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Appendix A: Detailed Study Methodology

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Overall Approach

The study was undertaken in two main parts. The first stage comprised a literature review and an initial phase of qualitative research. The locations in which the initial qualitative research was carried out were defined by the identification of case study areas. The case study areas were identified and agreed with the client group prior to the execution of the initial qualitative research. An interim report was produced which identified the implications of the findings of the stage one work for the second phase of the study.

The second stage of the study comprised a detailed assessment of bus demand in each of the ten case study areas. This involved consultations with Local Authorities and bus operators including collating any available local data that could be used in the detailed analysis of bus patronage. The bus scheme designers were interviewed, where possible, to gain an understanding of how 'softer' factors are incorporated into scheme design.

Primary data on attitudes towards and usage of bus services for users and non users was also collected in the case study areas. Part of the primary data collation involved collecting stated preference data on how people trade off different bus service attributes – both 'hard' and 'soft' when they make their travel choices. This provided relative valuations of different bus service attributes. This element of work investigated how the valuations of soft variables should be incorporated into multi-modal models and forecasting models of bus patronage.

Detailed analysis of current bus trip rates for public transport was undertaken using the National Travel Surveys and was supplemented with the primary data collated in the ten case areas and with secondary data from elsewhere. An attempt was made to identify the differences in trip rates resulting from socio-economic, demographic, geographic and public transport service variables. This was then used to identify any differences between areas that may be attributable to other factors such as bus service quality.

The risk of bias was in part avoided by undertaking research on two before and after situations during the period of the commission.

The final step of the study was for the resulting models and values to be applied in transportation models that had been used to justify bus service improvements or compared enhanced bus with light rail schemes.

Stage 1: Literature Review

Few studies in the public domain have attempted to value the influence of softer factors in bus operation. The focus of this type of research in the UK is usually on fixed rail systems or undertaken in the context of London. The key "softer" interventions to be examined fall into the following broad categories:

- Vehicle quality;
- Driver quality;

- Security/fear of crime;
- Accessibility Marketing and branding;
- Multi-operator tickets;
- Simplified fare structures;
- Smart cards; and
- Real time information systems

There are a greater number of studies covering some issues than others. Information provision and real time information provision are perhaps the most heavily studied areas with new studies emerging all the time. Even here however, the number of studies seeking to identify willingness to pay remains small. Information and marketing is part of a continuum of communication which is perhaps most intense with respect to personalised travel planning interventions. Whilst workplace and other location based travel plans are qualitatively different in that their aim is to reduce car use rather than increase passenger transport use – this will often be part of the proposed solution. The impacts of travel planning on public transport patronage have therefore been considered as part of the information continuum. Other demand management policies were considered outside the scope of this literature review.

The review has focused on evidence relating to the introduction of “softer” factors and their impact on travel behaviour. The review phase comprised four main strands:

- Search for, and examination of published sources of UK and international experience;
- Consultation to identify sources of further unpublished information or studies (integrated with the consultation, pre-case study phase);
- Identification of scope for and data for a meta-analysis; and
- Integration of information into a definitive statement of the evidence on the role of softer factors in impacting on bus demand and modal shift.

The review clearly defined each type of intervention and the boundaries of the review and then examined published sources seeking to identify evidence on:

- Change in patronage;
- Modal shift; and
- Values relating to specific soft factors.

An early task was to define the quality criteria for judging studies. Indicative quality assessment criteria for studies reviewed:

- Before and after evidence of impacts on patronage, scale and timing of surveys;
- Modal shift: scope of surveys, does it identify the nature of the shift: direct shift of a trip, indirect through new trips being made by bus;
- SP studies: sampling procedure, range of attributes and levels, plausibility, quality of models; and
- For all studies the degree to which other potential causal factors are studied and contextual factors.

Given that much of the evidence identified was from studies of multiple interventions or “packages”, a meta-analysis was undertaken that sought to disentangle these effects.

The initial search enabled the production of an initial draft review designed for further consultation with experts to identify gaps both in knowledge and the review. There was a need to consult widely with organisations and individuals in order to supplement published information by identifying grey literature: PTEG, CPT, ATCO, ACT, UITP, TfL, and the main operators.

The final phase brought all the material together within a rigorous framework to provide a definitive review. The review:

- Defined the range of "softer" factors;
- Assessed the types of evidence available;
- Reviewed evidence;
- Draws conclusions on the quality of the evidence by factor; and
- Provides the basis for undertaking a meta-analysis.

Stage 1: Selection of Case Study Areas

The literature review provided a starting point for making contact with potential case study consultees – this enabled a case study wish list to be developed which includes "interesting" potential case studies, case studies which meet the project team and client's requirements, case studies where consultees' appear to be cooperative and case studies where there is likely to be significant (quantitative) data to be collected.

Initial case study consultation took place with the Passenger Transport Executive Group (PTEG), individual PTEs, the Confederation of Passenger Transport (CPT) nationally and within the East Midlands. The Association of Transport Coordinating Officers was consulted, and the organisation's ATCO mailing list was used to consult all ATCO members about potential case studies. The Bus Interventions Study[1] database was consulted in detail, as was the DfT 'Kickstart' database, to ascertain whether any of these schemes would lend themselves to case study status within this study. Discussion also took place with a number of bus operators, and the literature review revealed some possibilities for case study selection.

An initial list of 56 potential case studies was drawn up from which the final case studies could be selected. In some cases the studies were proposed by the promoters themselves, some arose from discussion and consultation with stakeholders, some were contained within the databases consulted and many arose from consultation with the CPT. Others arose from discussion and proposals within the study team.

Consultation also took place at the national level with representatives of Stagecoach, First, Go Ahead and National Express. This had the dual benefit of putting forward suggestions for potential case studies, and also ensuring a high degree of cooperation with the study. Operators saw the benefit of this study in enabling them to forecast more accurately in the future the likely impacts of individual soft measures or packages thereof.

The initial number of potential case studies was reduced to 33 and then to 15. These case studies were discussed with the client and a set of 7 case studies with 3 potential case studies was agreed. Initial consultation with the case study stakeholders demonstrated some potential difficulties in obtaining

[1] An earlier research study undertaken by AECOM for the Department for Transport

quantitative data; for example, in Merseyside no quantitative analysis has been undertaken to establish any link between the TravelSafe initiative and bus patronage; in Cornwall not all operators were willing to take part in the research.

The final set of case studies chosen was:

1. Poole MORE services (quality corridor).
2. Hull (interchange).
3. Go Ahead North East (branding) – Sunderland.
4. Warrington (interchange).
5. Cambridge/CITIBus (network simplification; branding).
6. Leeds ftr (image).
7. Fastrack (busway) – Dartford, Kent.
8. Blazefield Witch Way (quality corridor) – Burnley, Lancashire.
9. Goldline Service 66 Warwick/Leamington Spa (new quality route).
10. Nottingham Route 30 (Eco Bus).

Interviews were set up with stakeholders in each of the case study areas (both bus operators and local authority representatives). A topic guide was developed to discuss the development and implementation of the soft measures within each of the case study areas. Consultation interviews were attended by members of the study team from STAR and Faber Maunsell; a digital recording was made of each of the interviews where the participants gave permission.

Interviews were also set up in certain potential case study areas which failed the final cut of case study selection but where the study team felt that the qualitative information obtained would provide valuable background material to the study. In general these background case studies were eliminated from the final case study selection owing to fears over the likely level of quantitative data availability following initial contact with the consultees.

Operators and local authority officers alike were generally very willing to give their support to this study as they saw the benefit in developing a forecasting tool in relation to sift measures. Only three operators approached declined to take part in the study; one felt that too much research time had already been devoted to their organisation; the other 2 operators cited pressure of time as the reason for declining to take part in the interview process.

Table 1 Selection Criteria for Case Study Schemes (Final Version)

