

Abstract

The increasing scale of, and demand for, civil air transport world-wide has necessitated a greater volume of people travelling to and from airports. The vast majority of these journeys are made by private cars, which has resulted in traffic congestion and raised levels of air pollution in and around airports. Subsequently, airports are re-evaluating their approach to ground access mode choice and considering how to moderate the reliance on private cars. Based on a survey of passengers at Manchester Airport in the UK, attitude statements pertaining to psychological constructs from the Theory of Planned Behaviour and the Norm-Activation Theory, combined with key factors relating to the passenger's trip, are used to identify eight behaviourally distinct groups of passengers with varying potential to reduce their private car use. Two of these groups, described as the *Conflicted Greens* and the *Pessimistic Lift Seekers*, are identified as having the greatest potential to reduce private car use to airports. Analysis reveals the need for decision makers to address the existing attitude-behaviour 'gap' that can prevent positive environmental attitudes being translated into the use of more sustainable modes, as well as tackling the perceived difficulty some passengers associate with using these modes.

Keywords: Airport, ground access, segmentation, private car, environment

1. Introduction and research context

Owing to its visible and well publicised environmental impacts, the aviation industry has found itself at the forefront of developments to reduce emissions and become more environmentally sustainable. One important way the industry is attempting to reduce its environmental externalities is by encouraging airport users to travel to and from the airport using more sustainable modes of transport and reducing their reliance on private car use.

Given the high volume of passengers, employees and freight accessing airports, the role of ground access travel as an environmental issue is considerable. For example, it is estimated that an airport handling 45 million passengers annually can generate up to five million miles of ground access travel every day (Coogan et al. 2008). The majority of these journeys are undertaken by private cars. At large airports it is estimated that private cars account for 65% of ground access journeys, while this figure can be as high as 99% at smaller regional or secondary airports, which typically struggle to support regular public transport services (Humphreys and Ison, 2005).

The dominance of private cars for ground access trips has led to severe problems of traffic congestion around airports and has had profound implications for local air quality. These problems are exacerbated by passengers who choose to be dropped-off/picked-up at the airport (sometimes referred to as 'kiss-and-fly'), as two additional trips are generated to and from the airport (one return trip to drop passengers off and another to collect them on their return). The disproportionate environmental impact of this mode has been revealed in a recent study of ground access travel modes at Manchester Airport, UK. Miyoshi and Mason (2013) found that drop-off/pick-up

journeys produce a substantially greater volume of carbon dioxide per passenger kilometre (229g/ pkm) than cars that are driven and parked at the airport (75g/pkm). Drop-off/pick-up journeys are also economically detrimental for airports since passengers do not pay car parking fees for the duration of their trip.

In recognition of the ground access problem, in the UK airports are required to set targets for decreasing the share of journeys by private cars and increasing the share of trips by public transport (DETR, 1998). This is also important for airports from a business perspective, given that airport expansion is increasingly predicated on strategies being put in place to minimise the environmental impacts, lower congestion and reduce other deleterious impacts of ground access travel (see DfT, 2003). In 2012, the Department for Transport published a *'Draft Aviation Policy Framework'* (DfT, 2012), which sought to help establish a new sustainable policy framework for UK aviation. A key feature of the framework was the need to make more efficient use of existing airport capacity, including ground access.

Reducing the environmental impacts of private car use and the need to facilitate behavioural change is well established in other areas of travel behaviour research, where there has been a growing focus on the role of personal attitudes and psychological outlooks in informing and configuring travel behaviour (for example, see Anable, 2005; Nordlund and Westin, 2013). Accordingly, recent years have witnessed an increasing interest in the use of policy options such as marketing, information provision, and tailored services to encourage people to reduce their car use and instead adopt more environmentally sustainable and efficient modes of transport. These measures are sometimes referred to as 'soft' or 'smarter choice'

policy options as they are distinct from the so called 'hard' alternatives such as road pricing (Cairns et al., 2008; Bamberg et al. 2011).

Recognising the need for airports to develop strategies for tackling the ground access problem and reduce private car use, the paper aims to determine behaviourally distinct segments of airport passengers in order to identify those with the greatest potential to reduce their car use. The paper adopts a novel social psychological approach, employing attitude statements pertaining to psychological constructs from the Theory of Planned Behaviour and Norm-Activation Theory so as to group passengers according to their underlying attitudes and perceptions, as well as key trip related characteristics.

The following section provides a brief introduction to the use of social psychological approaches in travel behaviour research, before the method is described and the empirical findings presented. Finally, the implications for strategies aimed at reducing private car trips to airports are discussed.

2. Social psychology and travel behaviour research

While early travel behaviour research tended to rely on established economic approaches to explain behaviour, more recently this has been expanded to include psychological and attitudinal determinants of travel behaviour. These have increasingly employed established social psychological theories of attitude-behaviour relations. Two of the most influential and commonly used are the Theory of Planned Behaviour (Ajzen, 1991) and the Norm-Activation Theory (Schwartz, 1977).

