

Factors Affecting Use of Transport Related Smartphone Applications

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Abstract

Smartphone ownership has rapidly grown over the past ten years. Smartphone applications offer both transport users and suppliers the opportunity to better utilise existing systems and infrastructure. Application users have the potential to access a wide range of information in real-time and on the move. This allows individuals to make change their travel plans on-route with the knowledge that their decisions are based upon reliable and updated information. This paper examines the socio-economic characteristics that determine smartphone application usage and demand for potential features. Results indicate that use of applications varies with age and trip type. Demand for different functions varies with age, public transport ticket ownership and driving habits.

Keywords: Smartphone, Transport Apps, Demographics

Introduction and Literature Review

With the rapid increase in smartphone ownership witnessed over the last few years, levels currently sit at around 50% of the population (Worldwide Independent Network, 2012), unique opportunities have emerged to provide users with increasingly accurate and personalised information about transport options. Applications (apps) offering services such as real time public transport information and traffic information allow users to make decisions in real time about their travel options. These applications are developed by a wide range of organisations with varying agendas and purposes, and offer opportunities unlike those available via the traditional Internet (Pitt et al 2011). Public transport operators utilise apps not just to highlight their existing services but also provide additional services such as information on real time changes to scheduling, existing Satellite Navigation providers produce apps to mirror some the functionality of their existing products for expanding app market, while other non-profit organisation seek to highlight the environmentally sustainable options available to a user. Only a subset of the population owns smartphones and not all smartphone owners use all the possible functions of their handset (Verkasalo et al, 2010). This may be determined by a number of factors such as the perceived usefulness of the application and the perceived enjoyment arising from it or by other attributes of the individuals in question (Verkasalo et al, 2010). This paper aims to examine how demographic characteristics can predict the use of transport related applications for varying trip purposes.

Methodology

Data collection

To examine the research questions posed in this paper, a survey was conducted in the form of an on-line questionnaire distributed via a number of sources including the electronic notice boards of semi-state organizations in March and April 2012. 457 responses were received in total with a completion rate of 78.3%.

Due to the approach taken during the distribution of the survey, the sample is not representative of the Irish population as a whole. The sample has more respondents in the higher brackets for education and employment type than would be expected for the Irish population in general (CSO, 2011). It is likely that the electronic questionnaire format used for the survey would be more accessible to those individuals engaged in office based employment with consistent access to information systems than those engaged in manual labour.

Results

To examine the role of smartphone applications in the provision of transport information, it is important to first consider where individuals currently source information about their transport options. Figure 1 displays the percentage of survey respondents that access transport information via a given medium. Results indicate the Internet, (this term was left undefined as the Internet may be accessed by many devices, although Smartphone Apps were clearly delineated as another source of information) is the most popular source of information and that the radio is still used by the majority of respondents. Radio is still very popular especially amongst car drivers and older respondents, which is intuitive as many drive time radio shows provide regular traffic updates. With regard to use of Smartphones, 31% of respondents stated that they used these applications to gain information about transport options. Considering that Smartphone technology is relatively new and the ability of applications to provide services above and beyond those available on the traditional Internet is still in the development stages, this represents a significant market share. This would suggest that transport related smartphone applications are in the early majority stage of usage as defined by the technology diffusion model.

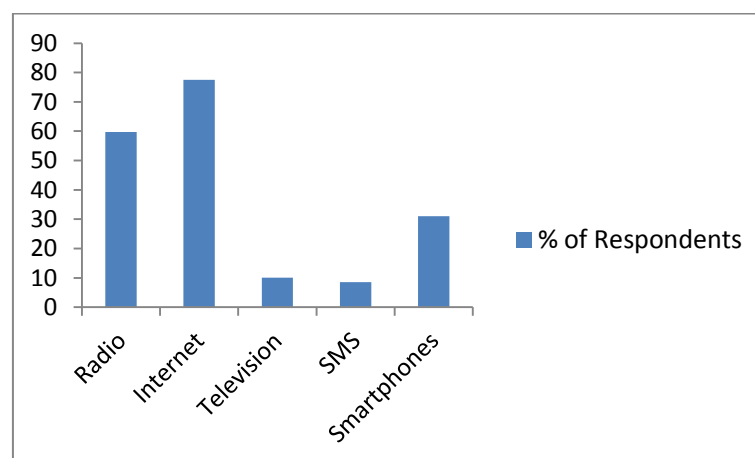


Figure 1: Sources of Transport Information

Trip Type

Individuals require varying levels of information given the trip type, their familiarity with the trip, and their mode choice. For example it may seem logical that an individual walking a route to their regular work location would require much less information than an individual undertaking a public transport trip for the first time in an unfamiliar location. To examine these hypotheses respondents were asked how often they use Smartphone applications for nine different trip types. As this question was more interested in the relative usage of applications with respect to trip type rather than absolute use which may be difficult for the respondent to recall, the options presented were left for the individual respondent to define.