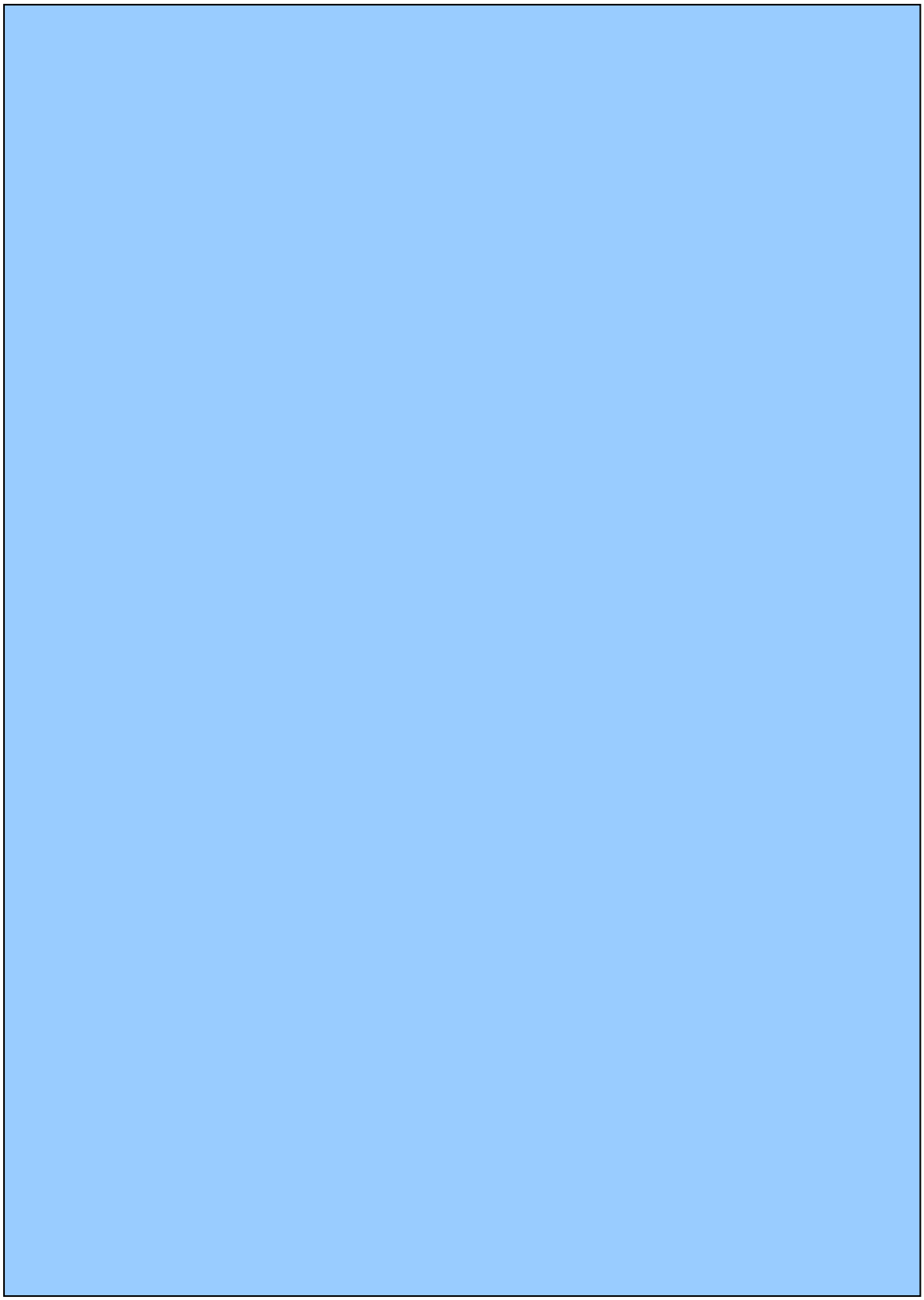

Table 2 Case Study Consultees

Case Study	Consultee	Job Title	Organisation
Goldline 66	Phil Medlicott	Managing Director	Stagecoach Warwickshire
FTR York	Richard Eames	Managing Director, First York	First York
	Barbara Bedford	FTR Project Director	
	Andy Pike	Business Development	
Warrington Interchange	Barry Eaton	Passenger Transport Co-coordinator	Warrington Borough Council
	Steve Hunter	Strategic Transportation Officer	
	Nigel Featham	Managing Director	Warrington Borough Transport
Cambridgeshire Citibus	Andy Campbell	Managing Director	Stagecoach Cambridgeshire
	Philip Norwell	Commercial Director	
	Paul Nelson	Local Passenger Transport Manager	Cambridgeshire County Council
MORE	Alex Carter	Managing Director	Go Ahead Wilts & Dorset
Fastrack	David George	Fastrack Project Manager	Kent Thameside
	Kenneth Cobb		Kent County Council
	James Cook	Senior Transport Planner	
Hull Interchange	Bob Rackley	Commercial Manager	East Yorkshire Motor Services
	Graham Hall	Highways & Transportation Manager	Kingston upon Hull City Council
Nottingham Route 30	Andy Gibbons	Team Leader, Public Transport	Nottingham City Council

Go Ahead North East	Peter Huntley	Managing Director	Go Ahead North East
	John Conroy	Managing Director	Stagecoach
	Robin Knight	Commercial Director	
	Gordon Harrison	Senior Planning Officer	Nexus
Blazefield Witch Way	Geoff Lomax	Commercial Director	Keighley & District Travel (Blazefield)
	Dave Alexander	Managing Director (Yorkshire Operations)	Blazefield Group

Additional schemes	Consultee	Job Title	Organisation
Fastway	Nick Hill	Commercial Development Manager	Metrobus
	David Crockford	Transport Planner	West Sussex County Council
Norfolk	Ian Hydes	Network Projects Manager	Norfolk County Council
	Mary Richards	Customer Services Manager	
	Ben Coulson	Managing Director	Norfolk Green
Cornwall	Geoff Rumbles	Managing Director	Truronian
	Steve Nicholson	Principal Transport Officer	Cornwall County Council
Peterborough	Teresa Wood	Passenger Transport Team Manager	Peterborough City Council
	Barry Kirk	Transport Planning Group Manager	
	Andy Campbell	Managing Director	Stagecoach Cambridgeshire
	Philip Norwell	Commercial Director	
Merseytravel	Julian Westwood	Travelsafe Officer	Merseytravel
Centro	John Bird	Assistant Director (Development & Planning)	Centro
	John Sidebotham	Assistant Director (Strategic Planning)	

Stage 1 Initial Qualitative Research

The purpose of the qualitative research was to:

- Understand attitudes to bus travel;
- Understand the relative importance of 'softer' factors in the overall travel experience and the influence on propensity to use bus;
- Understand how traveller response to softer factors varies across market segments, locations and by journey context;
- Explore whether there is a hierarchy of needs in relation to bus service attributes – do all 'hard' attributes e.g. reliability, frequency, speed and cost need to be 'satisfactory' before 'soft' attributes become important or are there overlaps if so, for which key segments; and
- Inform the design of stated preference experiments:
  - By ensuring that all relevant factors that influence travel decisions are considered and explored;
  - By identifying which softer factors can be traded off against other travel characteristics;
  - By understanding which softer factors are 'dis-satisfiers' as opposed to barriers to travel;
  - By exploring the levels of service that affect 'satisfaction' levels or thresholds at which travel decisions are made;
  - By understanding the limitations that potential respondents may have in performing trade-offs, for example the number of factors and variables that people can cope with;
  - By understanding the terminologies that are understood by those who potentially will be included in stated preference surveys.

Following a pilot phase for the Go Ahead North East Case Study in Sunderland, depth interviews were primarily to carry out the research. Research was then carried out in the other 9 case study areas. The recruitment for the depth interviews was carried out by professional social and market research interviewers. Respondents were recruited door-to-door along the corridor of the specified bus route(s) in a specific area. This was to ensure respondents lived within a reasonable distance to the route of interest and were in close proximity of one another (to reduce travel time between interviews).

Respondents were recruited based on the following criteria:

- Bus usage:
  - Used bus at least twice a week; or
  - Used bus 2-4 times a month ie use bus weekly or fortnightly; or
  - Do not usually use bus but have used it in last year (non user).
- Length of Bus use:
  - Used bus as main mode and have done for long period (over three years) (long term users); or
  - Used bus as main mode now but have only recently started using bus (within last year or two) (switchers); or
  - Used bus less often than monthly (less often).

- Car availability
- Age
- Gender

The target number of interviews per area was five. However, a number of respondents withdrew at the last minute, for a variety of reasons e.g. medical appointments, attendance at funeral. To compensate over-recruitment of interviewees was undertaken towards the end of the survey. The number of completed interviews per area is shown in Table 3.

Table 3 Completed Surveys by Case Study Area

Case Study Area	Number of Interviews
Pool	5
Hull	4
Sunderland	4
Dartford	5
Cambridge	4
York/Leeds	4
Warrington (Pilot)	4
Burnley	6
Warwick	5
Nottingham	4
Total	45

SP Gaming Approach

A Stated Preference (SP) gaming approach was used towards the end of each depth interview (where appropriate) in order to understand what changes would increase/decrease bus patronage, explore what aspects are critical/non critical and understand attitudes towards packages of improvements.

This stage of the depth interview was useful in testing the SP presentations in order to understand how best to present different factors. Feedback from this exercise would inform the design of the SP survey to be conducted in the next phase of the research.

Following this they were presented with a grid containing ten factors (a mixture of hard and soft), each of which was described by a number of levels (best case scenario to worst case scenario). There were usually five levels for each factor; however more continuous variables such as fare, in-vehicle time and wait time had many more levels. When completed, this grid represented their journey. Respondents were then asked to identify which level of each variable was closest to what they currently experience.

They were then asked to identify which would be the best improvements they could imagine (by moving to the left on the grid from their current position). They were asked whether they would be willing to pay 5p for each these improvements in order to explore the package effect.

Following this, respondents were asked to identify the five factors that would detract them from using bus by moving to the right on the grid from their current position.

Potential interactions were explored to examine whether a detractor in one variable could be compensated by improvements in others.

Stage 2 Primary Data Research – Overview

The purpose of the primary data collection was to:

- Provide robust quantification of the relative importance of soft factors to the travel choice decision;
- Provide validation of SP based evidence by reference to trip rate and RP choice modelling;
- Explore the issue of marketing and of information in the context of the take-up of new services; and
- Provide insights into likely mode switching as a result of improved quality buses.

Five distinct aspects of primary data collection were undertaken. These were:

- A series of Stated Preference exercises to deal with the relevant issues in valuing 'softer' qualitative factors and to determine their impact on modal choice;
- Collection of Revealed Preference data relating to the choices travellers actually make which reveal the actual importance that they attach to 'soft' attributes;
- The collection of trip rate data from purpose specific surveys in order to identify from a cross-sectional perspective the effects of different levels of bus service quality on the actual demand for bus travel;
- The collection of trip rate data from purpose specific surveys in order to identify from an inter-temporal perspective the effects of changes in bus service quality on the actual demand for bus travel; and
- The assembly of a range of survey based data relating to bus use and perceptions so as to determine the influence of knowledge, habit and marketing on the demand for bus travel.

Stage 2 Primary Data Research: Stated Preference

The Stated Preference (SP) stage of the CAPI based questionnaire was split into two components. The first and main part took a conventional valuation format and dealt directly with trade-offs between soft variables as well as addressing the well-known package effect. The second considered either: choices between bus services of different qualities where appropriate; choices between bus and other modes to address issues of mode switching; or choice contexts which either the literature review or the qualitative research indicated to be potential fruitful avenues for exploration.

The first stage SP involved two exercises for each respondent:

- The first SP exercise dealt with trade-offs between all the soft variables of interest to this study, including those revealed as important in the qualitative research and the literature review. It was specifically designed to allow

examination of factors such as interaction, budget and halo effects that possibly contribute to package effects, and to distinguish genuine package effects from those that are an artefact of the SP approach.

- The second SP exercise valued a range of different overall packages of bus quality improvements to determine the relationship between the sum of the values of individual attributes and the valuation of the overall package and, more importantly, to determine the factors which lie behind any package effect.

As a result of this first stage SP, the valuations of specific attributes were re-scaled to be consistent with the valuation of the entire package. A 'rating scale' approach was used to impute valuations to a range of attributes that were not deemed to merit inclusion in the SP exercises but which were of potential interest.

The second stage of the SP interview examined a range of the following issues as most appropriate:

- Those who were in a position to choose between different operators or indeed between different routes with different levels of bus quality were offered SP exercises based directly on these choice contexts.
- Others were offered SP choices between their current mode (typically car) and a range of bus options with different degrees of quality in order shed light on mode switching possibilities.
- We also retained the option of offering SP exercises based upon choice contexts which were revealed as part of the qualitative research.

There was need for a sufficiently large sample of data in order to allow for respondents to be segmented by, as a minimum:

- Regular bus user/ infrequent bus user and non-user populations;
- Car accessible and non-car accessible populations; and
- High, average and low income groups.

To avoid wasting data, parsimonious approaches based on the use of dummy variable interaction effects, was used to determine variations in coefficient estimates across market segments where this was empirically warranted. The target sample size of 250 completed surveys per case study area (i.e. 2500 surveys in total) allowed for the requisite segmentation and provided a large overall sample to provide robust estimates. Given the very large number of variables and service characteristics that can be included in an SP of this type, there was a range of different designs, tailored to specific journey types: the large sample was required in order to facilitate this.

