Available online at www.sciencedirect.com

ScienceDirect

Transportation Research Procedia 11 (2015) 263 – 279

Transportation Research Procedia

www.elsevier.com/locate/procedia

10th International Conference on Transport Survey Methods

Field evaluation of the smartphone-based travel behaviour data collection app "SmartMo"

Martin Berger [a]*, Mario Platzer [a]

verkehrplus GmbH, Elisabethinergasse 27a, 8010 Graz, Austria

Abstract

This paper outlines an innovative approach to the evaluation of a self-administered smartphone-based survey for the collection of travel behaviour data. For this approach, a traditional travel survey is modified to match mobile devices. The smartphone application "SmartMo" is designed in a multi-stage iterative development process. It is then implemented and evaluated through a number of field tests involving 97 participants. Results of the field evaluation will be discussed including the technical performance (e.g. secure data transfer and data management, energy consumption, map-matching), usability (e.g. comprehensibility, handling, joy of use) as well as user acceptance (e.g. willingness to participate, data protection and privacy). A brief overview of the SmartMo data collection system will also be provided.

Peer-review under responsibility of International Steering Committee for Transport Survey Conferences ISCTSC

Keywords: self-administered smartphone-based travel survey; data collection; privacy by design; trip non-response, battery consumption, field test

* Corresponding author. Tel.: +43 69918870744.
E-mail address: martin.berger@verkehrplus.at

Peer-review under responsibility of International Steering Committee for Transport Survey Conferences ISCTSC
doi:10.1016/j.trpro.2015.12.023

1. Background

Multifaceted demands on travel surveys have emerged over the last years. Challenges are primarily due to transport policy objectives, societal changes and the emergence and employment of increasingly complex transport planning methods.

Valid and detailed individual travel behaviour data is urgently required for research and evidence-based decision-making by policy-makers. Further challenges emerge when the goal is to provide high quality individual travel behaviour data and improve user acceptance of travel behaviour surveys.

1.1. Requirements

Traditional and numerous current travel surveys use paper based travel diaries, in which all realized trips have to be reported by the respondents mostly over the course of one day. Many relevant studies (Stopher et al. 2007, Wolf et al. 2003, Bricka 2008) affirm the already long-held suspicion that travel diaries are quite error-prone. On the one hand many trips are not consciously perceived, since the travel behaviour is very complex and often habitual. On the other hand, retrospective information is subject to memory recall constraints and the individual ability of subjective estimation. Traditional travel surveys in the form of a travel diary can no longer keep pace with actual social and technological developments. Central problems and challenges include,

- the increasing necessity of valid and more detailed travel behaviour data, such as a full coverage of short distance trips (e.g. walking and cycling trips for intermodal travel), the exact route and the use of "new" modes of transportation (e.g. Car- and Ridesharing, electric cars),
- the declining motivation and acceptance among participants to take part in surveys due to an overall increase of surveys and direct marketing as well as increased privacy concerns and data protection demands.

1.2. Chances

At the same time, the technical possibilities available for travel surveys have changed rapidly. The proliferation of innovative information and communication technologies, GPS positioning systems and GIS systems offers numerous opportunities to optimize the procedures for collecting mobility data. Advantages of a mobile, smartphone-based survey include:

- Smartphones - equipped with numerous sensors – are ubiquitous, they can be used anywhere and anytime.
- Robust, portable and affordable GPS tracking instruments record data automatically without much effort for the users. Data (e.g. trip distance and duration) is unaffected by self-reported errors (e.g. short trips by foot) and therefore GPS are high precision instruments.
- Integration of GPS systems with GSM and WLAN modules in smartphones taking advantage of numerous beneficial smartphone characteristics: user-friendly touch screen and key pad, low weight and high battery performance.
- Standardized and flexible software development environments enable the implementation of complex and adaptive questionnaires on smartphones.
- Increasing usage of GIS devices, e.g. digital maps including public transport networks, footpaths (e.g. OpenStreetMap,) and tools for data integration (e.g. GIP: graph integration platform).
- Development of powerful map-matching algorithms for matching tracks and map data.
- Progress in statistical and visualization tools (Google Maps, Google Earth, RGL: 3D real-time visualization device system for R) for 3D visualizations of trip and activity data.