As the results of this question may not be at first glance very easy to interpret, it was decided to create a “frequency score” for each trip type. This was created by multiplying by 4 the percentage of respondents who selected the “Always” option for a given mode, the “Often” option by 3, the “Sometimes” option by 2, and the “Rarely” option by 1, and summing these scores. No score was assigned to the “Never” option as in this case no activity takes place. Using this metric it becomes apparent (see Table 1) that transport applications are used much more frequently for trips that users are unfamiliar with. Unfamiliar driving trips, followed unfamiliar public transport trips, are the most frequent trip types that lead users to access transport apps. It is interesting to note that the range values for varying types of public transport trips is much smaller than for driving and walking/cycling trips, suggesting that apps still have a considerable utility for public transport trips that individuals are familiar with. This makes sense intuitively as public transport services often contain variations that even an individual with experience of a given route may not always be able to predict.

It therefore appears that applications may be being used for two primary distinct purposes. Drivers use apps for route finding purposes, similar to Satellite Navigation devices, as do public transport users on unfamiliar routes. Public transport users also appear to use apps on routes they know to check real time information.

Table 1 App Use vs. Trip Type

Trip Type	Frequency Score
Driving Commuting Trips	93.3
Driving: Non-commuting trips you are familiar with	93.7
Driving: Trips you are unfamiliar with	257
Public Transport: Commuting Trips	160
Public Transport: Non-commuting trips you are familiar with	139.3
Public Transport: Trips you are unfamiliar with	223.9
Walking or Cycling: Commuting trips	93.5
Walking or Cycling: Non-commuting trips you are familiar with	91.9
Walking or Cycling :Trips you are unfamiliar with	182.9

Smartphone Application Usage and Demographics

Examination of smartphone usage with respect to a number of variables indicates that only age can be considered as significant predictor variables. Table 2 outlines the results of Chi squared significance tests for other variables examined. These results suggest that transport related smartphone application use does not significantly vary with personal characteristics

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such as education or an individual's transport habits. Any Chi squared value above 0.05 is deemed to be statistically insignificant for this study.

Table 2: Significance of Variables

Variable	Age	Gender	Education	Car Ownership	PT Ticket	Cycling Habits	Walking Habits	Driving Habits
Chi ²	<0.005	0.236	0.793	0.143	0.146	0.418	0.628	0.135

The Role of Age

Figure 2 examines how sourcing of transport information varies with respect to age. Splitting respondents into two groups (i) 15-44 years old and (ii) 45+ yielded the most insightful results in this area. Radio is much more common as a source of information for individuals 44+. Confidence interval tests at 95% confidence indicate that the 45+ group is between 12% and 31.5% more likely to get transport information off the radio. Similarly individuals in the under 15-44 group are between 15% and 32% more likely to use smartphone transport apps. No statistically significant differences can be observed for Internet use between groups.

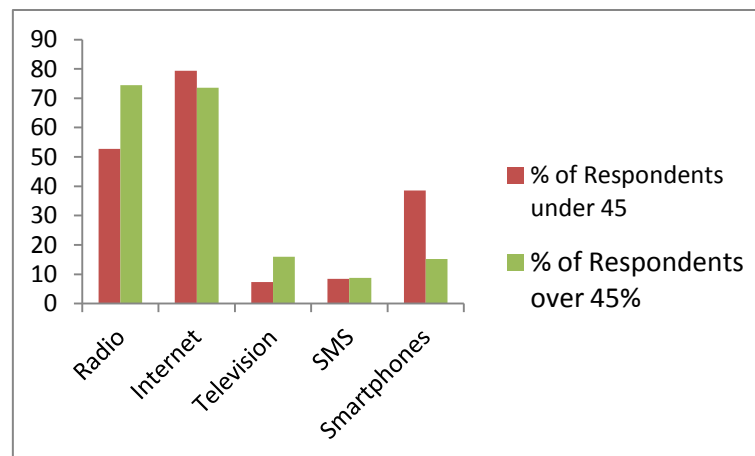


Figure 2: Sources of Transport Information vs. Age

Figure 3 provides a more detailed the relationship between the use of transport smartphone applications and the age of respondents. It is clear that these applications are more popular amongst younger people with a peak user score of 45% being observed in 25 to 34 year olds. Rates of usage for respondents 45+ are seen to be only rough a third of those observed in the 25-34 category.