In order to engage with respondents to achieve a high sample rate, a face to face household survey was the preferred method. This had the following advantages for the collection of SP survey data:

- The SP scenarios presented can be selected for relevance to journeys actually being made, for example, purpose and distance;

- Interviewers can make use of Showcards and other visual aids to explain and present the interview so that the quality of the data collected is very high;
- Quotas can be controlled for so that sufficient data for the required segmentation is obtained; and
- CAPI can be used.

The use of CAPI for the collection of the data was utilised to capture the following benefits:

- The CAPI questionnaire is more easily tailored to the travel patterns of the respondent;
- A large number of SP designs can be included, with the computer programme designed to randomise these amongst respondents; and
- The data is available for analysis on an ongoing basis, to check for quotas and progress.

For each case study area, the catchments were examined to identify the survey area and the population data. Quotas were set for each area to take account of:

- Demographics, including gender, age group;
- Regular bus user/ infrequent bus user and non-user populations;
- Car accessible and non-car accessible populations; and
- High, average and low income groups.

The questionnaire was designed to record the following information:

- Travel patterns of an individual in the household;
- Destinations visited in corridors of interest, modes used, frequency of travel etc.;
- Modes available to individual and household;
- Attitudes to modes of travel, including local public transport in different corridors, frequency of use, using perceptions of travel modes;
- Functional perception - rating of cost, frequency, reliability, comfort, etc. for various types of transport generally as well as for a specific journey;
- 'Emotional' perception – rating of relative status or seeming suitability for someone in their type of job/socio-economic grouping of a particular mode of transport, e.g. modernity, healthy, 'be seen using';
- Awareness of differing service levels of local bus services;
- Demographic information – age group, gender, employment status, income group; and
- Attitudinal information relating to bus use.

Debriefing questions were used at the end of the SP stage to explore the reasons for particular patterns of responses, such as always choosing a particular option, the cheapest option or exhibiting preference intransitivity.

Stage 2 Primary Data Research: Revealed Preference

An appreciable amount of empirical research in transport is conducted without any recourse to actual behaviour. This is despite the fact that SP studies have, in some instances, yielded 'worryingly large' valuations for what at face value seem to be relatively minor factors. If the valuations really are of the magnitude typically indicated, they ought to be influencing actual behaviour and thereby detectable in actual choices.

To complement the SP exercises based on the choice of bus type, involving operator or route choice, suitable RP data was collected in contexts where respondents had relevant choices. Some individuals may have been able to use a different route with cheaper but poorer quality buses or dearer but higher quality buses. On a single route, there may have been different operators with different quality buses where the actual choices people make reveal the importance they attach to soft factors. Even when there is a single operator, useful trade-offs may exist, such as a willingness to wait at a bus stop for a better bus.

Stage 2 Cross-Sectional Trip Rate Modelling

Further pursuing the theme that there needs to be a firm basis in actual behaviour for any forecasting of the effects of improved bus service quality on the demand for bus, data on individuals trip making by bus was collected by household interview. Given that individuals who faced different qualities of bus were surveyed, the effect on bus travel was expected to be detectable. Information was collected on:

- Usage of bus services in the local area, by service number, frequency, destinations;
- Awareness of key services in the area; and
- Socio-demographic factors.

The aim was to collect factual data relating to bus trip making and to explain variations in these across individuals as a function of:

- Individuals' socio-economic and demographic characteristics;
- Land use and local factors;
- Quality of local bus services, including any network effects;
- Accessibility of local bus services;
- Fare levels;
- Availability and attractiveness of competing modes; and
- Awareness of local bus services, including marketing initiatives by operators or local authorities.

It is well-known that bus use differs considerably by socio-economic and demographic group. Generally speaking, it declines with income, is higher for women than for men and is greatest for the young and the elderly, the less-well educated and those living in more densely populated areas. It is also well established that the bus fare is an important factor in determining whether or not individuals choose to travel by bus.

The isolation of the effect of socio-economic and demographic variables on the propensity to make bus journeys is crucial in reliably determining the effects of

soft factors on the demand for bus travel. National Travel Survey (NTS) data was used for this purposed to supplement the primary data collated for the study. The NTS collects information on household trip making and household characteristics. Whilst it does not cover bus quality in detail, proxies were thought to be possible. This analysis was based on the most recent data available, currently covering the years 2003 and 2004. The NTS has a sample of between 7000 and 8000 households per year.

Stage 2 Inter-Temporal Trip Rate Modelling (Before and After)

Changes in bus service quality lead to changes in bus patronage. The extent of such changes was determined by the identification of locations where changes were planned and conducting before and after surveys. This identified the extent of trip generation and allowed segmentation by factors such as income level and previous levels of bus use.

In addition, a programme of retrospective questioning was pursued. This technique has been successfully employed in the examination of the effects of improvements in railway rolling stock, changes in rail reliability and the movement towards zonal fare systems. Existing bus passengers were interviewed on services where improvements had been made in recent years. Passengers were asked whether they were aware of the improvements, whether bus service improvements had brought about any change in bus use and what they would do if the bus service quality was as it was before.

Quantitative relationships have been developed between bus use and the various different quality improvements that occurred, allowing the behavioural sensitivity to vary across key market segments and also according to the elapsed time since the improvement and with marketing effort.

Stage 2 Factual Data: Knowledge and Marketing

One reason why bus patronage does not reach that forecast by SP models is not necessarily that they provide an over-optimistic response to improved services but that travellers are unaware that new services exist. A large amount of factual data was collected as part of the study data collection which will support detailed and sophisticated modelling. It has been possible to develop models which explain take-up of new services as a function of awareness of them. Awareness has been explained as a function of relevant variables, including marketing effort, the degree to which bus services have improved and other socio-economic and trip related factors.

Additionally, this has been enhanced by developing a more general model of information awareness. Perceptions of the precise features of bus services have been linked, including fares and frequencies as well as soft factors, to actual characteristics, and determine the key factors that influence this relationship.

Stage 2 Application of Results

The relationships produced through the development of new values from the Stated Preference approach have been applied to two models developed by AECOM for multi-modal studies and public transport studies. The principal objective was to import the new values in the mode choice relationships and rerun the models comparing the results with those previously produced.

Good potential for the use of this approach is where light rail has been assessed against high quality bus and bus quality bus corridors has been assessed at differing levels of quality. In some cases the models have been used to assess bus options even if the model was not originally used for that purpose.

The owners of the models were asked for permission for their use and have been informed that its use in this way will remain confidential – in the event that the revised mode choice model produces results that are materially different to the original work.

Finally the difficulties in applying have been reviewed in the draft guidance. In addition the effect of the findings from the guidance have been reviewed on the scheme tests and seek to isolate the factors that were particularly influential and those that may have less importance for the forecasts.

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Appendix B: Literature Review

1. INTRODUCTION

This literature review is focused on evidence relating to the introduction of measures with soft impacts and their impact on travel behaviour alongside evidence on the value passengers place on such interventions. The review concentrates on uncovering evidence in the UK context as being most transferable, but has also sought to identify key international evidence and best practice examples to assist in building the evidence base. The review phase comprised three main strands:

- Search for, and, examination of published sources of UK and (where possible) international experience;
- Consultation to identify sources of further unpublished information or studies (integrated with the consultation, pre-case study phase); and
- Integration of information into a definitive statement of the evidence on the role of soft measures in impacting on bus demand and modal shift.

The report is structured as follows:

- Chapter 2 explores potential definitions of softer factors or impacts.
- Chapter 3 identifies new sources of money values for softer factors over and above those identified in previous reviews and assesses them alongside key earlier studies.
- Chapter 4 examines the evidence on the impacts of softer factors on patronage and modal shift in the academic literature.
- Chapter 5 draws conclusions from the available evidence.

Indicative quality assessment criteria for studies reviewed were developed:

- Before and after evidence of impacts on patronage, scale and timing of surveys;
- Modal shift: scope of surveys, does it identify the nature of the shift: direct shift of a trip, indirect through new trips being made by bus;
- SP studies: sampling procedure, range of attributes and levels, plausibility, quality of models; and
- For all studies the degree to which other potential causal factors are studied and contextual factors.

However, many studies are limited in scope and or the level of reported detail, such that a formal matching to the assessment criteria did not seem productive. Key studies are reviewed in some detail with respect to methodology.

In this review we also seek to shed light on some of the issues and challenges associated with any analysis of the impacts and values of softer factors as identified in the proposal, namely:

Firstly, there is the well-known package effect, where the sum of the stated preference based values of individual attributes that compose a package is typically found to exceed the valuation of the overall package. The source of the problem is rarely identified in empirical research. Are there genuine effects arising from, for example, interaction or budget effects, or is the package

effect a function of using stated preference, such as might arise from halo effects or response bias? It must also be remembered that a different form of package effect might exist here, whereby introducing specific improvements makes little difference to bus demand but when several are introduced together, as with a Quality Bus Partnership scheme, the demand impacts are disproportionately large.

Secondly, even after correcting for package effects, stated preference based valuations of soft factors can be very high. As found in the earlier Public Transport Quality Literature Review Study (FaberMaunsell 2003). Strategic response bias is primarily suspected but other forms might be present. This is hardly surprising since the purpose of the often 'naïve' applications of stated preference in these circumstances will often be readily apparent to respondents and they will have an incentive to overstate their valuations to influence policy makers (Wardman and Bristow, in press).

Thirdly, soft variables might not influence demand in the same way as fare and journey time. It may be that soft variables have to achieve a minimum standard or threshold. Such a threshold might be expected to move upwards in terms of quality over time in a modern consumer driven society. Deducing demand impacts from monetary values through reference fare elasticity, as is commonly done, would therefore be inappropriate.

Fourthly, much previous research has concentrated on existing bus users. However, to induce mode switch, it is important to consider non-bus users who can be expected to have somewhat different preferences. It would be important in this context to explicitly model heterogeneity of preferences even within a sub-market such as existing car users.

Finally, in order to more fully understand mode choice and trends in bus use, it is important to move beyond the traditional 'economic' based approach to modelling, not by replacing it but by complementing it with the inclusion of socio-psychological variables, covering such factors as attitudes, lifestyle, aspirations, peer pressure, esteem and such like and explicitly including situational constraints on behaviour as well as the role that physical effort (e.g., use of body), mental effort (e.g., concentration) and affective effort (e.g., worry and uncertainty) have on the propensity to use bus. One key issue to explore is whether there is a hierarchy of travel needs relating to bus service provision. Is it necessary for certain travel attributes to be achieved for example fast reliable cheap service before the softer variables come into play or do these soft variables over-ride some of the 'harder' variables in particular circumstances.

This is a living document and is expected to evolve to some degree over the lifetime of the project.

