ticket cost, availability of schedule/maps at bus stops, availability of service information by phone or Internet, vehicle reliability, competence of drivers, security against crimes at bus stops, personnel helpfulness, administration of complaints, and the physical conditions of bus stops.

In the face-to-face survey, an interviewer administered a paper questionnaire to a sample of 150 users at the bus terminal at the university campus. The questionnaire was completed in five to eight minutes by each respondent. In a second survey, an invitation to complete a Web-based questionnaire was sent to 9,900 students using the e-mail addresses provided by the university. Of these, 329 responded giving a response rate of 3.32%. This low rate is because many of those not responding did not use transit services or their e-mail addresses provided by the university were wrong. Of the 329 responding, 251 (76.3%) completed the questionnaire well enough for their responses to be included in the study. The other 78 (21.7%) could not be considered because they did not specify the bus service used. Some of the interviews (92 out of the 251 who participated in the Web-based survey) were completed by passengers traveling on the same bus lines as those interviewed in the face-to-face survey.

The descriptive statistics in Table 1 show the two samples are similar with most of the respondents being female, younger than 22 years old, and belonging to middle income-class families. The average number of people in a respondent's family is about four (4.35 for face-to-face respondents and 4.07 for online ones) while the average number of people with drivers licenses is

about three (3.24 for face-to-face respondents and 3.18 for online ones). Finally, the average number of cars per family is 1.9 in both cases.

**Table 1: General Characteristics of the Respondents**

Characteristic	Value	Face-to-face survey (150 respondents)		Web-based survey (92 respondents)	
		(%)	Item response rate (%)	(%)	Item response rate (%)
Gender	Male	37	100.0	34	93.5
	Female	63		66	
Age	up to 22 years	43	100.0	55	90.2
	from 22 to 24 years	39		28	
	from 24 to 27 years	11		9	
	over 27 years	7		8	
Family size		4.35		4.07	
Family income level*	Lower	20	100.0	19	91.3
	lower-middle	16		27	
	Middle	52		44	
	upper-middle	9		7	
	Upper	3		3	
Faculty	Arts	14	100.0	15	92.4
	Economics	29		20	
	Engineering	23		20	
	Math., Phys. and Nat. Science	13		18	
	Pharmacy	11		11	
	Politics	8		10	
	Inter-faculty	2		6	
Family members	3 or less	17	100.0	27	92.4
	4	43		45	
	5 or more	40		28	
Members with driving license	2 or less	25	100.0	21	92.4
	3	35		46	
	4 or more	40		33	
Number of cars per family	1	29	100.0	24	90.2
	2	51		60	
	3 or more	20		16	
	Average	3.24		3.18	
Car driving license ownership	did not own car driving license	3	100.0	3	92.4
	own car driving license	97		97	
Car availability	did not own car	53	100.0	74	90.2
	own car	47		26	
Ticket/card	one-way ticket	0	100.0	22	100.0
	one-day travel card	99		73	
	weekly travel card	0		0	
	monthly travel card	1		5	
Travel time	minutes	48		52	
Travel time including access and egress times	minutes	73		57	

\*The lower level is to 1,000 Euros, the lower-middle from 1,000 to 2,000 Euros, the middle from 2,000 to 4,000 Euros, the upper-middle from 4,000 to 5,000 Euros, the upper is over 5,000 Euros. The classes of income refer to net monthly income of a family unit.

Transit users were asked to specify their travel times to the university by bus. The reported average travel time in the face-to-face survey in Table 1 is about 48 minutes, while it is about 52 minutes for those who completed the Web-based survey. Although these times are comparable, there are notable differences, such as the average total travel time including waiting and access/egress times, which are about 73 minutes for those in the face-to-face survey and 57 minutes for the others in the Web-based survey. The travel times of those in the face-to-face interviews are reliable compared with the travel times of those in the Web survey. This is because those in the Web survey did not understand the difference between total travel time and on-board travel time, given that many of them gave similar values for both. Examining the item responses the face-to-face survey does not produce loss of information, while for each item statement there are 6%-10% non-respondents in the Web-based survey.

