Chapter 2

Behavioural Data Collection Using Mobile Phones

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ABSTRACT

This chapter reviews the development of mobile phone-based travel survey instruments and systems over the last 15 years and discusses the issues and challenges that they will likely face in the future. The essential ideas were proposed in earlier mobile phone surveys in the 1990s but have since become more sophisticated. Probe Person (PP) survey systems were developed in the 2000s using GPS-assisted mobile phones connected to Internet Web diaries, and were implemented in several cities in Japan. This chapter presents the characteristics of PP systems and survey examples. Smartphone-based travel survey systems have recently been developed and implemented all over the world. This chapter includes a case study of a smartphone-based PP survey system in Kumamoto, Japan. Advantages and remaining issues are discussed with the goal of improving information use and enhancing communication technologies in the field of travel data collection and analysis.

INTRODUCTION

Conventional transport planning methods were first designed to suit large-scale, long-term, and comprehensive transport infrastructure development. The target of transport planning then changed to smaller-scale, shorter-term, specific-purpose transport system planning and travel demand management. Travel survey methods have provided essential travel demand data to those who engage in transport planning and management. Yet, in spite of the historical trends of transport planning, travel survey methods have not been dramatically improved. Traditional surveys, such as Person Trip surveys, have survived as travel data collection methods for several decades. Travel
data observed with traditional survey methods have been effective for coarsely aggregated travel demand analysis and modeling. Recent transport planning, however, has required travel data with a higher resolution in both space and time dimensions, as planning needs have shifted towards the evaluation of more detailed alternatives. One-day travel data with coarse resolution is insufficient for these recent requirements. Seamless, longitudinal data are necessary in order to validate the effects of transport management programs (Hato & Kitamura, 2006).

What types of travel data collection methods should be further investigated to satisfy the recent trends in transport planning and management? In order to discuss this issue, we would like to distinguish the characteristics of various types of travel data collection methods. When classifying these methods, two different attributes can be combined. The first attribute indicates whether the data collection environment around a traveller is either virtual or real. In a virtual world, a respondent is in an artificial travel environment, such as a laboratory experiment, and is asked to make travel decisions as if he/she were in the real world.

The second feature is whether the relation between respondent and surveyor is active or passive. Active data collection implies that the surveyor requests that the respondents represent their travel behavior in words. In passive data collection, respondents do not describe their travel behavior spontaneously; the behavior is observed and recorded by the surveyor. Travel data collection methods can thereby be characterized as combinations of these two features: virtual and active, virtual and passive, real and active, and real and passive.

A typical ‘virtual and active’ case is a questionnaire survey that enquires about travel behavior under hypothetical situations. A stated preference (SP) survey in a laboratory experiment is an example of this case. A ‘virtual and passive’ case corresponds to travel data collection using traffic and travel simulators supported by computer graphics (CG) technology. These methods, under virtual or hypothetical environments, are effective in obtaining travel behavioral data for various alternative policies if the respondents have not yet actually experienced certain behavior, such as new transport services for the future.

Traditional PT surveys represent a ‘real and active’ case. Real and active surveys have frequently been applied to large-scale travel research for many decades. Various survey instruments have been used, such as mailed questionnaire sheets, personal telephone interviews, and Internet Websites. A respondent is commonly asked about his/her travel activities during the past day(s). When detailed attributes of the travel behavior are required, the respondent is required to answer a large number of questions. However, memory is imperfect and an individual may not find it easy to remember all of his/her past travel activities. In particular, the exact place and time of a trip are difficult to remember, even during daily activities. The description of travel behavior depends on the individual’s memory, so errors and mistakes can frequently occur. Thus, behavioral surveys based on questionnaires are not always perfect for microscopic travel behavior data collection.

Problems regarding conventional questionnaire-type travel surveys were discussed in Ettema, et al., (1996) and Axhausen (1998). They examined data collection methods with regard to travel behavior from the perspective of the validity and quality of travel and activity data. Recently, computer-assisted telephone interviews (CATI), computer-assisted personal interviews (CAPI), and computer-assisted self-interviews (CASI) have been developed. They will be useful in reducing the efforts of both surveyors and respondents and improving the accuracy of travel data collection. Sharp and Murakami (2005) have also discussed survey methodology considerations for personal travel surveys.

The last category of travel data collection is the ‘real and passive’ case. In comparison with active data collection, the passive approach to real-world travel data collection was not popular in the past