The Theory of Planned Behaviour emphasises the role of personal utility maximisation in governing behaviour, positing that behavioural intention is the key

antecedent of actual behaviour. It assumes that if alternative behaviours exist, a choice is made based on the relative strengths of the intentions to perform each one (Bamberg et al. 2011). In turn, it postulates that the construct of intention is causally determined by three additional psychological constructs; attitude, a person's general feelings of approval or disapproval towards an action, subjective norm, perceptions of approval or disapproval from one's significant others concerning the performance (or not) of a particular behaviour, and perceived behavioural control, a person's perceptions of the extent to which a behaviour will be easy or difficult to perform (Bamberg et al., 2003; 2007).

Although conceived as a general action theory, the Theory of Planned Behaviour has received empirical evidence supporting its use in a travel behaviour context (see Gardner and Abraham, 2008 for a review). It provides a useful framework as it contains the central predictors of travel behaviour, is readily applied in a survey context since it contains only five constructs (at least in its original form) and is open to the inclusion of extra constructs should the research require it (Haustein and Hunecke, 2007). For example, studies have also variously investigated the role of descriptive norm, described as perceptions of what is typical or 'normal' behaviour in a given situation (for example, see Heath and Gifford, 2002), efficacy, perceptions about what can be achieved (for example, Anable, 2005), and anticipated feelings of guilt, whether or not people felt they would feel guilty about using a particular mode (for example, Bamberg et al. 2007).

The Norm-Activation Theory (Schwartz, 1977) takes a very different approach. It was developed in the context of explaining pro-social, altruistic behaviour; actions that require some sort of personal sacrifice for the greater benefit of others (Abrahamse

et al., 2009). It assumes that feelings of personal moral obligation (known as personal norms) are the only causal determinants of behaviour (Bamberg et al., 2007). The process of norm activation involves two further constructs. According to the original conceptualisation of the theory, personal norm is determined by 'awareness of consequences' (perceptions that there will be negative consequences if the person does or does not act) and a measure of responsibility (defined as a general tendency towards responsibility denial). This latter construct later became known as 'ascription of responsibility'.

As the two theories take very contrasting views of the antecedents of behaviour, several studies have compared their predictive ability to ascertain whether travel behaviour is motivated by moral and normative influences or by considerations of personal utility and self-interest (for example, Abrahamse et al. 2008; Bamberg and Schmidt, 2003). An alternative view is that a combined theoretical approach is likely to yield better, more robust results, as travel behaviour is best viewed as a mixture of self-interest and concern for others (Matthies, 2003; Bamberg and Möser, 2007). This is the theoretical approach adopted by the current research.

3. Method

3.1. Study airport

When selecting the study airport for the research it was considered important that it should be a significant airport given the high volume of ground access trips, and have existing issues of high private car use. Using mode share data published by the Civil Aviation Authority (CAA, 2010), Manchester Airport in the UK was chosen as the study airport as it had by far the highest relative overall share of private car

journeys (86.8%) of the four largest airports in the UK, with Gatwick, Heathrow, and Stansted Airport having private car shares of 62.1%, 59.5% and 52.2% respectively.

Manchester Airport is located in the north-west of England and handled 19.7m passengers in 2012 (CAA, 2013). It is well connected to the UK national motorway and rail network. There are also various local and regional bus services operating to the airport. Public transport operations are integrated at the airport in a single hub complex called 'The Station', which is connected to the two terminal buildings by elevated walkways. The airport has on-going targets for increasing the overall share of public transport journeys by passengers to 26-28% by 2015, and a longer term ambition to achieve 40% of passengers travelling to the airport by public transport by 2030 (Manchester Airport, 2007). The scale of this task is demonstrated by the fact that in 2009 only 13% of passenger journeys were made using public transport (CAA, 2010).

3.2 Questionnaire development and data collection

A face-to-face, interviewer administered questionnaire survey was utilised for collecting the required data. This consisted predominantly of 44 attitude statements pertaining to constructs in the Theory of Planned Behaviour, the Norm-Activation Theory, and additional constructs relating to descriptive norm, efficacy and anticipated feelings of guilt. Attitudinal statements were measured on a 5 point Likert scale (Strongly agree = 5, Strongly disagree = 1), with higher scores representing more favourable responses. These formed the basis of the cluster analysis procedure, which was used to form the passenger groupings. The questionnaire also elicited important trip related information regarding the passenger's ground access

journey and their flight. These were identified from the literature as important factors affecting ground access travel behaviour. The six factors were:

1. *Mode choice*, whether the passenger had travelled by car, drop-off, taxi or public transport.
2. *Trip purpose*, whether the passenger was travelling for predominantly leisure or business purposes.
3. *Luggage*, whether the passenger was travelling with checked-in luggage or not.
4. *Travel Group Size*, whether the passenger was traveling alone or as part of a group.
5. *Time of access*, whether the passenger travelled to the airport in the early morning (05:00-07:00) or not.
6. *Journey distance*, whether the passenger's journey origin was less than, more than or equal to, 60 minutes' drive from the airport.