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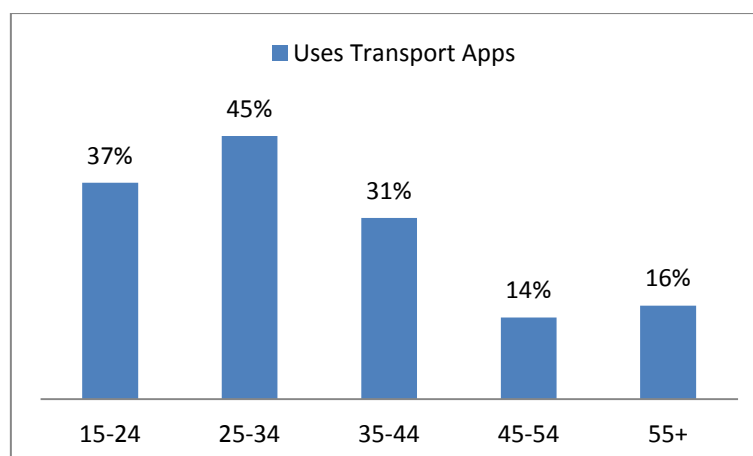


Figure 3: Age vs. % Use of Apps

One explanation for the results observed in Figure 4 may be that Smartphone ownership is higher amongst younger people, providing a partial explanation for their greater usage rates. This is certainly true within the sample examined in this study (see Figure 5,) as under 45's are between 16 and 37% more likely to own smartphones than over 45s.

While this goes someway to explaining the observed differences, when Smartphone owners within the sample are divided into under and over 45 year olds, it is found that application usage is still significantly larger in the younger group. Smartphone owners under 45 years are between 4.14%-34.88% more likely to utilise transport applications than Smartphone owners over 45. This would suggest that age plays two distinct roles in terms of likelihood of using a transport application. Firstly, individuals in the over 44 bracket are less likely to own a Smartphone and are therefore unable to access applications, and secondly, individuals who are in the over 44 bracket and do own smartphones are still less likely to utilise transport applications than younger owners. While the 15-24 year age bracket appears to be a certain anomaly in terms of increased Smartphone use with respect to age, this group also has lower levels of Smartphone ownership. However in this case we attribute this to lower levels of purchasing power rather than slow rates of technological adaption.

