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Increasing Smartphone-based Travel Survey Participants

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Abstract

This study discusses two smartphone-based travel surveys in Kumamoto, Japan, and investigates methods to increase the number of participants in smartphone-based surveys. The first was a visitors' behavior survey conducted in downtown Kumamoto, which collected 1,086 samples. The second was a truck floating car survey. We offered an incentive and several recruitment methods to increase the sample size. The objectives of this study are to demonstrate the difference between reward effects and effective recruitment methods among different participants. Analysis of the visitors' survey reveals that young people prefer rewards, while some aged people think that rewards do not matter.

1. Introduction

Smartphone-based travel survey methods attract significant attention as promising alternatives to classical paper-based or web-based survey methods. The smartphone-based method distributes the survey application by web store. Then, participants download the app and install it on their own smartphone. Thus, this method can reduce the survey cost of renting and shipping instruments such as GPS devices, and we can then further improve the GPS-based probe person survey system (e.g., Asakura and Hato 2004, Hato 2010). Despite these advantages, we must consider the challenges of smartphone-based surveys using participants' smartphones. Several papers discuss issues regarding the implementation of such surveys (e.g., Nitsche et al. 2012, Cottrill et al. 2013, TRB Travel Survey

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Methods Committee 2013), which pose common challenges such as the battery lives of smartphones and privacy issues of participants.

In this paper, we focus on the reward and advertisement strategy to increase the sample size of smartphone-based surveys. People may consider the smartphone-based survey to be more complicated than traditional surveys. Then, recruitment methods and rewards for the participants would play significant roles in increasing the sample and producing a successful outcome.

Research questions of this paper are as follows: How much reward is effective to increase the number of participants? Are these effects different among participant attributes? Does reward give some bias of sample distribution? Is providing rewards cost-effective? Are there any methods outside of rewards to increase the number of participants? What kinds of recruitment methods are effective to increase the number of participants? These questions are investigated among traditional surveys and classical topics. This paper is original in that it examines these issues in smartphone-based surveys based on our experience in Kumamoto, Japan.

As described in our previous paper (Nohara et al. 2013, Maruyama et al. 2014, Asakura et al. 2014), we developed smartphone-based travel survey apps for both Android and iPhone platforms. Using these apps, we conducted a smartphone-based survey trial as a supplement to a large-scale household travel survey conducted in the Kumamoto Metropolitan Area of Japan in autumn 2012. We asked 13,279 households to participate in the smartphone-based survey. Because of some governmental constraints, we were unable to offer incentives to participants during this smartphone-based survey. Fortunately, we recruited 97 participants without offering incentives. Sample distributions of the survey are discussed in Maruyama et al. (2014). One of the challenges of the autumn 2012 survey was a low response rate. To overcome the challenge and gain additional travel information, we conducted additional smartphone-based surveys in November and December 2013. The first survey, the visitors' behavior survey in downtown Kumamoto, asked the pedestrians and shoppers in that area to participate in a smartphone-based survey on holidays. We provided some incentives (including a coupon worth JPY500 or around US$ 5) to increase the number of samples. We prepared several strategies including posters, a leaflet, broadcasting, and a social networking service, and we successfully collected 1,086 samples. The second survey was the truck floating car survey. We asked seven logistic companies to participate in the smartphone-based floating car survey and accumulated 21 samples of five days' trucking behavior.

The objectives of this research are to examine the following issues based on our survey experience in Kumamoto, Japan.
1. To demonstrate the reward effect of a smartphone survey especially focusing on its attribute difference.
2. To examine the sampling bias of a smartphone survey given according to the reward policy.
3. To investigate the effect difference by recruitment method and to reveal an effective recruitment strategy.

The paper is structured as follows: Section 2 describes our smartphone survey system and survey details. Section 3 reveals the results of analysis such as attribute distribution of participants, effect of advertisement, and reward. Finally, section 4 summarizes the findings of this study.

2. Methods

2.1. Smartphone-based Survey System

Figure 1 illustrates the smartphone-based travel survey system that we developed. 1) First, users have to register personal information on the website. Users must input their age, gender, address (city/ward/town/village where they are living), and condition of employment (worker/housewife/student/other conditions). The data server retains this information under the severe privacy control. After registration, they receive a unique ID and password that is necessary for the app. 2) Users download the app on the app market for each platform (Android OS/iOS) and install the app to their own devices. 3) In the app, users first input ID and password. The server verifies the ID and their device, and the app starts working. 4) Users begin the survey by tapping the "Departure" button. Then, GPS and acceleration data information is collected and sent to the data server by using the 3G/4G cellular network or Wi-Fi network.