The questionnaire was administered to departing passengers at Manchester Airport over a six week period in June and July 2011. The market research company KGS were commissioned to help administer the questionnaire as they had significant experience of administering surveys in an airport setting and had an existing professional association with the airport. To ensure a representative sample, data collection was split into 50 individual shifts (each lasting 6 hours), which were arranged to cover morning (06:00-12:00), afternoon (12:00-18:00) and evening (18:00-20:00) periods. Shifts were also arranged for weekdays and weekends in

order to capture a wide range of destinations and travellers. Overall, 860 questionnaires were collected.

3.3 Statistical analysis

Analysis of the data involved two stages. Firstly, factor analysis was used on responses to the attitude statements in the questionnaire. This was undertaken to establish a number of latent psychological factors, and to derive a series of factor scores for use in further analysis. Passengers with, and without, regular access to a car in the UK were treated separately. Those without access to a car will inevitably have a more limited set of available transport options than people with access to a car. Including both groups in the segmentation procedure may therefore have precluded attitudinal data and other factors from forming meaningful segments and explaining behaviour. To avoid this possibility, passengers with, and without, access to a car were treated separately.

For passengers with car access ($n=676$), 44 attitude statements pertaining to psychological constructs from the Theory of Planned Behaviour, the Norm-Activation Theory and three additional constructs were subjected to principal components analysis with Varimax rotation. The procedure was then repeated for passengers without access to a car ($n=172$). As a number of statements in the questionnaire only related to passengers with car access, only 33 attitude statements were included in the factor analysis for this group.

A summary of the factor analysis is shown for passengers with car access in Table 1. Ten factors were generated representing constructs such as general attitudes towards public transport, awareness of the problem of car access to airports, and

perceived social pressure to use public transport. Attitude statements were considered to load onto a factor if they exhibited a factor loading of greater than or equal to 0.5. The vast majority of items loaded strongly onto one factor (≥ 0.5) and weakly onto the other remaining factors (< 0.5).

Table 1. Summary of factor analysis for passengers with car access (n=676)

Factor	Example attitude statement (item loading highest on factor)	Items loading on factor	Cronbach's alpha (α)
PTRANS: general attitude towards public transport	How easy would it be for you to use the train to travel to Manchester Airport (<i>very easy-very difficult</i>)	12	0.939
AWARE: awareness of, and feelings about, private car access to airports	There is an urgent need to reduce private car use to airports (<i>strongly agree-strongly disagree</i>)	6	0.838
TAXI: attitudes towards taxis	How likely is it that you will use a taxi to get to Manchester Airport (<i>very likely-very unlikely</i>)	5	0.831
BUS: attitudes towards bus	How likely is it that you will use a bus to get to Manchester Airport (<i>very likely-very unlikely</i>)	5	0.854
MORALPT: Moral obligations to use public transport	Regardless of what other people do, I feel morally obliged to use public transport instead of my car to get to the airport (<i>strongly agree-strongly disagree</i>)	4	0.902
CAR: attitudes towards car	How likely is it that you will use a car to get to Manchester Airport (<i>very likely-very unlikely</i>)	3	0.785
DROPOFF: attitudes towards drop-off	How easy would it be for you to be dropped-off when you travel to Manchester Airport (<i>very easy-very difficult</i>)	3	0.794
MORALCAR: moral obligations to use a car/drop-off	When travelling to Manchester Airport, I would feel a strong moral obligation to be dropped-off (<i>strongly agree-strongly disagree</i>)	3	0.778
SOCIAL: perceived social pressure to use a car	Would people who are important to you approve or disapprove of you using a car to get to Manchester Airport (<i>strongly approve-strongly disapprove</i>)	2	0.809

A summary of the factor analysis is shown for passengers without car access in Table 2. Eight factors were generated in total. These were largely similar to those for passengers with car access, with the exception of Factor 6 (MORALAWAY: moral obligations to use drive away modes), and Factor 7 (SOCIALPT: perceived social pressure to use public transport). Seven out of the eight factors had an acceptable internal reliability and (Cronbach's $\alpha \geq 0.70$), and were retained for further analysis.

Table 2. Summary of factor analysis for passengers without car access ($n=172$)

Factor	Example attitude statement (item loading highest on factor)	Items loading on factor	Cronbach's alpha (α)
PTRANS: general attitude towards public transport	For me, using public transport to get to Manchester Airport would be easy (<i>strongly agree-strongly disagree</i>)	12	0.927
BUS: attitudes towards bus	How likely is it that you will use a bus to get to Manchester Airport (<i>very likely-very unlikely</i>)	4	0.855
TAXI: attitudes towards taxis	Would people who are important to you approve or disapprove of you using a taxi to get to Manchester Airport (<i>strongly approve-strongly disapprove</i>)	4	0.830
DROPOFF: attitudes towards drop-off	How likely is it that you will be dropped-off when you travel to Manchester Airport (<i>very likely-very unlikely</i>)	4	0.802
AWARE: awareness of, and feelings about, private car access to airports	Private car access to airports is a major environmental problem (<i>strongly agree-strongly disagree</i>)	4	0.733
MORALAWAY: moral obligations to use drive away modes	When travelling to Manchester Airport, I would feel a strong moral obligation to be dropped-off (<i>strongly agree-strongly disagree</i>)	2	0.771
SOCIALPT: perceived social pressure to use public transport	Would people who are important to you approve or disapprove of you using the bus to get to Manchester Airport (<i>strongly approve-strongly disapprove</i>)	2	0.722