### **Analytical Techniques**

To determine the differences between the samples in the face-to-face and Web-based surveys, three analytical techniques were employed. Paired *t*-test was used to compare the means of the variables in the two surveys. Specifically, it was used to test the significance of the differences between the sample means in the face-to-face and Web-based surveys regarding the importance and satisfaction ratings of the service quality attributes. The null hypothesis is that there are no differences between the two observations. If the probability associated with a *t* value is low ( $< 0.05$ ), there is evidence to reject the null hypothesis.

Next, the Fisher *F*-test is used to compare the variances in the two surveys by testing the null hypothesis that the different populations responding to the surveys have the same variance. More specifically, this method tests the significance of the differences between the sample variances of the ratings expressed by users in the face-to-face and Web-based surveys. Finally, discriminant analysis is used to predict membership in the groups responding to the face-to-face and the Web-based interviews on the basis of a linear combination of some of the variables in Table 2. This multivariate statistical technique allows the variables that discriminate between the two surveys to be identified.

### **FACE-TO-FACE IN COMPARISON TO WEB SURVEY**

In both surveys, the respondents expressed their feelings about level of service by rating its importance and their levels of satisfaction with the service. The survey used 16 service quality variables and a numerical scale ranging from one to 10. The service characteristics and their descriptive statistics are in Table 2. While the face-to-face survey provided ratings by all the passengers interviewed, in the Web-based survey there were six non-responses on average for each service attribute both for importance and satisfaction rating. The attribute, administration of complaints, is the least rated in terms of importance with an item response rate of 88%. The averages of the ratings of importance in the face-to-face survey are higher than the ratings in the Web-based survey. In the face-to-face survey, the attribute with the lowest importance rating is “availability of service information by phone and internet” and the highest rated item is “vehicle reliability and competence of drivers.” The overall average rating of importance from the face-to-face survey is 8.62 compared with 7.68 for the Web-based survey. For each service attribute there is almost a difference of one point between the rating based on the face-to-face and the Web-based survey.

The *t*-test test shows that the averages of the importance ratings are dissimilar in both surveys except for reliability of runs and information through telephones and the Internet etc. (See Table 3.) From Table 2 there are some attributes whose satisfaction ratings are higher in the face-to-face survey than in the Web survey. These include security and personnel helpfulness. The attributes for which the satisfaction ratings are lower in the face-to-face interviews are reliability in terms of on-time performance and availability of schedules or maps at bus stops. In both surveys the average rating of satisfaction is about 6.5. However, in the face-to-face survey, the range of the average

satisfaction rating is from 3.63 (“availability of shelter and benches at bus stops”) to 8.49 (“security against crimes at bus stops”). In the Web-based survey the range is from 4.74 (“physical condition of bus stops”) to 7.46 (“vehicle reliability, competence of drivers”). The service attributes, schedule adherence, vehicle reliability, and competence of drivers are rated similarly in both surveys. A *t-test* of differences of means confirms the same average satisfaction ratings in both surveys. Other service attributes with similar average satisfaction ratings as the overall average are the availability of a bus stop near home, service frequency and reliability of runs, bus cleanliness, vehicle reliability and driver competence, the administration of complaints, and the physical condition of bus stops.

