Quality Monitoring in Public Transportation using Internet Panel Surveys

Ebtihal Sheety[1], Ayelet Gal-Tzur[1], Shlomo Bekhor[2]

Quality monitoring in public transport (PT) relies heavily on surveys to collect data on users' perceptions of PT service quality (Furtado et al., 2017). While surveys are a robust and flexible tool for data collection, they face major challenges from societal and technological developments (Couper, 2017). Within the PT sector, there is considerable interest in replacing traditional on-board paper-based surveys, on which most PT services still rely, with new, ICT-based approaches that might lower costs or generate better quality data (Agrawal et al., 2017). The main concerns associated with these surveys are ensuring sample representativeness and the quality of the data obtained. The "mode effect" – i.e., the influence of using different survey methods that can lead to different results – is not yet fully resolved in the field of transportation. Little research has been conducted to validate alternative data collection methods, in particular in relation to service quality benchmarks, quality perceptions, and satisfaction with transportation (Agrawal et al, 2017).

This study assesses the potential of an Internet Panel (IP) as a means of obtaining data from transit passengers via questionnaires that assess their perceptions of service quality and levels of satisfaction. The IP method is characterized by relatively simple logistics, cost effectiveness, and quick access to large and diverse samples. Moreover, it provides an ability to increase the reliability of ongoing monitoring by periodically interviewing the same people.

We assessed the validity of this collection mode by comparing its results to those of an on-board survey conducted for the BRT system of the Haifa metropolis. An on-board customer satisfaction survey is conducted yearly by Yefe Nof Transportation, Infrastructure Constructions LTD. The comparison here presented is based on the 2016 survey.

The questionnaire used for the IP followed the general framework of the on-board survey. The respondents were first asked to provide socio-demographic data and information regarding the frequency of using the BRT system. The main part of the survey comprised 12 questions regarding satisfaction attributes associated with the BRT's level-of-service, and one final question relating to the respondent's overall satisfaction. Similarly, to the on-board survey, a 1–5 Likert scale was used for all 13 questions.

The target population of the IP was adults aged 18+ who are residents of neighbourhoods along the BRT lines and are occasional to regular users of the BRT service. We obtained 304 valid questionnaires and used 3,705 on-board questionnaires as a basis for data validation.

[1] Transportation Research Institute, Technion, Israel
[2] Faculty of Civil and Environmental Engineering, Technion, Israel

The statistical analysis produced the following main results:

- **Socio-demographic characteristics**: we identified significant gaps between the two samples in both age and gender characteristics. The IP included a greater percentage of females (65% in the IP and 53% in the on-board survey) and a higher ratio of adults over the age of 60 (15% compared to 9%).
- **Trip frequency**: Notable gaps in travel frequency were identified. Over 80% of the respondents to the on-board survey are frequent users of the BRT (at least once a week), compared with only 45% of respondents in the IP.
- **Satisfaction**: Under the assumption that trip frequency is a significant parameter affecting passengers' satisfaction, we compared the results of the two surveys for frequent users. There was no significant difference in satisfaction for nine of the twelve attributes tested (see Table 1). Significant differences were found for the other three attributes as well as for overall satisfaction.
- **Response rates for questions**: We examined differences in response rates for each of the satisfaction attributes between the two surveys. The results are shown in Table 1. It is apparent that the response rate in the IP survey is higher for the vast majority of questions and is lower for only one question (dealing with the driver's appearance). Moreover, we found identical trends in both surveys, with questions characterized by a high response rate in the on-board survey also characterized as such in the IP Survey.

Table 1: Comparison of satisfaction levels and response rates

	Significant difference in satisfaction level?	**Response rate in IOP compared to on-board**
Reliability	NO	Similar
Trip duration	NO	Significantly higher
Frequency	NO	Significantly higher
Driver's appearance	NO	Significantly lower
Quality of driving	NO	Significantly higher
Information reliability	NO	Significantly higher
Ticket validation	NO	Significantly higher
Crowding	YES	Significantly higher
Comfort of getting to the bus	NO	Significantly higher
Comfort of seating	YES	Significantly higher
Cleanliness	NO	Significantly higher
Trip comfort for elderly/ babies/ handicapped	YES	Similar
Overall satisfaction	YES	Significantly higher

- **Attributes that influence overall satisfaction**: Four of the top five attributes influencing overall satisfaction were identical in the two surveys.

The results reveal the potential of using IP as a cost-effective and reliable means of collecting information regarding commuters' PT satisfaction levels. They also provide insights into possible ways of enhancing the contribution of this data gathering mode, as detailed below.

First, with regard to the socio-demographic characteristics of the population sampled, the higher proportion of passengers who are over 60 years old in the IP is an advantage, as it is generally difficult to recruit respondents from this sector for on-board questionnaires. At the same time, efforts should be devoted to increasing the number of frequent PT commuters participating in the IP survey.

The similarity in satisfaction between the IP survey and the on-board survey for 9 out of 12 attributes is encouraging. Thus far, we have been unable to identify any specific property that differentiates the attributes for which satisfaction levels were similar in the two surveys from those for which significant differences were found. This issue should be addressed in future research. As for overall satisfaction, high similarity was found in the attributes having the greatest impact on this value. However, two of the three attributes whose satisfaction values were found to differ significantly between the two surveys are among those influencing overall satisfaction. Hence, the gap between the two surveys in overall satisfaction is not surprising.

The comparison of response rates is clearly in favour of the IP. The exception in the response rate associated with the driver's outward appearance could be anticipated, as this is an aspect of a journey one may not necessarily pay attention to, and may find difficult to recall when completing the questionnaire at home. The identical trend in both surveys concerning questions characterized by a high/low response rate suggests that response rates reflect the properties of the question being asked and its perceived importance by respondents.

To summarize, although on-board surveys provide a significant advantage of reaching a large population of PT commuters, IP has great potential as a cost-effective complementary tool that enables transport authorities to conduct frequent surveys and improve the reliability of ongoing monitoring by periodically interviewing the same people.

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