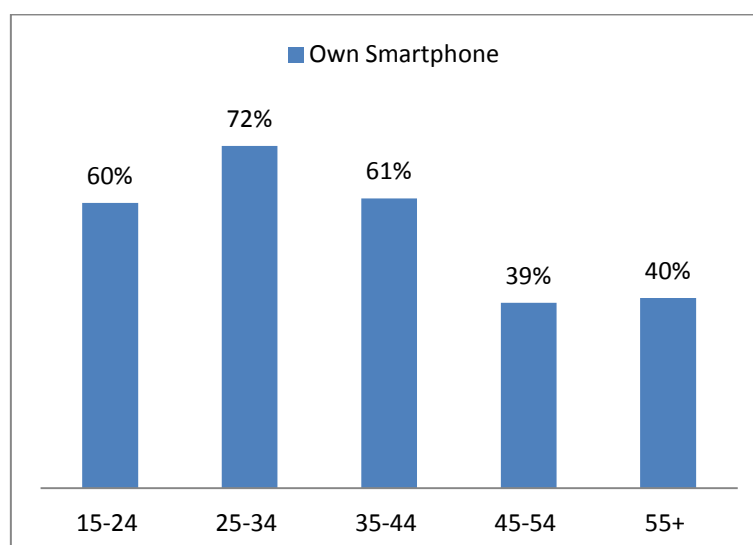


Figure 4: % Smartphone Ownership vs. Age

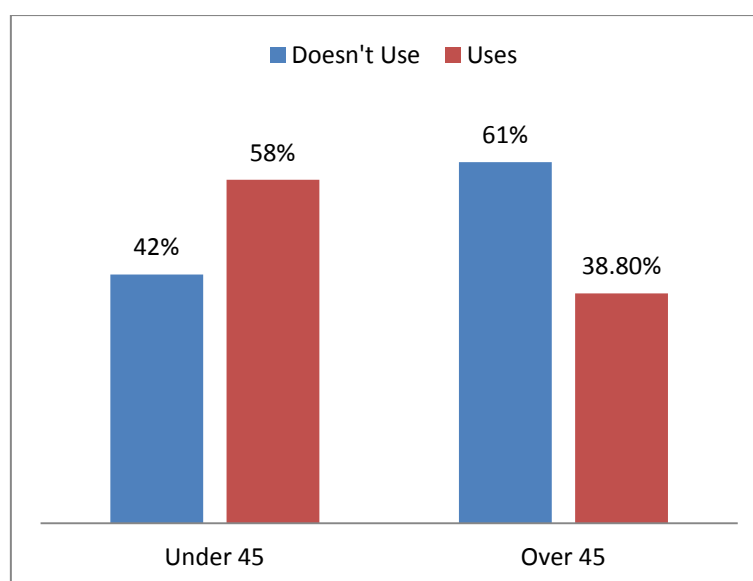


Figure 5: Age vs. App Use (Smartphone Owners)

Unfamiliar and Familiar Trips

Transport applications for smartphones are not all the same. Various applications offer different functions and different levels of information. Respondents were asked to select one feature that they felt was most desirable in a transport application. Choices available included Real Time Public Transport Information, Travel Time Information, Real Time Traffic Information, Cost information, Environmental Information, and Weather Information.

As highlighted in Table 1, Smartphone usage for familiar and unfamiliar trips is very different, and it was therefore decided to examine two simplified trip types. The first trip that users were already familiar with such as a commuter trip, school run or visit to friends and relatives, and the second was an unfamiliar trip such as a journey to another city or part of their own city that they were unfamiliar with. Results displayed in figure 6 demonstrate that demand for application features is highly dependent on the nature of the trip.

It is clear that travel time information is in much more demand for trips that users are unfamiliar with. This is an intuitive result as we can assume that users have overtime built up and expectation of trip time through experience. It is likely that an if any deviation from this expected time occurs the user can extrapolate the likely change from either public information or traffic information in tandem with their own experiences.

For trips that respondents were familiar with Public Transport Information was selected as the most desirable feature by the largest number of respondents. This may reflect the success of current public transport applications recently launched in Dublin. Both weather and environmental information were selected as the most desirable feature by only a small percentage of respondents for each trip type.

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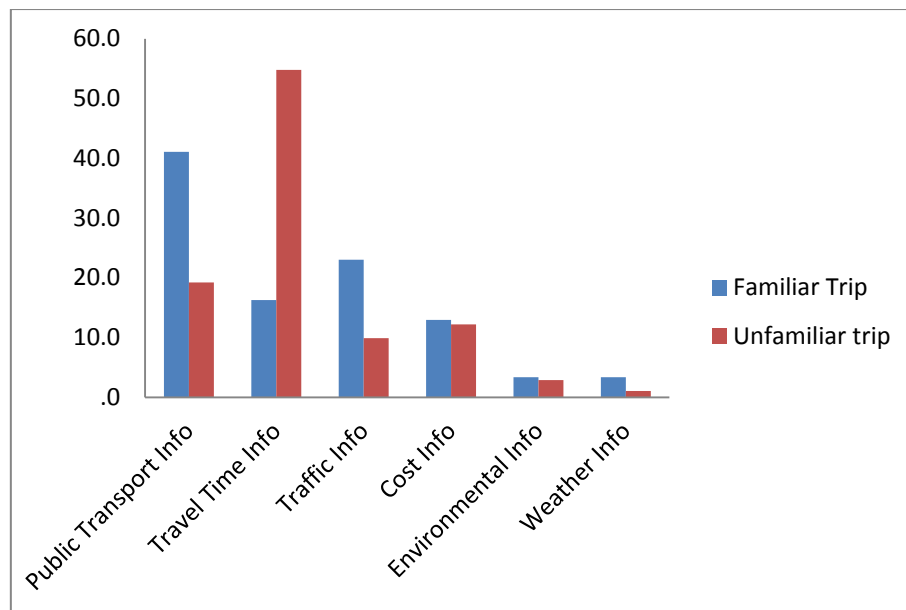


