

Using Mobile Devices to Collect Transit Survey Data Onboard Buses: Experience with Second Round of Surveys

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A second round of on-vehicle rider surveys with mobile devices was conducted in April in conjunction with Fargo-Moorhead Metropolitan Council of Government's (FM Metro-COG) transit rider survey. The transit rider survey was prepared by Metro-COG, with assistance from SURTC, and is being used for their 5-year Transit Development Plan (TDP). The intended sample was current MATBUS riders, and the survey was made available in three formats: paper, online, and in person using handheld mobile devices. The objective of SURTC's involvement in this survey was to test the use of these mobile devices for conducting onboard intercept surveys. Various observations based on the experience provide input to any subsequent transit research project involving the use of mobile devices to collect transit passenger data.

Survey Administration

Paper copies of the survey were made available on all buses and at the Ground Transportation Center (GTC), MATBUS's main transfer hub, during the week of April 25th. Paper surveys were all self-administered. A box of surveys was in each bus. Riders could pick up a survey themselves and return a completed survey to a return box on the bus or at the GTC. Bus drivers, on occasion, would mention the survey, but most often they did not. Signs on the bus and in the GTC advertised the survey. An online version of the survey was available on Metro COG's website from April 25th to May 6th, 2011. Public notices, early input informational packets, press releases, social media notices (MAT Facebook) and websites included references to the survey and its importance relative to the TDP update.

At the same time that paper surveys were being conducted, SURTC collected onboard surveys with mobile devices. The mobile device survey was the same as the paper and online surveys, with the exception of a few questions specific to the mobile device technology that were added. While the first round of onboard mobile-device surveys last December was conducted on two routes serving mostly North Dakota State University (NDSU) students, this round was conducted on a number of different routes serving a more diverse group of riders throughout the Fargo-Moorhead community. Routes were selected so they would cover a wide geographic area and so that both heavily traveled routes and lesser-traveled, lower-frequency routes would be represented. Some of the routes that were originally selected to be surveyed were dropped due to the unavailability of surveyors. Routes that were surveyed included routes 1, 2, and 5 in Moorhead; 11 and 13 in north Fargo; and 15, 21, and 22 in south Fargo. Surveys were conducted as follows:

- April 25: one surveyor on route 15 from 8 am to 11 am, and another split time between routes 1 and 5 from 11:30 am to 4:30 pm while also collecting a few responses at a transfer point.
- April 27: one surveyor split time between routes 2 and 13 from 8 am to 10 am.
- April 28: one surveyor on route 11 from 8 am to 9:15 am.
- April 29: two surveyors on route 15 from 7:45 am to 9 am, and two surveyors split time on routes 21 and 22 from 9 am to 11 am.

In total, 17.75 person-hours were used for collecting surveys. More hours had been originally planned, but some surveyors were unavailable. In addition to the smartphones that were used for the previous survey, a 7-inch Samsung Galaxy tablet was procured and used for this survey.

Riders were intercepted onboard the bus and invited to participate in the survey. In some cases, the respondents completed the survey themselves on the mobile device, and other times the surveyor asked the questions and entered the responses. The method was based on the preference of the respondent. In instances where the respondent wanted to enter responses him or herself, assistance from the surveyor on how to use the device was sometimes needed.

Response Rate

Thirty-five survey responses were received. This amounts to 2.0 completed surveys per person-hour. This response was lower than what was experienced with the first round of onboard surveys and lower than what was expected. In the first round of surveys, 57 responses were received in 13 person-hours, for a rate of 4.4 responses per person-hour. The number of responses is likely to vary based on the length of the survey, average trip length, the number of riders (potential respondents) on the bus, and the willingness of riders to complete the survey. These factors were all likely contributors to the lower number of responses received for this survey.