The various factors and six situational variables were then subjected to cluster analysis, an exploratory statistical technique that aims to develop meaningful subgroups of individuals or objects based on their similarities (or differences) on

selected characteristics. It does this by attempting to maximise homogeneity within the clusters, and heterogeneity between the clusters (Hair et al., 2005). Cluster analysis has been applied to a range of transport applications in order to determine market segments. For example, Anable, 2005 identified segments of day trip travellers with varying potential to reduce their private car use, while Ryley, 2006 defined groups of residents in Edinburgh, Scotland, according to their experience of significant life stage events and their use of non-motorised modes. There are also (albeit more limited) examples of cluster analysis applied in an aviation context. For example, Mayer et al. 2013 used market segmentation to determine groups of leisure passengers that varied by environmental attitudes and behaviour.

In the analysis a two stage approach was adopted. Initially, a hierarchical (agglomerative) procedure (Ward's Method) was applied to investigate the structure of the data and to establish the possible number of clusters. Having established the required number of clusters the procedure was re-run using a robust non-hierarchical (divisive) clustering technique (K-Means). Once the clustering solution had been finalised, each cluster was profiled in terms of their shared attitudinal and trip characteristics. The results of this are described in the following section.

4. Results

4.1 Attitudinal profile and situational characteristics of the passengers segments

The clustering procedure yielded eight distinct segments, six for passengers with access to a car and two for passengers without car access. Using the mean factor scores derived from the factor analysis, names were assigned to each segment to summarise its general attitudinal outlook (see Table 3). A summary of the attitudinal

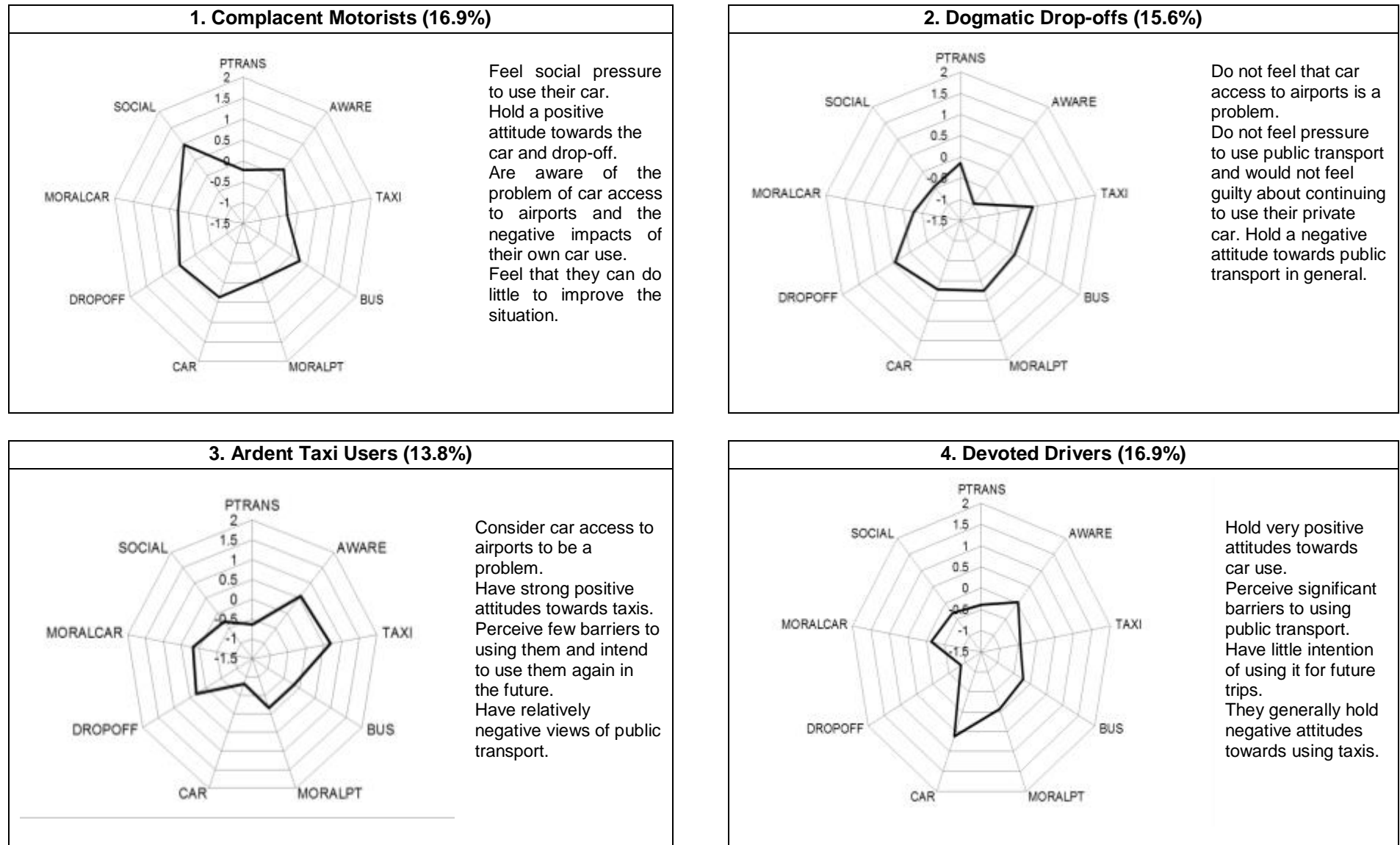
profile of each cluster is provided in Figure 1. This information is presented graphically via star charts which display the mean factor scores for each group.