2. DEFINITION OF SOFTER FACTORS TO ENCOURAGE BUS USE

An improved bus experience and patronage growth can arguably best be achieved through implementation of a combination of 'hard' and 'soft' measures. Where hard measures could be defined as physical engineering measures, impacting on journey time or reliability and changes to the operation of services in terms of frequency or coverage. In contrast soft measures centre on informing individuals or segments of society about available public transport services and providing a more desirable travel experience. Hard measures are more easily quantified in terms of effects through changes in walk, wait and in-vehicle time and reliability. These aspects have been researched over the years and demand relationships established alongside values of time (Balcombe et al 2004). Soft measures have not received the same attention and there is not the same level of understanding of their value to passengers or effect on demand. However, given the increasing recognition of the ability of soft measures to achieve desired behavioural shifts in the context of personal travel behaviour, bus transport provision and sustainable distribution (Cairns et al 2004; The Ten Percent Club, 2006; DEFRA, 2007) quantifying the effects of these soft measures in the context of bus travel will assist decision makers.

Given the lack of a widely accepted definition our initial distinction between hard and soft factors was as follows:

- Hard interventions are those that impact on objectively measured aspects of the time (walk, wait or in-vehicle and including on-time arrival) or money costs of a journey.
- Soft interventions are those that impact upon the experience of the journey and may impact upon perceived time costs and hence reduce the disutility of journey time.

Such a definition clearly places aspects of vehicle and bus stop quality in the "soft" domain. The definition is fairly helpful in allowing factors to be categorised. Even so there are still measures that fall between domains, for example, smart cards or simplified fares structures, in that they will often impact upon the money cost of a particular journey as well as making access to the system easier. Moreover, they may also impact on scheduled journey times by speeding up boarding and alighting.

It may perhaps be more useful to consider hard and soft outcomes rather than hard and soft measures. In which case hard outcomes are those that may be measured objectively in terms of time or money saving. Whilst soft outcomes are changes in perceptions and perhaps changes in behaviour. Table 2.1 provides some definitions of "soft impacts or outcomes" and the measures that could create them.

Table 2.1 Soft impacts/outcomes: definitions

Soft Impact	Measures
Quality of in-vehicle experience	Vehicle: age, ease of access, seating quality, cleanliness, entertainment, cctv. Driver: training to achieve politeness and smooth ride.
Increased awareness of service availability	Conventional and unconventional marketing approaches
Improved knowledge whilst travelling	RTI, public service announcements on vehicle
Ease of use	Smart cards, travel cards, ticket structure, low floor vehicles.
Quality of waiting and walking experience	Shelters, bus stations, ticket machines, seating, information provision, cctv, staff presence, lighting
Safety and security	cctv, staff presence, lighting etc

Soft impacts are considered here under five main classifications: quality of in-vehicle experience; awareness and knowledge; ease of use; quality of the walking and waiting experience and safety and security throughout journey. These are by no means exclusive classifications, and there is some overlap between sections due to interactions, for example real time information can provide bus users with a greater sense of security as well as improved knowledge. However these definitions were selected as the best way to consider all the soft measures, pertinent to bus-use, identified to date.

In-vehicle Experience

A bus user's in vehicle experience depends upon both the travel environment, in terms of vehicle, quality, comfort and space, and the attitude of the driver, in terms of the level or 'politeness' of customer service and their ability to drive in an appropriate manner. Both vehicle and driver quality are considered to be soft measures with the potential to affect demand.

Vehicle quality is defined to include: general comfort of the vehicle in terms of seating and space; age of vehicle; cleanliness; low floor access; entertainment and innovative designs such as the bendy bus. Other innovative solutions to provide a more pleasant travel environment would be included here but not CCTV on vehicle, as this is categorised as a measure impacting on safety and security.

Driver quality includes: driver politeness and smoothness of ride which may be achieved through targeted training.

Awareness and Knowledge

Accurate information provision is essential for existing and potential bus users and marketing of a service is advised to retain users and attract non-bus users. To make the distinction between information provision and marketing, information provision is details of timetables and routes, either paper based or electronic, available upon demand or at stations or stops; marketing of the bus product may include targeted distribution of such information.

Paper based information includes timetables and maps available in vehicle, at station, stops and other sources. Telephone information lines and staffing at stops, in terms of information provision, may be included here or under roadside infrastructure. Discussion of real time information includes information collected using a tracking system and communicated to users and potential users electronically, via message boards or SMS[2] and the internet or through information at bus stops.

Marketing includes other promotional material, aside from timetables, in-vehicle, and at stations and stops but also information, including timetables, which are more widely distributed. It extends to general marketing, direct marketing through a range of media of a service or route to users and potential users. Sales promotions such as two for one offers or free tickets for a limited trial period would be included here. Network and route level initiatives on simplification and branding, bus liveries etc are included, though arguably a sixth category regarding the network is required.

A line has been drawn to exclude detailed coverage of the role of travel plans. Whilst individualised or personalised travel plans are of clear relevance and are included as far as possible, however the potentially large literature here is beyond the scope of this review. Travel planning in organisations is not included.

Ease of Use: Ticketing and Fare Structure

Fare levels have a well defined effect upon demand and are not within scope of this review. Here the focus is on ticketing and fare structures, especially on measures adopted to make public transport use less complicated. Simplified fare structures, either in terms of single fare or period ticket, available at a flat or graduated fee will be considered in terms of effect. As will multi-operator ticketing, limited since deregulation of services but popular for public transport users who need to access more than one mode, or more than one operator's vehicles. Smart cards, electronic pre-paid tickets, holding passenger information, reducing the need to pay on bus are addressed. However, there will in almost all cases also be a fare effect for individuals which makes it difficult to disentangle the simplification / travel card effect from the total impact.

Walking and Waiting Environment

Waiting for a bus, train or tram is accepted as part of a public transport journey so infrastructure provision will affect user experience and demand. Roadside infrastructure helps to form the physical waiting environment and includes: shelters, stations, access to vehicle and any other physical facilities such as ticketing machines, available where people board or alight from buses. Information provision provided at stops or facilities such as CCTV and lighting in relation to safety and security discussed elsewhere, but integral to the roadside experience. The walk experience will also be impacted by the quality of the public realm. Given this the reader is advised to consider these interventions as relating to roadside infrastructure when appropriate.

[2] Short message service or text message

Safety and Security Throughout Journey

Crime or fear of crime can provide an effective barrier to bus use. Here we examine what bus users and non-bus users find threatening about public transport use including anti-social behaviour, and possible design and communication solutions to counteract these. Security issues and fear of crime will consider physical and design measures such as CCTV, lighting and staffing in both the waiting environment and on-vehicle. Initiatives, including educational programmes, designed to reduce crime or the fear of crime are discussed.

Network Changes and Development

This has been suggested as an additional aspect to cover under soft measures. However, changes to service provision should count as a hard measure impacting on walk, wait and or in-vehicle times. Nevertheless they will also impact on perception of the network and its attractiveness in general. These aspects will be covered under branding and marketing especially with respect to network branding such as the overground, whilst recognising that such rebranding is rarely undertaken without a revision of service provision.

It is also worth considering at this stage the way in which these softer impacts may interact with the hard factors. It is expected that as the quality of the journey experience increases, the disutility associated with time spent travelling may be reduced. This may be because the time period is perceived to be shorter, which could result from real time information systems. The most likely effect though is that the associated disutility reduces. Table 2.2 outlines some potential interaction effects.

Table 2.2: Expected Interaction Effects: Soft Impacts and Hard Impacts

Hard	Soft
In-vehicle time: Perception of duration Disutility	 RTI Interaction value of IVT and comfort – vehicle and drive quality + safety and security
Wait time: Perception of duration Disutility	 RTI, quality of waiting environment Interaction value of wait time and wait environment
Walk time: Perception of duration Disutility	 Quality of public realm Quality of public realm
Frequency / reliability	RTI Quality of waiting environment
Money cost	Ticket type, fare structure

The next two chapters contain the main review material. Chapter 3 reviews valuation studies, adopting broader categories dictated by the limited number and coverage of the available research. The focus is on methodology as much as on the actual values derived. Chapter 4 examines direct evidence on the impacts of soft factors on patronage and modal shift. The above categories are used as far as possible in this analysis.

3. EVIDENCE ON VALUES OF SOFTER INTERVENTIONS

In this chapter we examine the body of evidence on the values of soft interventions. The focus is on developments since the last review in this area in 2003 (FaberMaunsell) and also covers key earlier studies. Evidence from earlier reviews Litman 2007, Balcombe et al 2004, Nellthorp and Jopson 2004 and FaberMaunsell 2003 identified in the Inception Report and an additional review by Nossum and Killi (2006) which covers largely Norwegian and Swedish sources of valuations of quality attributes and a Booz Allen Hamilton (2000) review of relevant material in this case for Transfund New Zealand inform our choice of key studies. Nellthorp and Jopson provide a useful comparative table of values for both bus and rail values of softer attributes (see annex) although most of the values are derived from a further secondary source (Balcombe et al 2004).

Section 3.1 examines studies that have largely focused on the bus journey and section 3.2 on waiting facilities. Section 3.3 contains research on other modes that is useful from a methodological perspective. Section 3.4 contains conclusions. In this chapter we follow the existing literature in dealing with the interventions rather than the outcomes.

3.1 Stated Preference Studies of Bus Journey Attributes

A small number of recent applications of Stated Choice experiments to value bus service attributes including some soft factors have been identified in the academic and grey literature. These are listed below alongside key earlier studies to date we have not identified any studies based solely on revealed preference choice of bus service.

- Evmorfopoulos (2007): values for a package of bus quality measures in Leeds.
- McDonnell et al, (2007a and 2007b): values for quality of waiting facilities, chance of getting a seat, real time information provision and ticket machine availability for a Dublin bus corridor.
- Phanikumar and Maitra, (2007): values of seating and standing comfort for rural bus service in West Bengal.
- Van der Waerden et al, (2007): values include bus stop type and information provision, chance of seat on the bus in Wageningen, Netherlands.
- Espino et al, (2006 and 2007): value for bus comfort on Grand Canary.
- Steer, Davies, Gleave (2006 and 2007) bus trip quality.
- Le Masurier et al, (2006): inferred value for vehicle attributes from SP study of time values for conventional v articulated bus.
- Phanikumar and Maitra, (2006): values for seat comfort, chance of getting a seat, standing comfort, noise levels and appearance for bus travel in Kolkata.
- Bos et al, (2004): valuing quality attributes of park and ride systems in the Netherlands.
- Accent Marketing and Research (2004): assess trams against conventional double deck buses and bendy buses.
- Knutsson (2003): values waiting time at telephone switchboard, information, driver assistance for Special Transport Services in Sweden,

- Nossum (2003), values for bus journeys in Oslo including seat availability.
- Hensher et al (2003) survey of 1479 bus users, aimed to derive a service quality index. Values are not reported but may be inferred from the model – as this is split by route, there is some route related variation.
- Hensher and Prioni (2002) survey of 3849 bus users in New South Wales, values for a range of service quality attributes may be inferred from the reported model, which is complicated by variation between operators.
- Accent Marketing and Research (2002) values for information provision, CCTV on vehicle and at stop, driver politeness and friendliness. 1104 bus users and 1269 car users were interviewed. ITS/TSU (2002) apply the Accent work in models of bus corridors. The original survey data has recently been re-analysed by Laird and Whelan, 2007.
- Alpizar and Carlsson (2001): values comfort and security for bus services in Costa Rica.
- Streeting and Barlow (2007) refer to a study valuing service quality aspects of buses in Sydney (Booz Allen and Hamilton, 2001).
- FaberMaunsell (2000) study of Croydon Tramlink including quality factors.
- Balcombe and Vance (1998) CVM approach to valuing information provision in four areas of England.
- York and Balcombe (1997) values for the introduction of low floor buses in London and North Tyneside.
- SDG (1996) values for a number of softer factors for London buses, also reported in Swanson et al, 1997.