Ridership levels

The first round of surveys was conducted on two of the most heavily used routes in Fargo-Moorhead, so there were more riders onboard and, therefore, more potential candidates to complete the survey, boosting the number of responses. In the current round of surveys, some of the routes included were among the more heavily used routes, while some were low-volume routes. Even on the more heavily traveled routes, our surveyors had the bad luck of being on board at times when the buses were not as busy as usual. It should also be noted that in a small urban area such as Fargo-Moorhead, the average bus occupancy rates tend to be well below those found in larger urban areas. It would be expected that more surveys could be collected in larger urban areas with more heavily used buses and rail transit.

Average trip lengths and survey length

One of the problems encountered with this round of surveys is that some of the transit trip lengths were very short, especially on a few routes. For example, routes 2 and 13 travel by Minnesota State University Moorhead (MSUM) and NDSU, respectively, and they have several student riders who take very short trips, and there were not as many riders on the remainder of the route. Similar problems were also

experienced on other routes. This created a serious time constraint, as there was not enough time for riders to complete the survey. Several surveys were started that were not finished because the riders had to get off, so the results were not usable.

Shortening the survey would likely have increased the number of responses, as more respondents would have been able to complete it during their trip, and the surveyor would have been able to move on to another respondent quicker. The survey often took 10 minutes or more to complete, and it was observed that riders taking the paper survey tended to complete it quicker. The average time to complete a survey during the first round was quicker. This was partly due to a somewhat shorter survey, but could have also been due to student respondents being more familiar with the technology and able to complete the survey quicker. In fact, student respondents for the current survey were found to be faster in completing the survey.

An advantage of the paper survey was that riders were able to complete it at their leisure and return it the next time they rode the bus or at the GTC. They did not necessarily need to complete it during their current trip.

Some questions are also more difficult to ask with the mobile device than with a paper or online survey. For example, some of the questions in the paper survey were in the form of a matrix. Respondents were given a number of possible service improvements and asked to rate, along a scale, how important each would be to them, and they were also asked to rate a number of service qualities along a scale. These types of questions are easy to set up on paper or online as a matrix question. On the mobile device, however, matrix questions were not possible, so they had to be set up as a number of individual questions, which made the survey seem longer and also likely made it take a little longer to complete.

Willingness to complete the survey

During the first round of surveys, willingness to take the survey was very high. Of 66 riders approached to take the survey with the mobile device, 86% were willing to do so. Eight (12%) of these riders declined to take the survey and 1 wanted to take the survey by paper instead (which they were allowed to do). For the current survey, the rejection rate was not documented, but it was observed to be much higher. Older riders, in general, tended to be less willing to complete the survey. The first round of surveys was conducted of college students who tend to be more interested in the technology and willing to complete the survey.

Other

Another issue to note that probably influenced response rate for this survey is that identical paper surveys were being conducted at the same time. Some of the riders that were approached indicated that they had already taken the survey by paper. This reduced the potential number of respondents for taking the survey with the mobile device.

Summary

Based on experience, the most important factors influencing survey responses are survey length and the trip length of passengers. A passenger's trip length determines the length of time they would be available to complete a survey administered through a mobile device.

Some of the factors are beyond the control of the survey team, including average trip lengths and ridership levels. Given these conditions, the survey team can employ certain strategies to maximize the response rate. Two primary factors in this category are the length of the administered survey and the number of research team members simultaneously collecting data on the same bus at the same time. First, the length of the survey is key in that a respondent's ability to complete it is constrained by the length of their trip. Hence, a survey of a particular length should be designed in accordance to the average passenger trip length along a particular route. Second, to capture as many responses as possible it may be more effective to have multiple persons administering the survey at the same time on the same bus. This method seeks to maximize the available time, again due to passenger trip lengths.

Experience with Using the Technology

Many of the respondents who took the survey said they liked and preferred using the mobile devices. Even though response rate was low, riders generally liked the technology, especially younger people. Student riders, for example, were interested in taking the survey with the device, but many could not due to not having enough time.

Many respondents, in particular those who are not students, wanted the survey read to them and did not want to complete it themselves. Still, they tended to like the technology.