Table 3 Summary of passenger segments

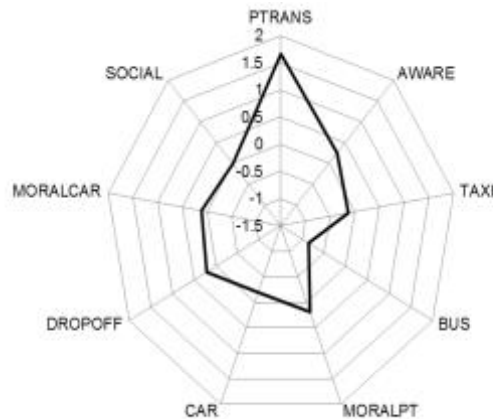
Segment	Car access	Share (%)
1. Complacent Motorists	Yes	16.9%
2. Dogmatic Drop-offs	Yes	15.6%
3. Ardent Taxi Users	Yes	13.8%
4. Devoted Drivers	Yes	16.9%
5. Conflicted Greens	Yes	9.2%
6. Environmental Champions	Yes	5.9%
7. Pessimistic Lift Seekers	No	11.3%
8. Public Transport Advocates	No	10.4%

The six car access clusters were defined predominantly by their varying attitudes towards using public transport and the car. For example, the *Devoted Drivers* held very positive attitudes towards using the car and negative attitudes towards using public transport, whereas for the *Conflicted Greens* the opposite was true. Other groups were defined predominantly by their views towards a certain mode. The *Environmental Champions* and the *Ardent Taxi Users*, for example, were characterised by their attitudes towards the bus and taxi, respectively. With the exception of the *Complacent Motorists*, there was relatively little variation between the groups in terms of the perceived social pressure they felt to behave in a certain way or any feelings of personal moral obligation. The two non-car access clusters, the *Pessimistic Lift Seekers* and the *Public Transport Advocates*, were differentiated predominantly by their contrasting opinions of drop-off and public transport, and the perceived difficulty with which they viewed the use of different modes.

Figure 1 Star charts showing mean factor scores and attitudinal profile for each cluster

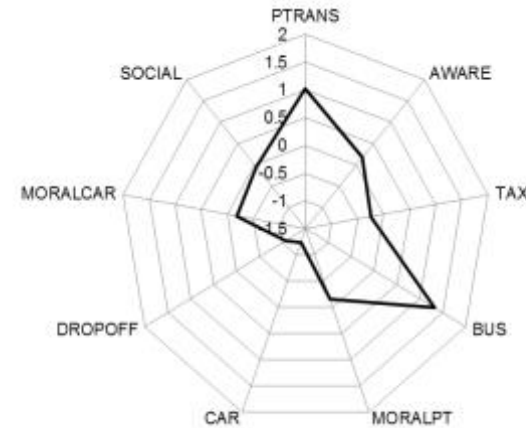


5. Conflicted Greens (9.2%)



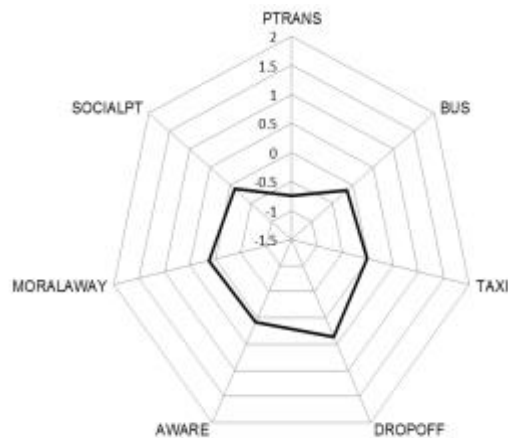
Hold positive attitudes towards using public transport and have a strong intention to use it in the future. Generally think that public transport is easy to use, yet hold a more positive attitude towards using the car, drop-off and taxi than the bus.