These studies are reviewed here and where possible comparable values identified.

Evmorfopoulos (2007) examined the values placed on a quality package to reflect the new aspects of a bus rapid transit (BRT) system – in the context of the cancellation of the supertram project in Leeds and proposals for a bus based alternative. The package included the following:

- Low floor access
- Off-vehicle fare collection
- Real time information on board
- Segregated track
- Air conditioning
- CCTV on board
- High level of sound proofing
- Environmentally friendly vehicle.

The surveys took place in summer 2007 and 91 responses were obtained from people waiting at bus stops along Headingley Lane and Otley Road, the route of the proposed supertram and BRT Northern Line Route. In an unsegmented model the package is valued at 12.74 pence per journey, whilst the value of journey time is 2.98 pence per minute and that of headway 2.62 pence per minute. The value of time is low but this appears to be common finding in studies of bus users. The lower value for headway is in line with the finding of Wardman (2004) that this value is less than the value of in-vehicle time. Although the single adult fare is £1.50, many of the respondents use

passes or concessions and the average fare is not reported. It is therefore difficult to compare with average fare. However, with respect to journey time, the package is equivalent to a saving of 4.27 minutes. A transfer price question obtained a somewhat higher value for the package at 21.66 pence, this may reflect the range presented.

Although the sample size is fairly small, some segmentation of the sample was undertaken by income and gender. The sample was split into low income (below £10,000) and high income (above £10,000). A clear income effect was identified with the low income group valuing the package at 10.02 pence and the higher income group at 14.56 pence. Women placed a lower value on the package than men.

Respondents were also asked to score each element of the package in terms of importance on a scale from 1 to 10. All elements has an average score between 5 and 8. The highest score were given to segregated track, environmentally friendly vehicle, cctv on board, RTI on board and air conditioning – all scoring over 7. When segmented by age (albeit with small samples), the clearest difference is on low floor access with age groups up to 44 years of age scoring it at less than 5 while those over 60 rate it at 7.40.

This is a relatively small scale study but an important one as it is the only recent work to examine bus user values in England outside London and it illustrates the potential importance of segmentation by income, age and gender.

McDonnell et al, (2007a and 2007b) examined the N11 Quality Bus Corridor in Dublin, drawing the sample from a catchment area defined as within 800 metres of the route. They undertook two preliminary focus groups prior to the SP experiment, however, no detail of the precise aims or coverage of these is given in the text. The main survey took place in 2005 and included the following attributes and levels:

- Journey time peak in minutes: 30, 35, 40, **45** and 55
- Journey time off-peak in minutes: 25, 30, 35, **41**, 50
- Quality of waiting facilities: low, **medium**, high
- Seat availability: **50%**, 70% or 90% chance
- Real time information at stops: **absent,** present
- Ticket machines at stops: **absent**, present
- Bus fare per kilometre: 1.7€c/km, 8.5€c/km, **17€c/km**, 25.5€c/km, 34€c/km

Each attribute has a pre-defined “status quo” level indicated in bold above. It is not clear whether the status quo is researcher defined or derived from empirical data. The design contains three attributes that can only be as now or better and four that can get worse, three of which only have one level that is worse than the status quo. The range in the bus fare is -50%, +50% and +100% but also a fare that is one tenth of the current level, which may not be believable to respondents.

The choice experiment included three options, two hypothetical choices and one status quo bus journey. Respondents were faced with 18 choice sets each containing three options consisting of seven attributes.

The design is unusual in some respects. Firstly, the use of a specific journey time as the status quo for all respondents, even though they would be spread along the route – with some on the original 9.2 km route and others on the later extension of a further 5.4 km. It is unclear whether the journey times provided are end to end or represent a typical journey. This suggests that some respondents would see the status quo journey as better or worse than their actual current journey in terms of journey time. The changes in journey time were expressed as absolutes in terms of minutes and as X minutes quicker or slower – so respondents could have focussed on the change rather than the absolute. Secondly, the specification of bus fare in terms of a rate per kilometre is unusual – the respondent is not presented with a fare or a specific change from a fare level. The respondent would need to know how far the journey was and multiply the fare by the distance. However, in the experiment this was also expressed as a percentage change – which respondents could then take to apply to their entire journey. The model was developed using the money cost levels. Sensitivity to cost may be affected if this variable is not easily understood. Moreover as respondents will probably be travelling on different types of ticket and with varying discounts – again this may not be realistic. The non-standard representations make it difficult to compare values from this study directly with others. Frequency was not included as the buses are already very frequent and focus group respondents did not suggest that this should be included. However, although they did mention bunching (McDonnell et al 2007a) neither reliability nor punctuality were included.

The softer factors explored are defined as present or absent in the case of real time information and ticket machines. Waiting facilities have three levels low, medium and high, there does not seem to be any further elaboration of these levels. Seat availability is specified as a 50, 70 or 90% chance of a seat. It is not apparent that these levels and descriptors were tested with respondents to explore understanding. It would have been helpful to know if security and safety emerged as issues in the focus groups or other measures of comfort and quality.

The survey sample was 1000. 93 respondents classed as non-traders were removed after modelling suggested improved performance if this were done. This is justified on the assumption that these respondents are modally captive and therefore less engaged with the experiment and less likely to consider all the attributes. The authors also refer to the paper by Espino et al (2006) as arguing that invariant responses are likely to bias the results.

A multinomial logit model was estimated alongside different random parameters logit formulations. The latter models performed best, with the preferred having a ρ^2 of 0.1603.

The values of attributes are given as willingness to pay per kilometre, dictated by the specification of the cost attribute. This also applies to the value of time savings. The authors do not provide a conventional value of an hour of journey time saved. It is possible to provide a (crude) estimate of the value of time by assuming a specific journey length. In this case the maximum possible journey length is 9.2 km for the original catchment area and 14.6km for the new catchment area. Values per kilometre can then be adjusted to the

journey length and converted to an hourly value. The use of the maximum journey length gives the highest possible values for journey time savings. The design and segmentations into 1999 and 2004 catchment areas and bus and non-bus users yields a possible 24 values of time saving attributes, only 13 of these are significant at a 5% level and a further 1 at 10%. For non-bus users in the original catchment area the value of time saved is at its highest for a 15 minute saving in the peak where the implied value of time is €2.68 per hour. For bus users the highest value of time saving is for a 16 minute off-peak time saving giving an hourly value of time of €3.23. For those in the new catchment area, non-bus users value of a 15 minute peak saving implies a value of time of €7.30 per hour and for bus users at €5.39. Note that values range from a low of €1.38 per hour. Values of large time savings imply higher hourly values than the values of smaller time savings. While this is unexpected given that the marginal utility of time saved would be expected to fall as more time is saved it does seem to add support to arguments that smaller time savings may be discounted by respondents (Mackie et al 2003).

Only the very highest estimate approaches the market values of non-work time recommended for application in appraisal of transport schemes in Ireland (Goodbody Economic Consultants, 2004) of €7.30 for non-commuting and €8.10 for commuting journeys. Given that the estimation method overestimates the value of time by basing it on the longest possible trip length, this suggests that the values of time obtained in this study are on the low side. A more realistic assumption on journey length of perhaps half the route length would halve the values of time estimated earlier. It is not therefore possible to express the values found for quality factors in terms of in-vehicle time.

However, it is possible to compare the value of attributes on a per kilometre basis relative to travel time. This is again not straightforward given the variation in the value of a minute of travel time between the levels of offered. Table 3.1 expresses the values of attributes in terms of in-vehicle time minutes per kilometre based on the unsegmented RPL model.

Table 3.1: Attribute Values from Unsegmented RPL Model

Attribute	Money WTP per kilometre €c/km	Minutes of peak in vehicle time per km	Minutes of off-peak in vehicle time per km
Wait facilities: low to high	0.493	0.827 – 1.476	1.409 – 1.526
Seat: 50% to 90% chance	2.675***	4.489 – 8.009	7.643 – 8.282
RTI: absent to present	1.839***	3.086 – 5.506	5.254 – 5.693
Ticket machine: absent to present	0.680	1.141 – 2.036	1.943 – 2.105

Source: adapted from McDonnell et al 2007a
*** indicates significant at 1%, other are not statistically significant.

The slightly higher off-peak values reflect the slightly lower values of off-peak travel time. The clear priorities are the chance of obtaining a seat and the presence of real time information.

However, the attributes and their values are explored further in models segmented by users and non-users and whether respondents are located on the early or later section of the route. The attributes valued on a per km basis

are all included in the final models and shown in Table 3.2, yet some parameters are insignificant. The availability of a seat is valued by all segments and most highly by existing bus users. Given that frequency was not raised as an issue in the focus groups, it is interesting that a variable related to frequency and vehicle capacity is the most highly valued. Only non-users value real time information, which may reflect their lack of knowledge of the frequency – this type of distinction can only be revealed through this type of segmented analysis. In the segmented model only the 2004 respondents place a significant value on the quality of waiting facilities.

Table 3.2 Soft factors: Values in Dublin €c per kilometre. (*, ** and * Represent Significance at 10%, 5% and 1% Respectively)**

Factor	1999		2004	
	Non-bus users	Bus users	Non-bus users	Bus users
Waiting facilities low to high	0.002	-1.076	1.958**	3.005**
Seat 50% chance to 90%	1.303*	3.140**	2.940***	5.290***
Real time information absent to present	2.161***	0.590	2.992***	1.604
Ticket machine absent to present	0.337	0.731	1.397	3.252**

Source: adapted from McDonnell et al 2007a

An alternative specific constant is included on the status quo journey. This is found to be significant and negative for those who have experienced the QBC since 1999. It is not significant for those on the new part of the route. This could, as the authors suggest, be an adaptation effect, the attractiveness has "worn off" or become internalised. However, if as the paper suggests the status quo journey time was constant for all respondents this would look clearly look less attractive to those living closer to the centre – who would be the 1999 segment and this could explain the high and negative ASC.