Figure 6: App Demands: Familiar vs. Unfamiliar Trips

Application Demands and User Characteristics

Comparisons of user demand with respect to the frequency with which they use certain modes of transport indicated that both Public Transport Ticket Ownership and Driving Habits were significant predictors of variation. Public Transport Tickets were broadly defined to encompass the many types of ticket available on Dublin's public transport networks. These included but were not exclusive to the newly introduced leap card, weekly and monthly tickets and the annual tax saver ticket incentive.

Results for the variation in user demand with to ticket ownership (Figure 7) indicate that public transport ticket owners (53.5%) were much more likely to select public transport information as the most desirable feature than non-ticket owners (28%). Non-ticket owners were more likely to choose traffic information with scores of 20% in comparison to 12.6%.

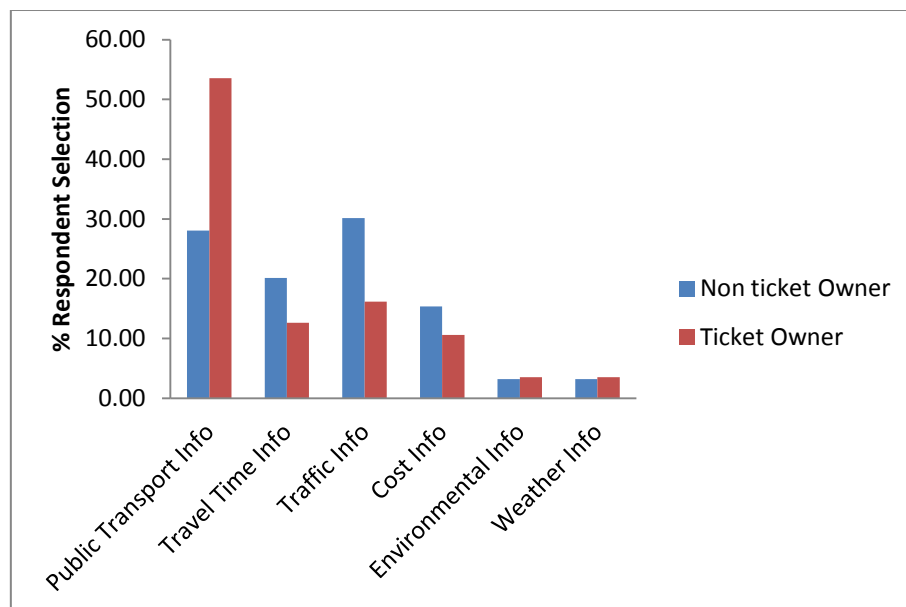


Figure 7: Public Transport Ticket Ownership vs. Application Features Demand

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Analysis of driving habits shows as expected that regular drivers (defined as driving three times per week) exhibit a reduced demand for public transport information and an increased demand for Traffic Information, Travel Time Information and Cost Information. It should be noted that while the demand for public transport information greatly reduces for regular drivers, it is still considered the most desirable feature by the largest number of drivers.