Some were grateful to be able to take the survey in this manner since they could not read well or had disabilities and were not able to take the paper survey. This is an important finding since it means using these devices for surveys can expand the number of people involved in the public input process. Those with visual or cognitive impairments, or those with physical impairments that affect their writing ability, might not be able or willing to complete a paper or Internet survey but would be willing to complete a survey if interviewed by someone using a mobile device.

Surveyors found it difficult to operate more than one device at a time, meaning only one survey could be conducted at a time per surveyor. Since many respondents needed assistance or wanted questions read to them, it would be very difficult to operate multiple devices at a time. This significantly reduces the number of responses that could be received as compared to a paper survey.

It was found to be a little difficult at times to do a survey when the vehicle was moving, but this could also be a problem with paper surveys.

Survey Responses about the Technology

A few questions were added to the end of the survey specifically regarding the use of the technology. The survey asked riders if the use of the technology impacted their decision to participate in the survey, if use of the mobile device impacted their answers, if they were concerned about privacy when completing the survey, if they would have preferred to complete the survey in private, if they would have preferred to complete the survey in an alternative format (paper), and if they have previously participated in an on-vehicle rider survey. The responses are shown in Table 1.

Table 1. Respondents Answers about the use of Mobile Devices for On-vehicle Surveys

	Yes	No	Don't know
	Number of responses		
Did the use of a mobile device impact your decision to participate in the survey?	15	8	7
Did the use of a mobile device impact you answers?	7	18	5
Were you concerned about your privacy when completing this survey?	3	27	- ^a
Would you have preferred to complete the survey in private?	2	28	- ^a
Would you have preferred to complete the survey in an alternative format (paper)?	5	24	- ^a
Have you previously participated in an on-vehicle rider survey?	9	21	- ^a

^aDon't know was not an option for these questions.

Half of the respondents said use of the mobile device impacted their decision to participate. Presumably, since these respondents agreed to participate, this result can be interpreted as meaning that these individuals would not have chosen to participate if the mobile device option was not available. The result indicates an opportunity to increase the number of overall survey responses by using mobile devices in addition to other formats.

About one-fourth of respondents said use of a mobile device impacted their answers. We are not sure as to the manner or extent of this impact. Future analysis will attempt to compare results from the mobile device responses and those from the paper and online formats and determine if there were any significant differences in terms of types of responses given or quality of responses.

Only three of 30 respondents indicated that they were concerned about privacy when completing the survey, and just two said they would have preferred to have completed it in private. Privacy does not appear to be a concern for most riders, even though many answered the questions verbally to the surveyor who entered responses.

Five of 29 respondents would have preferred to complete the survey on paper or some other form. A paper survey may have been easier or quicker for some, but the results still indicate that many like the mobile device format.

Just over two-thirds of respondents had never participated in an on-vehicle rider survey before, indicating that the survey reached a number of individuals who had not previously been involved in the public input process.

Cost

The cost for administering the survey includes the cost of the equipment and the labor cost. Equipment costs will be documented in another report. Equipment costs per survey will be initially quite high due to the high costs of the devices but will decrease over time as many survey responses are collected.

Labor costs per survey will depend on the number of responses received per hour. In the first round of surveys, 4.4 responses were received per person-hour. If a surveyor was hired at \$10 per hour, labor cost would be \$2.27 per survey. At \$12 per hour it would be \$2.73 per survey. In the second round of surveys, 2.0 responses were received per hour, which results in labor costs of \$5 per survey at \$10 per hour and \$6 per survey at \$12 per hour.

Labor costs for administering paper and online surveys are substantially lower. However, data entry costs also need to be considered, as well as the quality of the data. With the mobile devices, as with online surveys, no data entry is needed as the results can be downloaded directly into a spreadsheet. Future analysis will attempt to compare the costs of paper versus mobile device surveys when taking into consideration both survey administration and data entry.