**Table 2: User Perceptions of Services**

	Face-to-face survey				Web-based survey			
	Importance rates		Satisfaction rates		Importance rates		Satisfaction rates	
	mean	st. dev.	mean	st. dev.	mean	st. dev.	mean	st. dev.
Service attributes								
Availability of bus stop near home	8.99	1.25	6.53	2.69	7.66	2.69	6.27	2.66
Path	8.42	1.40	7.32	1.79	6.91	2.24	6.74	2.29
Service frequency	8.93	1.09	7.50	1.62	8.14	2.46	7.21	2.18
Reliability of runs that come on schedule	8.56	1.23	5.81	1.69	8.53	1.95	7.40	1.96
Reliability of runs that come on time	8.83	1.12	6.46	2.16	8.20	2.11	6.48	2.37
Availability of shelter and benches at bus stops	8.21	1.41	3.63	2.14	7.17	2.69	4.87	2.48
Availability of seats	8.85	1.12	7.31	2.11	7.92	1.89	6.25	2.31
Cleanliness of interior, seats and windows	9.08	1.06	6.88	2.01	8.21	1.91	7.33	2.12
Ticket cost	8.63	1.10	7.24	1.64	7.45	2.39	6.56	2.15
Availability of schedule/maps at bus stops	8.27	1.30	3.74	2.19	7.18	2.42	6.17	2.67
Availability of service information by phone, internet	7.75	1.38	5.43	2.20	7.44	2.27	6.43	2.43
Vehicle reliability, competence of drivers	9.61	0.76	7.45	1.67	8.65	1.86	7.46	1.95
Security against crimes at bus stops	9.32	1.24	8.49	1.59	7.98	2.37	7.00	2.58
Personnel helpfulness	8.42	1.27	7.93	1.71	7.47	2.32	6.72	2.39
Administration of complaints	7.94	1.32	6.31	1.60	7.25	2.35	5.88	2.39
Physical condition of bus stops	8.11	1.38	5.10	2.07	6.68	2.48	4.74	2.44
Overall service			7.24	0.97			6.95	1.54



**Table 3: Tests of Differences of Means and Equality of Variance**

Service attributes	t-test of differences of means		Fisher F-test of the equality between the variances	
	Importance	Satisfaction	Importance	Satisfaction
	rates*	rates*	rates**	rates**
Availability of bus stop near home	5.23	n.s.*	0.22	1.02
Path	6.48	2.20	0.39	0.61
Service frequency	3.46	n.s.*	0.20	0.55
Reliability of runs that come on schedule	n.s.	-6.70	0.40	0.74
Reliability of runs that come on time	3.04	n.s.*	0.28	0.83
Availability of shelter and benches at bus stops	3.92	-4.11	0.27	0.74
Availability of seats	4.81	3.65	0.35	0.84
Cleanliness of interior, seats and windows	4.56	n.s.*	0.31	0.90
Ticket cost	5.20	2.79	0.21	0.58
Availability of schedule/maps at bus stops	4.55	-7.70	0.29	0.67
Availability of service information by phone, internet	n.s.	-3.31	0.37	0.82
Vehicle reliability, competence of drivers	5.62	n.s.*	0.17	0.73
Security against crimes at bus stops	5,78	5.54	0.27	0.38
Personnel helpfulness	4.10	4.59	0.30	0.51
Administration of complaints	2.94	n.s.*	0.32	0.45
Physical condition of bus stops	5.73	n.s.*	0.31	0.72
Overall service	-	n.s.*		0.40

(\*) Not significant at a level of 5% ( $t=2.10$ ); (\*\*) not significant at a level of 5% ( $F=1.27$ ,  $df(\text{num}) = 91$ ,  $df(\text{den}) = 149$ )

Additional information can be obtained by analyzing the variability of the ratings of importance and satisfaction. This analysis shows that user ratings are nearly the same in the face-to-face survey, and the variance of the importance ratings of all the 16 service attributes is higher for the web-based survey than for direct interviews (Table 2). This is similar to what was obtained for the satisfaction ratings of the attributes except availability of bus stop near home. The different levels of similarity in user perceptions are also confirmed by the tests of equality of the variances of the two samples using the Fisher *F-test* (Table 3). The obtained values of the test suggest that the equality of variance test is not significant. Therefore, we surmise that the variances of the two groups of respondents are significantly different.