This is an interesting study in exploring the values placed on a range of factors influencing bus use and providing insights into how this might change over time with habituation. It is also one of very few studies to explore the preferences of non-users. The findings look reasonable in that non-users place a higher value on RTI than do users, the importance of getting seat is significant across segments and increases in importance with distance from the centre and hence journey time. However, it is difficult to compare these results directly with those from other studies due to the number of insignificant parameters and the unconventional specification of key attributes, most importantly cost.

Two studies by Phanikumar and Maitra (2006 and 2007) examine quality factors of urban and rural bus services in India. The two studies use a similar approach and both include: fare per kilometre, time expressed as speed and comfort in terms of seating, standing and the level of crowding. The urban study also includes waiting time, external appearance of the vehicle and noise level. The rural study includes headway. It is not clear how exploratory work may have informed the survey design, but the 2006 paper mentions discussions with experts and trip makers in setting the attribute levels.

Comfort had five levels: comfortable seating, congested seating, get a seat during the journey, comfortable standing, standing in a crowd. Noise levels were defined as very low, low, high and very high, this is a somewhat odd scale as it seems to have no middle range. Appearance is defined as good, average or poor. It is not immediately clear what the as now levels might be. The respondents were presented with a choice of four different alternatives in each set, each involving 6 attributes. This seems a rather complex choice set asking respondents to evaluate 24 pieces of information in order to make a choice, even though only six attributes are used.

The survey took place in October 2004 amongst bus users, yielding a final usable sample size of 1021 (91% of whom are male, it is not clear if this reflects the makeup of bus users). MNL and RPL models were developed for commuting and non-commuting trips, insignificant levels are omitted. The RPL models give a marginally better fit with ρ^2 around 0.232 to 0.234. The models suggest that with respect to softer factors both commuters and non-commuters are willing to pay most per km for a reduction in noise levels, followed by getting a seat and finally the appearance of the vehicle. Interestingly, in-vehicle time is consistently valued at more than twice the value of wait time. This would seem to reflect the discomfort involved in bus travel in Kolkata. The value of in-vehicle time is around £0.05 per hour[3]. In terms of minutes of travel time moving to very low noise level is valued at around 3.6 minutes of travel time for each kilometre travelled. This seems a very high value relative to the value of time.

The study of rural buses also finds a positive willingness to pay for getting a seat (understandably as the journey covered is around 5 hours from end to end). Again these cannot be directly compared with the value of time very easily.

Neither of these studies explores interaction effects, where the level of comfort might be expected to interact with the value of in-vehicle time. The complexity of the trade-off required of respondents might have been expected to cause problems, however, none are reported and the models have a reasonable fit. Quite apart from the complexity there is an issue with respect to the presentation of variables. Do users really understand fares when expressed as a fare per kilometre and time when expressed in terms of speed? The results will also be heavily coloured by context and therefore less comparable with European conditions.

Espino et al (2006 and 2007) present a study exploring bus attributes in Grand Canary using revealed and stated preference data. This drew on an earlier study by Cherchi and Ortuzar (2002) that was focused on the introduction of suburban train services in Cagliari and included a comfort variable for train, car and bus. The comfort variable was not estimated by mode and the model took the highest level of comfort as the base (to reflect the experience of car users) so it is difficult to draw useful conclusion on the value of bus comfort from this study. Nevertheless the comfort attribute at level one and two is always significant. Espino et al (2006, 2007) conducted 710 interviews to obtain revealed preference data, with respondents who used car but had a choice of mode. The stated preference experiment yielded 97

[3] Rate of exchange 82.3 Rupee to the £ coinmill.com 5/9/07

responses from a sample of 372. The surveys took place in late 1999 (Ortuzar, 2007). After discarding captive and inconsistent responses this reduces to 64 (Espino et al, 2007). A focus group with car and public transport users aided in the selection and definition of five attributes: travel time, travel cost, parking cost, frequency of service and comfort (Espino et al, 2006). Pilot surveys were used to fine tune the trade-offs. The comfort variable had three levels: low, standard and high. High being defined as "comparable with the comfort of travelling by car". The three levels for bus were as follows:

Low comfort: "The bus is full and you must travel standing up; sometimes you may encounter unpleasant situations, such as undesired physical contact, high level of noise (loud talking), unpleasant smells etc"

Medium comfort: "Bus almost full, you can sit but not exactly where you wish, and you can experience unpleasant situations, such as undesired physical contact, high level of noise (loud talking), unpleasant smells etc"

High comfort: "You have plenty of space and travel comfortably seated; there is a pleasant background music and you can even read without having to worry about traffic congestion"

Car: "the comfort you experience when travelling in your own car"

Source: Ortuzar (2007)

Nested logit models were developed to combine the RP and SP data, the author's report that mixed or RPL models did not yield sensible results. Removing "potentially lexicographic" respondents worsened the model fit (Espino et al, 2007) so these respondents were retained. However, a small number of individuals had marginal utilities with the wrong sign and these were omitted (Espino et al, 2007). Two models are presented one with comfort treated as a dummy variable, NL1 (ρ^2 = 0.1279) and one in which comfort interacts with travel time, NL2 (ρ^2 = 0.1247). In the NL2 model the dummy variable on comfort is multiplied by journey time.

In these models the cost attribute is defined to allow for income and time availability. Travel and parking costs are both divided by an expenditure rate (itself defined as per capita family income divided by available time – that is 24 hours minus working hours) (Espino et al 2006).

In the model where comfort is expressed as a dummy variable, across all individuals willingness to pay to move from low to standard comfort is €3.89 or 44.4% of the value of bus in-vehicle time (€8.76). The move from standard to high is €1.01 or 11.5% of the value of bus in-vehicle time. Men are willing to pay more than women for improved comfort (as they are for all other attributes which may reflect differences in disposable incomes between men and women?).

In the second model which interacts time and comfort, the average willingness to pay for changes in comfort are similar at €3.31 (low to standard) and €1.15 (standard to high). However, the value of time spent on the bus is moderated considerably by the level of comfort: €13.38 (low), €7.98 (standard) and €6.09 (high).

Both models clearly show that it is the move from low to standard that is most valued. Interestingly the only real difference between these levels in the descriptions is level of crowding and seat availability. This study provides further evidence of the importance of this attribute.

Espino et al (2007) consider the implications for policy and mode choice deriving elasticities and cross elasticities at different levels of comfort for the two models, see Table 3.3. These demonstrate that the direct elasticities with respect to time and cost are higher when quality is low as expected. In the model that allows time and comfort to interact the elasticity with respect to time spent on the bus is twice as high at low comfort levels as in the model that keeps time and comfort as separate attributes. The cross elasticities are almost doubled by a move from low to high comfort.

Table 3.3 Elasticity values for models NL1 and NL2

	Elasticity values					
	Comfort high		**Comfort standard**		**Comfort low**	
Direct elasticity	*NL1*	*NL2*	*NL1*	*NL2*	*NL1*	*NL2*
Time on Bus	-0.269	-0.295	-0.324	-0.522	-0.548	-1.273
Cost of Bus	-0.028	-0.068	-0.097	-0.128	-0.366	-0.264
Frequency of Bus	0.299	0.268	0.280	0.261	0.272	0.272
Cross elasticity						
Time on car	0.210	0.161	0.181	0.139	0.110	0.097
Cost of car	0.090	0.073	0.078	0.062	0.047	0.042
Parking cost of car	0.029	0.017	0.026	0.015	0.017	0.011

Source: Espino et al, 2007.

This is very interesting study in terms of the modelling approach and results showing explicit interaction between the value of in-vehicle time and comfort. It is limited by a small sample size and relatively low goodness of fit.

Bos et al (2004) have taken a very thorough approach to the identification of attributes that influence the use and evaluation of park and ride facilities. As the first part of an application of the hierarchical information integration approach (Louviere, 1984) which the authors suggest has not previously been applied in the context of passenger mode choice behaviour. The approach allows the exploration of complex decisions with many attributes. It assumes that individuals group the attributes into higher order decision constructs, evaluate each of these separately and then integrate these evaluations into a choice or preference (Bos et al, 2004). This implies a choice experiment for each construct and a "bridging experiment" to integrate the constructs into an overall preference.

Bos et al (2004) identified five decision constructs in this context:

- Parking: including information, chance of finding a space, ability to reserve a space and walking distance to public transport;
- Park and ride (P&R) facilities: supervision of the P&R, lighted pedestrian route. Liveliness at the P&R, and additional facilities such as a heated waiting room or supermarket;
- Connecting public transport: reliability and comfort of public transport;

- Time: seeking a parking space, traffic in the city, extra travel time to the P&R.
- Cost: total cost of transferring, costs of road pricing and parking costs at destination.

A somewhat simpler experiment was developed than that implied above in order to reduce respondent burden and remove any redundancy, based on three stated preference experiments, one covering P&R facilities, one the public transport and a bridging experiment. The survey involved 805 respondents in Nijmegen in 2002.

The initial estimates are of part worth utilities for the specific constructs. For P&R facilities the ranking is: supervision, maintenance, pedestrian route, additional provisions, walk time, waiting room and finally paying facilities. The emphasis is on safety and security issues. For public transport the most important factor is the certainty of a seat followed by number of transfers, frequency and mode. Overall time and cost are most important but the quality of the P&R facility and the quality of public transport are also important with the facilities having a slightly greater impact.

As the authors have put considerable effort into identifying the main influential attributes their conclusions that social safety aspects of the facility and seat availability on the public transport mode are key aspects is an important finding. However, the study does not report money values for attributes.

Le Masurier et al (2006) compared user responses to articulated and conventional bus services. This was intended to test whether the modal penalty for bus versus tram, should be the same for conventional and articulated vehicles. The existing model assumptions in the West London Tram study reflecting differences in “softer aspects” imposed a 4 minute boarding penalty on bus relative to tram and every minute on board a conventional bus is the equivalent of 1.2 minutes on a tram (in effect time spent on a bus is worth 1.2 times that spent on a tram). The study focused on the differences between the vehicles. 187 questionnaires were returned from 873 distributed in the Peckham - Lewisham corridor. The SP models indicate a penalty to articulated buses relative to conventional such that time on an articulated bus is valued at 1.3 times the value of time on a conventional bus. T statistics are provided, but no indication of the quality of the models overall, the models are assumed to be MNL (no specification is provided). Other aspects of the results are interesting in that the value of headway changes is estimated to be 2.25 times the value of in-vehicles time, in contrast to the findings of Wardman (2004) where the range of values is always less than 1. The authors note that the articulated vehicles have fewer seats than the conventional double deck vehicles. Users of both conventional and articulated buses express a preference for their current bus type. The limited information on the model limits interpretation of this study.

