Analyzing the Behavior of Smartphone Service Users

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ABSTRACT

This paper reports the findings of a study into the behavior of the users of a mobile service. The study analyses the behavior of travelers using a Smartphone application to access real-time transit information and contrasts such user behavior with that of users accessing a transit information service from a website. Previous research in this field has tended to focus upon the perceived benefits of providing real-time transit information and without investigating when and how often passengers would use such real-time transit information services. This paper specifically explores the behavior patterns of travelers using a Smartphone service and those of using a website to provide real-time transit information. Based on empirical data derived from real information services, the impact on user behavior of providing a mobile service is analyzed and contrasted to traditional Web-based service provision. The Smartphone service is furthermore used to conduct a passenger survey to obtain information on the individuals using the mobile service. The results of the analysis presented demonstrate that the demand for information from the website is constant throughout the working week whereas demand for Smartphone information increases during the week peaking during late afternoons and on Fridays. The results of the passenger survey demonstrate that over 80 percent of Smartphone application users are between 18 and 49 years of age and perhaps most importantly, that Smartphone survey questions are twice as likely to be answered compared to the response rates for Web or mail surveys.

Keywords: Distributed Information Systems, Intelligent Transportation Systems, Mobile Computing, Mobile Services, Pervasive Computing, Transit Information Analysis

1. INTRODUCTION

The uses of information communication technologies in transit operations in recent years have increased as these technologies have improved and become widely available. The explosion in the Smartphone market in recent years has opened up a large market for using these devices in transport operations. Sales figures have shown that one in three phones sold in Ireland is a Smartphone (Business and Leadership, 2010) and in the United States in the first quarter of 2009 Smartphones accounted for 28% of all handsets sold (Dano, 2009). Websites are

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nowadays commonly used to provide information services allowing travelers immediate and convenient access to a variety of transportation information ranging from route information, to timetables, to real-time information on arrival and departure times. Smartphones refer to the new generation of mobile phones, such as the Apple iPhone or the Nexus Google phone, that provide Internet access and advanced computing facilities. Smartphones extend the immediacy of websites with mobility and pervasiveness that results in “anytime and anywhere” access (Weiser, 1993) to such transportation information services. This allows travelers to plan their travels based on up-to-date information and most importantly, enables them to use real-time information to adjust their journeys while travelling, for instance, to cater for late arrivals or departures.

This paper examines the use of these technologies in providing transportation information services based on website and Smartphone data derived from a private bus operator in the wider Dublin area in Ireland. Many studies have looked at the benefits of providing real-time transit information and demonstrated the benefits of introducing these information services (Barbeau, Georggi, & Winters, 2010; Jariyasunant, Work, Kerkez, Sengupta, Glaser, & Bayen, 2010; Chamberlin, Choi, Hathaway, & Chesnut, 2010; Vasudevan, Wunderlich, Burnier, & Glassco, 2008). This study seeks to examine the demand for each of these technologies and the potential benefits that providing real-time transit information using websites and Smartphone applications has for transport operators and ultimately, technology users. With a particular focus on the behavioral patterns of when, from where and how often passengers would use such real-time transit information services, this investigation analyzes and contracts usage pattern with the aim to support service providers towards improving and tailoring their services according to the needs of the service users. The results of the passenger survey and the benefit analysis presented demonstrate that demand for both the website and the Smartphone application were significant and that the behavioral patterns of travelers using transit information differs depending on the information source. While patterns of website users reflect continues demand throughout the week, the patterns of Smartphone application users reveal peak demand during late afternoons and starting on Mondays, demand increasing throughout the week peaking on Fridays. The passenger survey demonstrates that between 56 and 66 percent of survey questions posed on a Smartphone were answered compared to a response rate of between 21 and 31 percent for email and mail based surveys (Kaplowitz, Hadlock, & Levine, 2004).

The transit operator examined in this paper, Dublin Coach, operates a bus service from a town called Portlaoise to Dublin Airport (and from Dublin Airport to Portlaoise). The route length of this service is 100km (62miles) and, as shown in the route map in Figure 1, takes in 15 stops along the route. The service carries on average 5,500 passengers per week. The service operates seven days a week once an hour from 04:30 to 21:30 and attracts individuals travelling to and from the airport as well as commuters to Dublin City Centre. The commuters travel to the Luas Red Cow stop and change onto a light rail service that travels into Dublin City Centre while airport passengers continue their journeys to the final stop. Each coach is equipped with a Global Positioning Systems (GPS) device and provides free on-board Wi-Fi access to all passengers. In 2009, the operator introduced a Smartphone application and a website (www.dublincoach.ie) both providing real-time transit information to travelers. As the coach service terminates at Dublin Airport, the demand for the service is constant across the day. This study reports on data collected for a six months period from the 1st of March 2010 to the 1st of September 2010. Note that since the data for this paper has been collected, Dublin Coach has expanded its service and now (early 2011) operates once an hour for 24 hours a day. Its website has been revised and updated to reflect this extended service.