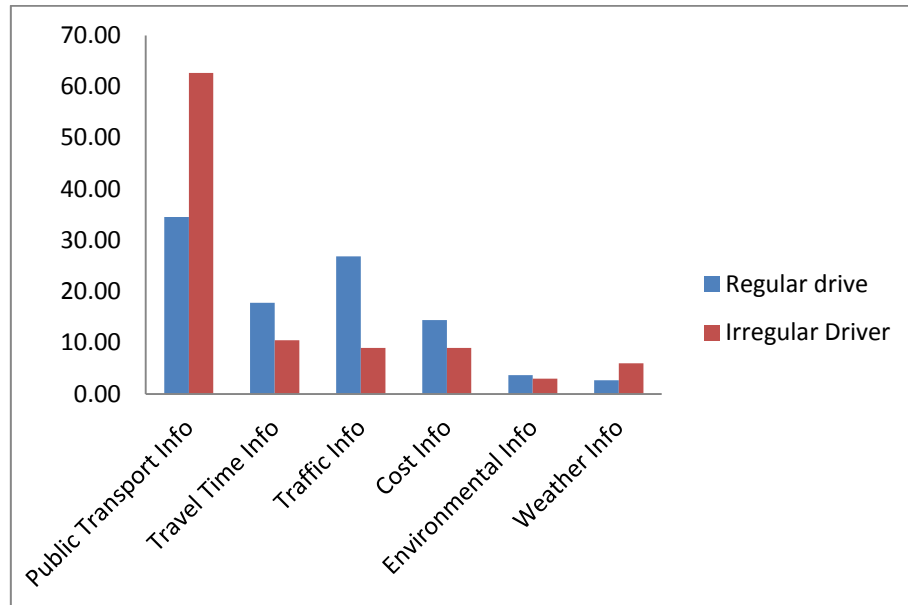


Figure 8: Driving Habits vs. Application Features Demand

As with application usage, age was found to be an important predictor of demand for application features. Younger respondents displayed a greater desire for public transport information while a greater proportion of older individuals wanted traffic information. This result can be explained as within this sample younger individuals were observed to be more likely to use public transport and older individuals more likely to drive.

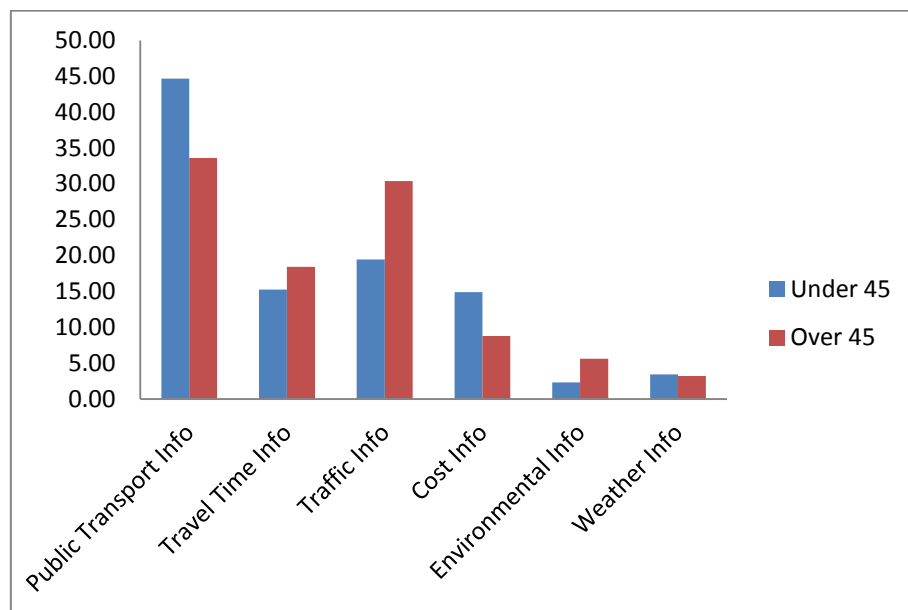


Figure 9: Age vs. Application Features Demand

Notable Non-Significant Results

While respondents' feature demands were observed to vary with respect to age, public transport ticket ownership and driving habits, it is also interesting to consider certain non-significant factors. Foremost of these is the finding that current users of transport related Smartphone applications do not differ significantly from non-users in their application feature demands for either familiar or unfamiliar trips. The respondents' gender and education as well as their cycling and walking habits were found to have no significant relationship to the feature demands.

Summary and Conclusions

Results of this study indicate that use of transport related smartphone applications and their features are dependent on a number of user characteristics. While smartphone applications are used by a considerable proportion of the sample examined, they still lag significantly behind both radio and the more traditional internet in terms of information provision. In terms of application usage, age is the most prominent indicator variable with younger people being more likely to use applications. This may be due to the fact that the market for these applications is not yet fully mature, or that older individuals are less likely to be early adapters. The demographic of transport application users cannot be assumed to be fixed and may change as a greater proportion of the population gain access to smartphones.

Use of transport applications is also dependent on the type of trip being undertaken and the mode used. Transport applications appear to be of greater value to users when undertaking trips that they are unfamiliar with or where there are factors, such as public transport arrival time, that are outside of their immediate control.

Acknowledgements

This research was funded by the PECOX Project under the European Union's 7th Framework

Programme Webpage: <http://www.project-peacox.eu/>



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