The results of Le Masurier et al may be compared with those of an earlier study by Accent Marketing and Research (2004) that examined trams, double deck and bendy buses. This study sought to identify any modal preference remaining after controlling for frequency, reliability, speed and cost. 233 stated preference interviews were conducted in 2003 split by tram users (81), bendy

bus users (73) and new double deck users (79). The experiments included: frequency, cost, time and for bus only reliability. The initial models reported include an alternative specific constant (ASC) for bendy bus and double deck. In an overall model both are negative – with the coefficient on double deck being larger. Mode specific models revealed a different pattern: tram users have large negative coefficients on both types of bus; bendy bus users have a high positive coefficient on bendy bus and a lower but still positive coefficient on double deck; double deck users have positive coefficients on both – larger for double deck (for bus users only the own mode ASC is significant). The modelling process continued experimenting with mode specific time coefficients, income effects and switching constants. Mode specific time coefficients improved the model fit and revealed a slightly higher disutility to tram than bus time. A clear income effect is identified with the cost coefficient being almost twice as high for those on household incomes below £10,000 as for those above £10,000. Models were also constructed where the mode specific constant was respecified to be the alternative mode. In every case the coefficients were negative and lowest and least significant for current double deck users. An ASC for current mode was also tested and was significant and positive. This study reveals a strong preference for the current mode. This type of segmentation is clearly important.

Waerden et al (2007) examine the choice between car, bus and bicycle for different journey purposes. The soft factors included are the chance of getting a seat and the type of bus stop. 960 respondents completed the SP in Wageningen, date of survey unknown. MNL logit models for different purposes, relatively low ρ^2 values between 0.075 and 0.102. The cost and time attributes dominate. Obtaining a seat is significant across journey purposes, whereas the type of stop only shows up in the leisure model. The model does not contain a conventional cost attribute or value of time so it is not possible to determine a value in time or money costs of the quality attributes.

Alpizar and Carlsson (2001) examined mode choice between bus and car, with improved bus quality as one of the attributes. Focus groups and discussions with experts were used to identify the alternatives, the attributes and levels. The soft factor is “comfort and security” specified at two levels as now or with the implementation of a quality improvement programme. This would include more comfortable buses, higher security at stops and on board. It is not clear precisely how this was presented to respondents. The sample is drawn from people who have access to a car and live and work in metropolitan area of San Jose and the survey work took place in autumn 2000. 90.7% of the sample usually travel by car and 39.9% reported needing a car during work The survey included a debriefing and of 602 respondents, 23 were excluded at this stage due to a lack of understanding or a negative attitude to the experiment. MNL and RPL models were specified, the RPL performs better, ρ^2 of 0.47 (RPL normal) and 0.48 (RPL lognormal) as opposed to 0.31 for the MNL. The quality program is not significant at the 5% level. The ASC on car is negative in the RPL models, but is more than offset by the positive coefficient on a dummy for regular car use and that for needing the car at work. This implies a strong preference for the current mode. The

impact of quality is very small. The authors conclude that the best means of attracting car users is to decrease the bus journey time.

The study by Knutsson (2003) of special transport provision with the attributes of demand responsive transport, included driver behaviour alongside attributes relating to fare and time. A postal survey was conducted in Stockholm, distributed to those who use the service, a response rate of 65% was obtained giving a sample of around 1457 (only the number distributed is given in the text 2241). Driver behaviour having two levels one of which is unspecified and the other "The driver is nice and helpful". The values for time waiting for pick up and time waiting on the phone are around four times as high as those for in-vehicle time. It is not clear how the levels were determined or their closeness or otherwise to experienced levels. The coefficient on driver behaviour is insignificant, as this either nice and pleasant or some kind of neutral perhaps this is not too surprising.

Additionally, Fearnley and Nossum (2004) report a Cost Benefit Analysis of passenger transport interventions that include the benefits of shelters and their maintenance, information at stops, real time information and low floor buses.

Hensher and Prioni (2002) and Hensher et al (2003) cover a broad range of quality attributes and thus provide an indication of relative preferences. The attributes in these studies were derived from the literature and bus operators (Hensher and Prioni 2002) though not directly from users and potential users. The stated preference (SP) experiments contained thirteen attributes each with three possible levels. Respondents were offered 3 choices, one of which was labelled as the current bus and asked to evaluate three choice sets. The design is complex and requires respondents to process and make comparisons between 39 separate pieces of information for each choice. However, the authors state that pre-testing indicated that respondents were able to consistently evaluate three choice sets, each with three alternatives (Hensher and Prioni, 2002).

Surveys were undertaken of users of 25 private bus companies in New South Wales in April-May 1999. A sample of 3,849 usable questionnaires was returned. A MNL model was developed (ρ^2 0.324). Table 3.4 shows values derived from the models reported in Hensher and Prioni (2002) and Hensher et al (2003), in neither paper are values derived from the models, as their purpose was the construction of a Service Quality Index. Hensher et al replace air conditioning, which people were not willing to pay for in the earlier study with temperature on the vehicle and add seat availability to the set. Interestingly the two attributes relating to safety at the stop and on-vehicle were dropped, although the smoothness of ride was clearly significant and had a relatively high value in the earlier study and very safe at the stop was also significant. It is difficult to see why these attributes were dropped whilst access to the vehicle and shelter facilities were retained although they were clearly not significant in the earlier study. It is possible that this set of variables was deemed more directly controllable by the operator and more easily measurable. In the later study the choice experiment is the same, 3 choices, each with thirteen attributes. In this case a nested MNL model is developed to allow for differences between the 9 segments surveyed (three

different route types from three different depots). Such segmentation is logical given the aim of the work, but it would have been more interesting in this context to see how priorities might have varied by say journey type or person type. In this case 9 values may be derived for each level of each attribute in the model. In Table 3.4 the range is indicated. The later study produces a somewhat different range of significant variables, the soft attributes that are significant in all segments are: seat all the way, stand part of the way, wide entry two steps, seat at stop and seat under cover. In some cases there is significant variation in values for an attribute level, in other cases where the weights are not significantly different they have been constrained to be the same across the model (Hensher et al 2003), thus the coefficient on stand part way is always the same. In the case of seat at stop and seat and shelter at stop the coefficients are the same on each level and it also has only two values one for the first three segments and one for the rest.

The values of vehicle access are much higher in the second study than in the first, albeit only of significance for a small number of segments. As with other studies the availability of a seat is valued highly. An additional finding appears to be a preference for the existing operator (the survey covered two operators), with 50.6% and 46% respectively choosing their existing package over the two alternatives (presumably in every case).

Table 3.4: Values of Bus Quality Attributes $AUS (values in italics based on insignificant coefficients)

Attribute and levels	Hensher and Prioni	Hensher et al
Bus stop		
Waiting Safety Reasonably unsafe Reasonably safe Very safe	 Base *0.32* 0.39	 Not included
Bus stop facilities No shelter / seats Seats only Bus shelter with seats	 Base *-0.07* *0.19*	 0.29 to 0.94 (9)[1] 0.29 to 0.94 (9)
Information at stop None Timetable Timetable and Map	 Base 0.62 0.41	 -0.59 (1)
Vehicle		
Access Narrow entry 4 steps Wide entry 2 steps Wide entry no steps	 Base *0.20* *-0.22*	 -0.68 to -0.91 (2) 0.69 to 0.92 (3)
Air conditioning None Available no cost Available surcharge 20% of fare	 Base *0.15* -0.36	 Not included
Cleanliness of seats Not clean enough Clean enough Very clean	 Base *0.29* 0.43	 0.45 to 0.58 (3)
Driver attitude Very unfriendly Friendly enough Very friendly	 Base 0.41 0.88	 Not significant
Safety on board: the ride is Jerky, sudden braking occurs often Generally smooth with rare sudden braking Very smooth, no sudden braking	 Base 0.43 0.74	 Not included
Seat availability Stand all the way Stand part of the way Seated all the way	 Not included	 0.38 to 0.43 (6) 0.64 to 1.72 (9)
Temperature on the bus Too cold Just right Too hot	 Not included	 Not in model
Value of in-vehicle time per hour	4.02	1.99 to 4.72
ρ^2	0.324	0.69

Source: adapted from Prioni and Hensher, 2002 and Hensher et al 2003.
[1]number of significant values in brackets

In an assessment of the drivers of demand on bus services in Brisbane (Streeting and Barlow 2007) use was made of values for some aspects of service quality. Values appropriate to the Brisbane context were taken from a study of buses in Sydney (Booz Allen and Hamilton 2001). That study found willingness to pay to move from a base level of service to an optimal level was around 2/3 of the average fare. Specific attributes included were: newer, cleaner, environmentally friendly, air conditioned, low floor vehicles, improved ride, customer friendly and well presented driver. Attributes used in the Brisbane study and the willingness to pay expressed as a proportion of the average fare were:

- Air conditioning 14%
- Environmentally friendly (gas powered) 5%
- Easy access (low floor) 5%

The values derived for Sydney in the original study of 300 bus users are shown in Table 3.5. In this case the key soft factor is air conditioning, valued at 13.9% of the average fare. RTI is in second place at 8.7% followed by factors relating to cleanliness, security and ride quality. The total (summed) value of the attributes is AUS $0.81 or 66.6% of the average fare. The priority placed on air conditioning is clearly at odds with the findings of Prioni and Hensher and Hensher et al in the same city.

Table 3.5: Values of Quality Factors: Sydney Buses

Potential Improvement	VALUATION PER BOARDING		
	Fare[(a)]	IVT[(b)]	% Fare[(c)]
All buses have easy access (ie no steps, wide isles)	$0.06	0.7	5.2%
All Buses are air conditioned	$0.17	2.0	13.9%
All Buses are environmentally friendly (ie gas powered)	$0.06	0.7	5.0%
Clean bus interior, no rubbish, graffiti regularly removed	$0.08	0.9	6.5%
Clean, comfortable seats in good condition	$0.07	0.8	5.5%
All buses have closed circuit security cameras	$0.08	0.9	6.5%
Real time passenger information at most stops	$0.11	1.2	8.7%
Simpler, more user friendly timetables	$0.04	0.4	3.1%
Large clear electronic destination indicators on all buses	$0.05	0.4	2.9%
Buses always driven smoothly	$0.07	0.8	5.4%
Driver always well presented and friendly	$0.05	0.6	3.9%
Total	$0.81	9.3	66.6%

(a) 'Willingness to pay' for improved service quality by way of higher fares
(b) Equivalent in-vehicle time (IVT) minutes
(c) Proportion of average Sydney Buses fare per boarding (adult and concession excluding school children)

Source: Booz Allen and Hamilton (2001).

