Participants' perceptions of smartphone travel surveys

Behrang Assemi [a,*], Hamed Jafarzadeh [b], Mahmoud Mesbah [c,a], Mark Hickman [a]

[a] School of Civil Engineering, The University of Queensland, Brisbane, QLD 4072, Australia
[b] Department of IT Management, Faculty of Management, University of Tehran, Tehran, Iran
[c] Department of Civil and Environmental Engineering, Amirkabir University of Technology (Tehran Polytechnic), Tehran, Iran

A R T I C L E   I N F O

A B S T R A C T

Smartphone travel surveys are becoming of central importance in collecting detailed, accurate data of people's travel activities. As with their conventional survey counterparts, the quality of data collected through these surveys is adversely affected by participants' non-response and resulting biases. However, little is known about the factors affecting people's perceptions and intentions to continue participating in such surveys. Although literature has investigated the associations between individuals' socio-demographic attributes and their likelihood of survey participation, the impact of their subjective perceptions and attitudes on their survey participation intentions and behaviour is under-explored. Hence, through a model of participants' perceptions of smartphone travel survey applications (survey apps), this study aims to reveal such impacts and how they affect the participants' intentions to continue participating in these surveys. In this study, a survey is designed and used to collect data in a smartphone travel survey before the participants are asked about their personal perceptions and attitudes. Partial least squares path modelling (PLS-PM) is applied to analyse the data, as it allows simultaneous estimation of the relationships between multiple latent constructs as well as the indicators of each construct. The results showed a significant, positive impact of the perceived "ease of use" and "usefulness" of the survey app as the technological medium of data collection on the participants' "satisfaction" and "intention" to continue participating in the corresponding survey. The study also found that participants' perceived "risk" associated with privacy concerns did not have any significant impact on their intention to continue participating in the survey.

© 2018 Elsevier Ltd. All rights reserved.

1. Introduction

With the increasing rate of spatial fragmentation, double-income families, and the diversity of household compositions, people's travel behaviour is becoming more complex. Accordingly, more sophisticated data-intensive travel demand modelling methods are employed to reflect this complexity which, in turn, creates a growing demand for enhanced methods of data collection. With the integration of Global Positioning System (GPS) technology in mobile phones, smartphone travel survey applications (abbreviated as 'survey apps') are increasingly gaining the attention of both researchers and practitioners as a potentially reliable alternative to conventional travel data collection methods (Gonzalez et al., 2010; Shen & Stopher, 2014).

In the past few years, a wide range of survey apps have been developed, promising numerous advantages over their conventional survey counterparts (Safi, Assemi, Mesbah, & Ferreira, 2014). These apps usually collect accurate trajectories and detailed travel behaviour data of participants (Shen & Stopher, 2014). The employment of Global System for Mobile Communications (GSM) signals in conjunction with GPS signals enhances the accuracy of positioning in these applications, enabling them to capture accurate data even in congested and undercover areas (Gonzalez et al., 2010). The possibility of uploading collected data through mobile networks and Wi-Fi makes the aggregation of survey data easy and almost flawless (Cottrill et al., 2013; Gonzalez et al., 2010; Nitsche, Widhalm, Breuss, & Maurer, 2012). Furthermore, utilisation of the participants' smartphones as the medium of data collection reduces the survey participation burden and the logistics costs of data collection (Cottrill et al., 2013; Gonzalez et al., 2010).

However, given the novelty of smartphone travel data collection methods and the lack of large-scale studies relying on these methods, little is known about participation in smartphone travel surveys. The literature acknowledges the challenges of real-world application of survey apps, yet it does not provide a clear picture of the impacts of these challenges on survey participation. Some of the known challenges which may influence people's participation include: high level of battery consumption (Nitsche et al., 2012; Safi, Assemi, Mesbah, & Ferreira, 2017), high level of required interaction with apps in the data collection procedure (Cottrill et al., 2013; Nitsche et al., 2012), interruption of participants' daily travel activities (Wolf, Bricka, Ashby, & Gorugantua, 2004), and privacy concerns (Draijer, Kalfs, & Perdok, 2000; Wolf, 2004).

Few studies have investigated individuals' participation and the factors affecting their intentions to continue participating in smartphone travel surveys. These studies have mainly provided insight into the relationships between individuals' socio-demographic attributes and their participation in such surveys (e.g., Bradley, Wolf, & Bricka, 2005). However, participants' experiences, their perceptions of survey apps, and how these experiences and perceptions affect their intention to continue participating in these travel surveys remain underexplored.

Therefore, there is a need to investigate the personal experiences and perceptions of smartphone travel survey participants to improve our understanding of the factors affecting survey participation, in the absence of extrinsic incentives (e.g., monetary rewards). These results are useful in finding appropriate strategies to encourage a wider range of people to participate in smartphone travel surveys and, in turn, to reduce the existing non-response rates and sample biases. Accordingly, the objective of this paper is to shed light on the major subjective factors that influence participants' perceptions of survey apps as well as their intentions to continue participating in these surveys.

In this study, a survey was implemented to address this research objective. The survey participants were firstly provided with the opportunity to use a survey app, Advanced Travel Logging Application for Smartphones II (ATLAS II) (Safi, Assemi, Mesbah, Fereira, & Hickman, 2015), to report their travel activities for two days. Then, they participated in an online post-experience survey to evaluate their perceptions and participation intentions. Understanding these perceptions and intentions are especially important, as doing so can provide insights about more effective designs for survey apps.

The paper is structured as follows. The theoretical framework of the research is presented in the next section. Then, the data collection and analysis methods are explained. The results of this study are presented, and the major findings are discussed in the fourth section. Finally, the conclusions and implications of this research are provided in the last section.

2. Theoretical background

2.1. Smartphone travel survey participation in relation to technology acceptance and continuance intentions

While non-response and sample bias are major concerns for the validity of smartphone travel surveys, the literature suggests that an individual's participation in such surveys can be significantly affected by their level of technology acceptance (Bricka, 2008). Following the studies of technology adoption in transportation and other disciplines (e.g., Fernández-Heredia, Monzón, & Jara-Díaz, 2014), it is useful to conceptualise people's participation in relation to their level of technology acceptance and its determinants to understand the impact of these technologies.

One of the most recognised theories of technology acceptance, the technology acceptance model, has been introduced by Davis (1989), and many variations of the basic theory have been developed (e.g., Venkatesh, Morris, Gordon, & Davis, 2003). The theory asserts that an individual's attitudes or level of satisfaction with a technology are affected by his/her perception of the "ease of use" as well as "usefulness" of the technology. Moreover, the individual's "intention" to use/continue using the technology is in turn affected by his/her attitudes or level of satisfaction with the technology. Previous research has shown that the technology acceptance model can explain a high level of variation in people's satisfaction and intentions toward a technology (Wolf & Seebauer, 2014).

2.2. A Model of smartphone travel survey participation

Building on the tenets of the technology acceptance model, this study develops a model of smartphone travel survey participation. Accordingly, the model proposes that an individual's perception of ease of use and usefulness of a survey app affects his/her level of satisfaction with the survey. This satisfaction in turn affects the individual's intention to use the technology and to participate in the survey. This study also includes the potential impact of an individual's perceived risk on his/her intention, while this aspect was lacking in the basic form of the theory. This is due to the literature's emphasis on the