6. Environmental Champions (5.9%)



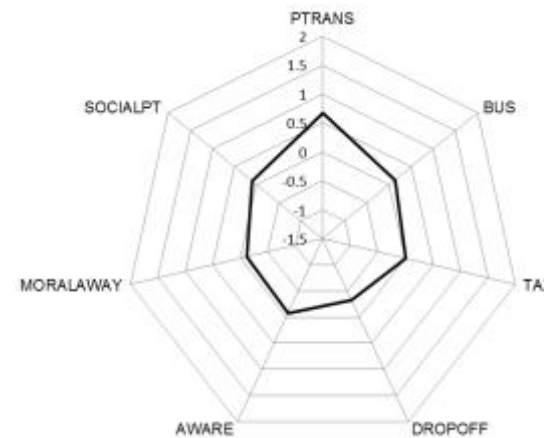
Hold very positive attitudes towards the bus and public transport in general. Do not feel a moral obligation to use public transport. Generally very negative views towards the car and drop-off.

7. Pessimistic Lift Seekers (11.3%)



No car access. Hold positive attitudes to using drop-off, and to a lesser extent taxis. Consider public transport to be difficult to use, view it in a negative light and have a low intention to use it for future ground access journeys.

8. Public Transport Advocates (10.4%)



No car access. Consider public transport to be easy to use. Generally have a positive view of public transport. Feel a degree of social pressure to use public transport. Fairly indifferent towards other modes.

Table 4 profiles the clusters according to their specific trip related variables. It can be seen that the mode share in each cluster largely reflected the group's prevailing attitudinal disposition. For example, the *Devoted Drivers* were characterised by high car use (94.4%), whereas public transport (80.0%) was the dominant mode for the *Environmental Champions*.

Business passengers were proportionally underrepresented in the *Complacent Motorists*, *Conflicted Greens* and *Environmental Champions* clusters, whereas they formed a relatively larger share of the *Dogmatic Drop-offs* group. A relatively high share of passengers in the *Ardent Taxi Users* (87.2%) and *Complacent Motorists* (86.8%) groups were carrying checked-in luggage. The *Environmental Champions* also revealed a high share of passengers carrying a checked-in bag (86.0%). This was unexpected, as carrying checked-in luggage is generally considered a deterrent to public transport use, yet the vast majority of passengers in this group (80.0%) used public transport. For these passengers it would seem that carrying luggage is not a significant barrier to the use of public transport.

Journey distance was found to play an important role in differentiating clusters that used taxis or drop-off; a larger share of passengers in the *Dogmatic Drop-offs* and the *Ardent Taxi Users* groups started their journey from areas closer to the airport than in other groups. Travel group size, on the other hand, defined clusters with higher public transport use such as the *Public Transport Advocates*, and, to a lesser extent, the *Environmental Champions*, who predominantly travelled alone.

Table 4 Trip related variables for each cluster

		1.Complacent Motorists	2.Dogmatic Drop-offs	3.Ardent Taxi users	4.Devoted Drivers	5.Conflicted Greens	6.Environmental Champions	7.Pessimistic Lift Seekers	8.Public Transport Advocates
		(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
Mode	<i>Car</i>	45.8	16.7	0.9	94.4	0	0	19.3*	0*
	<i>Drop-off</i>	53.5	50.8	29.9	5.6	21.8	0	58.0	0
	<i>Taxi</i>	0.7	30.3	67.5	0	21.8	20.0	22.7	18.8
	<i>Public Transport</i>	0	2.2	1.7	0	56.4	80.0	0	81.2
Trip purpose	<i>Business</i>	14.6	30.3	26.5	24.5	17.9	20.0	25.0	25.0
	<i>Leisure</i>	85.4	69.7	73.5	75.5	82.1	80.0	75.0	75.0
Bag	<i>Yes</i>	86.8	79.5	87.2	83.2	78.2	86.0	77.3	77.1
Flight Time	<i>Early/Late</i>	13.2	28.8	19.7	25.9	10.3	20.0	6.8	9.4
Group	<i>Alone</i>	43.1	46.2	45.3	31.5	44.9	58.0	53.4	79.2
Journey Distance	<i><60 mins</i>	68.8	84.1	84.6	47.6	50.0	58.0	63.6	49.0
	<i>≥60 mins</i>	31.2	15.9	15.4	52.4	50.0	42.0	36.4	51.0

4.2 Assessing the potential for reducing private car use

The segmentation sought to determine the potential of different passenger groups to reduce their private car use. Based on the attitudinal and situational profile of each cluster, potential opportunities, barriers, and possible strategic options for reducing their private car use were developed (see Table 5). In combination, the groups were then rated in terms of the potential for achieving reductions in private car use. Lastly, a suggestion regarding the 'next best' mode option for each group was devised, suggesting which (if any) mode of transport would be a realistic ambition in terms of effecting behavioural change.

The potential for achieving a reduction in private car use varies significantly between the clusters. As suggested by their group names, the *Ardent Taxi Users* and the *Devoted Drivers* are shown to be the most resistant to change, due largely to their strong favourable opinions of taxis and car use, respectively, combined with their negative opinions of public transport. In all likelihood, these passengers will continue to behave in a manner consistent with their prevailing outlook for the foreseeable future. This is also likely to be the case for the *Dogmatic Drop-offs*, who do not perceive ground access to represent a problem, hold positive attitudes towards being dropped-off, and will not feel guilty about continuing to use this mode in the future.