Discriminant analysis was used to provide more statistically accurate results to support the findings. We applied discriminant analysis to both the importance and satisfaction ratings expressed by the users about the service quality attributes. A summary of the statistical tests regarding the canonical discriminant function is shown in Table 4. This function shows an eigenvalue of 1.266 for the analysis based on the importance ratings and 2.079 for the analysis based on satisfaction ratings. An eigenvalue compares between group variance to within group variance. So, a large eigenvalue is associated with a model that explains a large proportion of between group variance compared to within group variance. The canonical relation represents a correlation between the discriminant

scores and the levels of the dependent variable (importance ratings of face-to-face and Web-based surveys). The values of correlation obtained are 0.748 and 0.822 respectively, which are high and show that the function discriminates well between the two survey methods.

Wilks' Lambda is the ratio of within-groups sums of squares to the total sums of squares. This is the proportion of the total variance in the discriminant scores not explained by differences among groups. A Lambda value of one is obtained when the observed group means are equal (i.e., all the variance is explained by factors other than the differences between those means), while a small Lambda occurs when within-groups variability is small compared with the total variability. A small Lambda indicates that group means appear to differ. The associated significance value indicates whether or not the difference is significant. We obtained a Wilks' Lambda of 0.441 for importance ratings and of 0.325 for satisfaction ratings, which are significant at the 0.000 level. Thus, the average importance ratings significantly differ between the two samples as well as the average satisfaction ratings.

The canonical discriminant function coefficients show the standardized independent variables included in the discriminant equation. The results indicate that the differences between the samples are more evident for the importance ratings of routes, reliability of runs, ticket cost, and availability of schedules/maps at bus stops, availability of service information by phone, internet, vehicle reliability, and security against crimes at bus stops. The most discriminating variables among the two samples of respondents expressing satisfaction are service frequency, reliability of runs, availability of shelter and benches at bus stops, availability of schedule/maps at bus stops, availability of service information by phone, internet, security against crimes at bus stops, personnel helpfulness, and administration of complaints.

The top and bottom parts of Table 5 summarize the numbers and percentages of those in the face-to-face interview and the Web-based survey correctly and incorrectly classified. The results show that 91.3% of the grouped cases are correctly classified into "face-to-face" or "online" groups (importance ratings). Face-to-face respondents were classified with better accuracy (98.0%) than online respondents (79.0%). Regarding satisfaction ratings, the percentage of correctly classified cases increases to 95.6% (Table 5). In this case, face-to-face respondents were classified with slightly better accuracy (97.3%) than online respondents (92.1%). A total of 21 observations in the analysis based on the ratings of satisfaction and 16 based on the ratings of importance were excluded because of lack of at least one discriminant variable.

Other results can be obtained from analyzing the difference between the importance and satisfaction ratings of each service attribute. It is found that this gap is higher for the data collected by personal interviews and that the ratings of satisfaction expressed by the Web survey participants are closer to the ratings of importance they expressed. Passenger perceptions about the overall service are very similar between the two types of surveys. In fact, the passengers interviewed in the face-to-face survey expressed an overall satisfaction of 7.24, while those interviewed in the Web survey gave overall satisfaction of 6.95 (Table 2). According to the *t-test* this difference is statistically significant at a level of significance of 95%.

Another overall measure is provided by the Customer Satisfaction Index (CSI), which is an index of service quality calculated as the sum of the average satisfaction rating of each attribute weighted by the respective average importance rating. A similar index, the Heterogeneous Customer Satisfaction Index (HCSI), takes into account the heterogeneity in user perceptions by means of the variance of the importance and satisfaction rates (Eboli and Mazzulla 2009). CSI is similar for the two types of surveys: for face-to-face survey it is 6.49, whereas it is 6.51 for the Web-based survey. On the contrary, HCSI is 7.56 for the face-to-face survey data, and 7.26 for the Web-based survey. This difference can be explained by the heterogeneity of user perceptions.