The *Complacent Motorists* pose a slightly different set of problems. While they appear more aware of the problems associated with car access to airports, they may be reluctant to use modes other than private cars because they think that their own actions will have little impact. While this group generally hold negative attitudes

Table 5 Opportunities, barriers and strategic options for reducing private car use for different passenger segments

	Current mode	Attitudinal profile	Opportunities	Barriers	Potential to reduce private car use	Strategic options	Next best mode
Complacent Motorists (16.9%)	Drop-off Car	Feel social pressure to use the car Aware of the problem of car access, but feel they can do little to help	Possibly susceptible to perceived social pressures to act in a certain way	Negative attitudes towards public transport Weak perceived efficacy of their own actions	Low	Conveying the importance of individual decisions in achieving shared goals. Consider the role of perceived social pressures to reduce private car use	Car Parking
Dogmatic Drop-offs (15.6%)	Drop-off	Do not feel that there is a problem Will not feel guilty about using private cars in the future Positive attitude towards drop-off	Few	Do not think what they are doing is a problem Negative attitudes towards public transport	Low	Education about the problems caused by car access, and the impacts this could have on them personally. Market based disincentives	Car Parking Taxi
Ardent taxi users (13.8%)	Taxi	Strong positive attitudes to taxis and feel that they are easy to use Aware of the problem of car access Negative view of car and public transport	They are aware of the problems associated with car access to airports Perceived behavioural control (i.e. ease) important for this group	Positive attitude to taxis Negative view of the car, but a more positive attitude to drop-off	Very low	Promote positive aspects of public transport and car parking, and the negative impacts of drop-off	None, but not drop-off
Devoted Drivers (16.9%)	Car	Very positive attitudes towards car, very negative attitudes towards all other modes	Very few, although they do have a strong negative view of drop-off	Very low intention to use public transport Consider public transport difficult to use	Very low	Reduce availability of car parking	None

Table 5 continued

Conflicted Greens (9.2%)	Public Transport	Positive attitudes towards public transport, think that it is easy to use and have strong intention to use it in the future	Existing positive views of public transport	Negative views of bus	Moderate-High	Improve perceptions of bus	Public transport
	Drop-off			Moderately positive view of drop-off and taxi		Reinforce positive aspects of travelling my public transport and provide continues incentives (for example, loyalty schemes)	
	Taxi	But more positive views of drop-off and taxi than the bus		Feel some social pressure to use the car			
Environmental Champions (5.9%)	Public Transport	Very positive attitudes towards using the bus and public transport in general, but does not appear to be morally guided	Consider that public transport is easy to use and have strong intentions to use it for future journeys	Few	Very high	Continue to promote alternative to private car modes and maintain service levels for trains and buses	Public Transport, especially bus/coach
		High perceived behavioural control					
		Very negative opinions of all other modes					
Pessimistic Lift Seekers (11.3%)	Drop-off	Consider public transport to be difficult to use (low perceived behavioural control), and have a low intention to use it in the future	Lack of car access	Preference for private car modes	Moderate	Promote the ease with which public transport and alternative modes can be used	Public transport Rental car
		String intention to use drop-off in the future		Perceive public transport to be difficult to use, and have a negative view of using it		Provide more information relating to alternative modes as these passengers are non-UK residents	
Public Transport Advocates (10.4%)	Public Transport	Fairly positive attitude towards public transport, feel it is easy to use display a degree of social pressure to use it.	Lack of car access	Few	Very High	Reinforce benefits of public transport	Public transport
		Moderate view of other modes	Current attitudes				

towards public transport, the finding that they are perhaps more susceptible than other groups to using a certain mode offers a potential opportunity for influencing their future behaviour.

At the other end of the spectrum are the *Environmental Champions* and the *Public Transport Advocates*, whose attitudinal profiles reveal positive attitudes towards using public transport and negative or less favourable attitudes towards other modes. Consequently, these groups are arguably less of a priority from a behavioural change perspective as they already exhibit the desired behaviour. Additionally, in the case of the *Public Transport Advocates* available mode choice options are constrained by the fact that this group do not have access to a car.

This leaves the *Conflicted Greens* and the *Pessimistic Lift Seekers* as groups where there is possible scope for reducing private car use. These two groups are arguably the most important from a behavioural change perspective, as their attitudes and trip characteristics appear to be more on the behavioural margins, where attitudes are generally more malleable and behaviour is more susceptible to change.

While the *Conflicted Greens* have the most favourable attitude towards public transport, only 56.4% of these passengers actually travelled by public transport on the day the questionnaire was administered; the remaining 43.6% travelled either by drop-off or taxi. It would seem that a problem for this group is not so much their underlying attitudes or future intentions, but rather the translation of these attitudes into actual mode choice. There appears to be a disparity between their attitudes and their subsequent behaviour. In other words, they do not always act in accordance with the way they (claim) to feel. While it is possible that this group overstated their positive attitudes towards public transport in the questionnaire, it may also be the

case that barriers exist (either perceived or real) preventing the translation of their prevailing attitudes into behaviour.