**Table 4: Summary of the Results About Canonical Discriminant Function**

<b>Importance rates</b>				
Eigenvalues	Eigenvalue	% of Variance	Cumulative %	Canonical correlation
	1.266	100.0	100.0	0.748
Test of function	Wilks' Lambda	Chi-square	Df	Sig.
	0.441	176.3	7	0.000
Discriminant variables			Standardized coefficients	Correlation values
Path			0.443	0.404
reliability of runs that come on schedule			-0.287	0.015
ticket cost			0.222	0.388
availability of schedule/maps at bus stops			0.307	0.224
availability of service information by phone, internet			-0.874	-0.261
vehicle reliability, competence of drivers			0.469	0.489
security against crimes at bus stops			0.475	0.448
<b>Satisfaction rates</b>				
Eigenvalues	Eigenvalue	% of Variance	Cumulative %	Canonical correlation
	2.079	100.0	100.0	0.822
Test of function	Wilks' Lambda	Chi-square	Df	Sig.
	0.325	233.9	8	0.000
Discriminant variables			Standardized coefficients	Correlation values
service frequency			-0.271	-0.079
reliability of runs that come on schedule			0.214	0.275
availability of shelter and benches at bus stops			0.355	0.422
availability of schedule/maps at bus stops			0.381	0.416
availability of service information by phone, internet			0.272	0.317
security against crimes at bus stops			-0.603	-0.540
personnel helpfulness			-0.385	-0.457
administration of complaints			0.244	0.098

**Table 5: Classification Results**

<b>Importance rates*</b>				
		Predicted Group Membership		
	Group variable	online	face-to-face	total
Count	online	64	17	81
	face-to-face	3	147	150
%	online	79.0	21.0	100.0
	face-to-face	2.0	98.0	100.0
<b>Satisfaction rates**</b>				
		Predicted Group Membership		
	Group variable	online	face-to-face	total
Count	online	70	6	76
	face-to-face	4	146	150
%	online	92.1	7.9	100.0
	face-to-face	2.7	97.3	100.0

(\*) 91.3% of importance grouped cases correctly classified

(\*\*) 95.6% of satisfaction grouped cases correctly classified

## CONCLUSION

The aim of this research is to determine significant differences or similarities in behavior when passengers are asked to provide their perceptions about their use of transit services through two types of surveys. These perceptions were collected from face-to-face and Web-based surveys addressed to users of an extra-urban bus service. No particular differences regarding socio-economic characteristics were observed in the two samples. These results contrast others where those interviewed in the Web survey were generally younger and had higher household incomes than those interviewed by traditional survey methods. However, our findings are different because both samples are university students belonging to middle income families.

More interestingly, there is a significant difference in the judgments of importance in the surveys. For almost all the service attributes analyzed, the average rating of importance in the face-to-face interview survey is higher than the average rating in the self-administered survey. These results suggest that when users personally express their judgments of importance to an interviewer, they tend to give more importance to service characteristics than when they complete the questionnaire alone. Also, users have a different threshold of importance depending on the type of survey. These differences were not observed for the satisfaction judgments. In fact, there are some attributes for which satisfaction ratings are higher in the face-to-face interview and others for which they are lower. Moreover, passenger satisfaction about overall service is very similar between the two types

of surveys. These results contrast the findings of Elmore-Yalch et al. (2008) that respondents of Web surveys are more satisfied with service than respondents of telephone surveys.

Further results highlight the most significant discriminating service attributes between the two different types of surveys, confirming some results of the descriptive analysis. From this analysis there are important differences between the two samples of passengers. In fact, it emerges that the differences between the samples are more evident for the importance ratings of service aspects like route, reliability of runs, ticket cost, and availability of service information. For the satisfaction ratings the differences between the samples regard service frequency, reliability of runs, facilities at bus stops and availability of service information. Another important finding is that the ratings of satisfaction expressed by the Web survey are closer to the ratings of importance. Perhaps users did not understand the difference between importance and satisfaction, or their ratings of importance and satisfaction are mutually influenced. This is also shown by observing that for the data collected by Web survey the classification of the service attributes according to the ratings of importance is similar to the classification according to the ratings of satisfaction.