The *Pessimistic Lift Seekers* pose a slightly different challenge. This group is composed largely of passengers who were dropped-off or used a taxi. Attitudes with respect to using public transport are the most strongly negative of all the clusters, which is reflected by the fact that not a single person in this group used public transport for their trip to the airport. Their outlook and subsequent behaviour is in stark contrast to the other non-car access cluster, the *Public Transport Advocates*. Responses to attitude statements and scores for psychological constructs suggest that the disparity in behaviour between the two groups may stem from their varying perceptions of the ease or difficulty of using different modes (perceived behavioural control from the Theory of Planned Behaviour). More specifically, the *Pessimistic Lift Seekers* generally perceive using public transport to be prohibitively difficult, while they consider using taxis and drop-off to be more straightforward. This would appear to be a significant impediment to reducing private car use for this group.

5. Discussion and conclusions

Analysis sought to determine segments of airport passengers in order to identify those with the greatest potential to reduce their private car use, and eight behaviourally distinct passenger segments were subsequently identified using cluster analysis. These groups varied considerably in terms of their potential for reducing private car use. Amongst these, two groups, described as the *Conflicted Greens* and the *Pessimistic Lift Seekers*, were found to have the greatest potential for behavioural change. For the *Conflicted Greens* the issue relates to translation of attitudes into behaviour, and thus the need to reduce the attitude-behaviour 'gap'. In

contrast, for the *Pessimistic Lift Seekers* need to reduce the perceived difficulty of using alternative modes was identified as a barrier to reducing private car use.

The majority of passenger segments showed a much greater resistance to change, exemplified by the *Ardent Taxi Users* and the *Devoted Drivers*. Consequently, rather than attempting to change the behaviour of these passengers, a practice that would arguably be futile, in the short to medium term it would perhaps be more time and cost effective to focus effort on maintaining their current patterns of behaviour and limiting 'negative' shift of passengers that might switch to using drop-off.

From a policy perspective, the rationale for this type of segmentation rests on the assumption that it is relatively ineffective to try to address the 'average' person in a behavioural change scenario. Instead, it is better to assess the shared needs, attitudes and perceptions of much smaller groups of individuals as they are likely to be motivated by different factors, hold varying attitudes towards the behaviour and thus experience different barriers to behavioural change. From this it is then possible to target groups who occupy the behavioural periphery, where attitudes may be more malleable and susceptible to change.

While relatively unusual in a ground access context, the social psychological approach has demonstrated the value of accounting for an individual's attitudes and psychological outlook in their travel choices in addition to structural and other trip related factors. The ability to identify disparities existing between a person's attitudes, intentions, and ultimate behaviour is important as it helps account for an individual's *perceived* capabilities and constraints in addition to any infrastructural or 'real' factors. Decision makers must recognise that both real and perceived barriers act as filters between the intention to behave in a certain way, and the behaviour itself.

Identifying the nature of these barriers and then, ultimately, reducing or removing them, should form a key aspect of policies for reducing private car use in the future. An example of this is provided by the *Conflicted Greens* group, who exhibit positive attitudes towards using public transport, yet actually favour private car modes. In this case it is not the attitudes of this group that need addressing, but the conversion of these attitudes into actual public transport use.

This is by no means a simple task for policy makers. Certainly, providing people with the opportunity, or the context, in which to make the desired or 'right' choice should form a fundamental aspect of facilitating behavioural change. If the options available to travellers are limited or the services themselves are inadequate, then no matter how well the psychological barriers are tackled or other policies put in place, it is unlikely that the desired outcomes will be achieved. This relies to a significant extent on the provision of key infrastructure, which can be considered as both a prerequisite for, and a great enhancer of, behavioural change strategies. In the case of ground access travel, the provision and continual development of key ground access infrastructure is an important facilitator of behavioural change, it is not a case of having one at the expense of the other.

To an extent, the scope for achieving meaningful reductions in private car use, and the types of strategies used, largely depend on the timescale involved. For the small, yet significant share of passengers occupying the behavioural margins where potential for change in the relatively short-term is possible there is perhaps scope for the implementation of various 'soft' incentive measures, as discussed by Cairns et al. (1998). However, as mentioned there is much greater reticence to change among the majority of passengers. For these people it would seem unlikely that 'soft' or

incentive measures alone will yield significant, long lasting reductions in private car use. Eventually it will become necessary for decision-makers to confront the substantial challenges posed by these groups, which may lead to a greater consideration of harder (perhaps market-based) disincentive measures.

Finally, while this paper has focussed on the need to initiate 'positive' behavioural change, it is important that decision makers remain cognisant of the fact that behavioural change is not a one-way process, and that shifts can occur just as easily (if not more so) in the opposing direction from the one desired. It is therefore important that decision makers are aware of the need to maintain the existing behaviour of those currently using more sustainable modes, rather than concentrating solely on effecting behavioural change in others.

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