From the analysis of heterogeneity in user judgments, the data collected from the face-to-face surveys could be considered more reliable than those from the self-administered interviews. These results can be considered useful contributions to the analysis of the differences in behavior and attitudes of respondents depending on the type of survey. Despite the Web survey being cheaper and less time consuming to conduct than the face-to-face survey, the data collected by the face-to-face survey are more accurate owing to the presence of interviewers who ensured respondents understood the questions. Based on the findings, we recommend asking users only satisfaction ratings when a Web-based data collection method is adopted in customer satisfaction surveys. The Web-based survey, however, can be considered a valid and convenient alternative to traditional face-to-face interviews, especially when customer satisfaction surveys are addressed to groups of people belonging to public or private corporations like universities.

## APPENDIX: The Questionnaire

### SURVEY ABOUT THE SERVICE QUALITY OF THE EXTRA-URBAN BUS SERVICES TO THE UNIVERSITY CAMPUS OF CALABRIA

Survey date

mm/dd/yy

#### SOCIO-ECONOMIC CHARACTERISTICS

Please, provide the requested information about your personal and family socio-economic characteristics in the appropriate boxes below:

Age

Gender

- male  
 female

Faculty

- Arts  
 Economics  
 Engineering  
 Mathematics, Physics and Natural Science  
 Pharmacy  
 Politics  
 Inter-faculty

Car driving license ownership

- yes  
 no

Place of residence

Number of family members

Monthly net family income

- up to 1,000 Euros  
 from 1,000 to 2,000 Euros  
 from 2,000 to 4,000 Euros  
 from 4,000 to 5,000 Euros  
 over 5,000 Euros

Number of owned cars

Number of family members with car driving license

Car availability

- yes  
 no

Transit Passenger Perceptions

**TRAVEL HABITS**

Now, provide the requested information about your travel habits in the appropriate boxes below:

Transit agency

Bus line

Bus stop of boarding

Access transport mode

- Walking
- Motorcycle
- Car as a driver
- Car as a passenger
- Bus
- Other

Bus stop of alighting

Egress transport mode

- Walking
- Motorcycle
- Car as a driver
- Car as a passenger
- Bus
- Other

Total travel time (min)

Access travel time (min)

Waiting time (min)

On board time (min)

Transfer waiting time (min)

Egress travel time (min)

Bus ticket/card

- One-way ticket
- One-day travel card
- Weekly travel card
- Monthly travel card

Ticket/travel card cost

**TRANSIT SERVICE QUALITY**

Below are some transit service quality factors.

Please, check the box which most accurately reflects how satisfied or dissatisfied you are with each item (1 totally dissatisfied, 10 totally satisfied), or check the N/A box if it is not relevant to you.

Service quality factor	N/A	1	2	3	4	5	6	7	8	9	10
availability of bus stop near home	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
path characteristics (n. of bus stops, distance between stops)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
service frequency	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
reliability of runs that come on schedule	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
reliability of runs that come on time	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
availability of shelter and benches at bus stops	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
availability of seats on board	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
cleanliness of interior, seats and windows	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
ticket cost	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
availability of schedule/maps at bus stops	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
availability of service information by phone, mail, internet, etc.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
vehicle reliability and competence of drivers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
security against crimes at bus stops	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
personnel helpfulness	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
administration of complaints	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
physical condition of bus stops	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>overall service</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Now, check the box which most accurately reflects how important or unimportant the various factors are to you (1 of no importance at all, 10 extremely important), or check the N/A box if the item is not relevant to you.

Service quality factor	N/A	1	2	3	4	5	6	7	8	9	10
availability of bus stop near home	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
path characteristics (n. of bus stops, distance between stops)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
service frequency	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
reliability of runs that come on schedule	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
reliability of runs that come on time	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
availability of shelter and benches at bus stops	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
availability of seats on board	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
cleanliness of interior, seats and windows	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
ticket cost	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
availability of schedule/maps at bus stops	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
availability of service information by phone, mail, internet, etc.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
vehicle reliability and competence of drivers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
security against crimes at bus stops	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
personnel helpfulness	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
administration of complaints	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
physical condition of bus stops	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>overall service</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



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