Accent (2002) research for CfIT examined values of quality aspects for users and non-users on different types of bus service. Bus users had two types of experiment: one that included soft factors and reliability the other combined the soft factors into a package and also included journey time, headway and fare. Car had a choice of car v bus as in the second bus experiment. Each respondent completed 8 paired choices. The "package" was defined as: "up to the minute electronic displays, CCTV at all bus stops and on all buses, driver is very polite and buses always arrive to schedule". Values are shown in Table 3.6.

Table 3.6 Package Values for Car and Bus Users (pence)

Route type	Bus user values	Car user values
All radial	31.51	264.0
Large urban radial	24.21	268.1
Medium urban radial	49.71	263.9
Small urban radial	17.31	134.4
Market town radial	22.96	658.5
Orbital	29.83	487.8
Inter-urban Long Short	 72.87 45.24	-
Park and ride	38.28	378.5

Source: adapted from Accent 2002

The bus user values for a total quality package do not look implausible, but it would be useful to be able to compare with actual fare levels. The later analysis (Laird and Whelan, 2007) does this for the radial and finds the package valued at around one third of the average fare faced in the SP exercise (32 pence and £1.06).The car user values appear very high, as are some of the values of time which range from £6.61 to £37.02 – even the lowest of which is above the current webtag guidance for non-work journeys. An assessment that excluded car non-traders was undertaken for the radial routes. This yielded a slightly lower package value of £2.46 as opposed to £2.64, but halved the value of journey time from 16.5 pence per minute to 7.9 pence per minute. Whereas the bus user values of time are low, £0.55 to £2.48. Laird and Whelan (2007) note that car user values of the package is more than double the mean value of the bus fares in the SP exercise for all radials.

Laird and Whelan (2007) pooled the data to estimate 3 models: bus users, car users and joint, these were then re-estimated to exclude non traders. The values of the quality package SP and the individual attributes from the first SP are shown in Table 3.7. The bus user model doesn't show much discrimination between attributes, except in the park and ride example where security issues are dominant as they are in the car users park and ride model. The model for all other routes suggests that car users place greatest emphasis on bus driver politeness. Interestingly neither bus or car users value electronic information more highly than conventional paper timetables and route maps – it appears to be the provision of any information that is valued.

The authors go on to examine in more detail a data set consisting only of urban bus users. The initial model has very low values of time – but higher values for commuters (£1.20 per hour) than for non-commuters (£0.84 per hour).The quality package is valued more highly by leisure users £0.39 than by other users £0.23. A RPL model provides a somewhat better fit and similar parameter values. The different value leisure users place on the package is identified through an interaction term.

Table 3.7 Value of Quality Attributes by Model (2001 prices)

	Urban, market towns and inter-urban				Park Ride			
	Car users' model	Bus users' model	Joint model		Car users' model	Bus users' model	Joint model	
			Car users	Bus users			Car users	Bus users
CCTV on all buses (compared to no CCTV)	£0.32	£0.06	£0.45	£0.21	---	---	---	---
CCTV on all buses and at all bus stops (compared to no CCTV)	£0.36	£0.07	£0.53	£0.24	---	---	---	---
CCTV at car park (compared to no CCTV at car park) (park and ride only)	---	---	---	---	£0.93	£0.17	£1.46	£0.67
CCTV and regular visible patrols (compared to no CCTV at car park) (park and ride only)	---	---	---	---	£1.31	£0.21	£1.90	£0.87
Timetables and route maps at bus stops (compared to no information at bus stops)	£0.30	£0.09	£0.58	£0.27	£0.11	£0.05	£0.20	£0.09
Up to the minute electronic displays showing minutes wait for buses (compared to no information at bus stops)	£0.33	£0.08	£0.56	£0.26	£0.12	£0.04	£0.19	£0.09
Buses always arrive to schedule (compared to current reliability)	£0.37	£0.09	£0.60	£0.28	£0.13	£0.04	£0.21	£0.10
Driver is quite polite and helpful (compared to driver is not very helpful)	£0.68	£0.08	£0.79	£0.36	£0.24	£0.04	£0.27	£0.13
Driver is very polite, helpful and cheerful (compared to driver is not very helpful)	£0.77	£0.11	£0.94	£0.43	£0.27	£0.05	£0.32	£0.15
New buses (compared to old buses)	£0.27	£0.05	£0.38	£0.18	£0.09	£0.02	£0.13	£0.06
New low floor buses with no steps (compared to old buses)	£0.47	£0.07	£0.62	£0.28	£0.16	£0.03	£0.21	£0.10
Value of Package (from package model)	**£1.83**	**£0.35**	**£2.17**	**£1.21**	**£1.83**	**£0.35**	**£2.17**	**£1.21**

Note 1: For urban areas, market towns and inter-urban the package includes real time electronic displays, CCTV at all bus stops and on all

buses, driver is very polite, helpful and cheerful and buses always arrive to schedule

Note 2: For park and ride the package includes real time electronic displays, CCTV at car park and regular visible patrols, driver is very polite, helpful and cheerful and buses always arrive to schedule

Source: adapted from Laird and Whelan, 2007.

Research in London explored aspects of bus trip quality interviewing 947 respondents across London 1995 (SDG, 1996). This research has been repeated at intervals and a study is currently underway (SDG, 2006 and 2007). The bus based attributes were 32 in the 1996 study, which used in-depth interviews with 17 bus users to generate attributes and logical groupings. The groupings reflect the movement through a journey. The SP exercises in 1996 and 2006 were designed on the following lines (details from SDG 1996):

- A set of SP exercises each dealing with a different part of the journey. No cost attribute. Respondents were asked about current experienced levels of attributes. In 1996 exercises were designed on pre trip information, bus stop infrastructure, information at bus stops (including reliability), hailing and boarding, the driver, moving to a seat, travelling in a seat (including travel time) and leaving the bus.
- An SP including a cost coefficient based on fare and one or more "bundles" with contents relating to one of the above SP exercises, eg bus stop infrastructure. Fare as now or increases of 10 or 20 pence.
- A maximum willingness to pay SP, based on an ideal bus service composed of the respondents top 4 or 2 attributes. The SP then offered this bundle v as now. Fare increases of 10, 20, 30 and 40 pence.

Drawings were used alongside text to illustrate the changes. Respondents were asked detailed questions about their current journey and this became the base – or one of the SP alternatives offered (with the exception of pre-trip information). Respondents were also asked to rate the importance of different attributes. The approach was extensively piloted. It is not clear whether simulation was used to test the designs. Respondents were presented with a choice between two stations, A and B and asked "which of these do you prefer" together with the strength of this preference – slight, strong or extreme, with a neutral "cannot choose". Although the neutral point states "cannot choose" the question as stated asks for strength of preference rather than a choice. A respondent might prrefer one to another without being willing to pay for it.

The 1996 analysis included the following steps (SDG, 1996):

- Estimating the preference weights for attribute levels in the first SPs
- Estimate willingness to pay for improvement bundles from the second SP.
- Allocate money values to all attribute levels using the relative preference weights
- Use information from the "perfect service" SP to address outliers.
- Weight sample to be representative.

Individual attributes are not directly valued. The values are derived from the "bundle" exercise.

947 interviews were completed. Inconsistent responses (27% of the original sample) were removed. This seems a high level of inconsistency given the efforts to ensure the basis in an existing journey. These were respondents who, with respect to bundles:

- On the basis of utility shifts, the bundle represented an improvement compared to their present service, yet they indicated a negative willingness to pay for that bundle;
- Conversely, on the basis of utility shifts the bundle represented a poorer service than the current one, yet they indicated a positive willingness to pay for it" SDG 1996 page 57

The current service was always one of the choices and no fare reductions were offered. Presumably then an option could involve a worse (same) service at the same (higher) price in order to allow the second bullet point to occur. Additionally some outliers were removed – the number is not given in the report. The value of time obtained, shown in Table 3.8, is a useful comparator with other studies.

Table 3.8 Value of in-bus time 1996

Time on bus	Time saving offered	Value of time (pence per minute)	Value of time (£ per hour)
Up to 10 minutes	2 minutes (max)	1.5	0.90
11 to 20 minutes	5 minutes	1.2	0.72
Over 20 minutes	10 minutes	0.4	0.24

Source: adapted from SDG 1996

The report suggests reasons for the low values of time obtained:

- Respondents were offered only time savings and these are likely to be valued less highly than deteriorations. No evidence is given but presumably this is drawing on the work of Tversky and Kahneman (1991) on loss aversion and reference dependency. Later work by Mackie et al (2003) concluded that the there was no significant evidence for a sign effect in a reanalysis of the value of time study conducted for the Department for Transport AHCG (1999).
- A "squeezing effect" whereby the amount people are willing to pay is limited whatever the set of improvements offered. The falling marginal willingness to pay for time savings as they increase in size is taken as supporting evidence for this claim. However, a fall in the willingness to pay per unit for a higher number of units is also consistent with diminishing marginal utility. Although Wardman (2004) provides evidence that the value of bus in-vehicle time per minute increases with journey distance. There might be a question on the ability of the design to recover "expected" values of time, given a maximum price increase of 20 pence in this exercise.
- In the executive summary it is also suggested that some of the savings may have been too low to trigger a response – yet the table above suggests that the smaller savings were valued more highly. Mackie et al

(2003) find that values for small time savings are problematic and may have a lower value.

- An aversion to higher speed possibly for safety reasons and a low value of time for older travellers.

It may be that the small time savings offered were viewed as achievable by respondents but not particularly useful. The longer time savings could have been discounted as implausible in the light of traffic conditions in London. Nevertheless, the values of time are very low even compared to the other studies which also tend to find low values of time for bus users.

The attribute values are shown in Table 3.9. The highest value "bundle" is clearly related to information and reliability, both of which are highly valued but also seen to a degree as substitutes hence the interaction terms. However, issues relating to cleanliness of both vehicle and bus stop and the nature of the ride in terms of roughness and crowding also have high values attached to moving from a from / to the worst levels. The willingness to pay for the "perfect service" was approximately 26.1 pence.

Table 3.9: Monetary Values (insignificant coefficients in italics)

Pretrip	Values (pence)
Standard timetables, at home	5.5
Standard Maps, at home	3.9
Five star phone service	2.8
Customized local information, at home	2.0
Bus stop infrastructure	
Shelter with roof and end panel	5.6
Basic shelter, with roof	4.5
Moulded seats at bus stop	*3.4*
Lighting at bus stop	3.1
Flip seats at bus stop	2.2
Bench seats at bus stop	*0.9*
Dirty bus stop	-11.8
Information at the bus stop	
Guaranteed customized local info at stop	10.0
Countdown	9.0
Guaranteed current info at stops	8.8
Best reliability improvement (>=10 headway)	7.8
Best reliability improvement (<=10 headway)	7.1
Medium reliability improvement (>= 10 headway)	6.8
Medium reliability improvement (<=10 headway)	4.4
Payphones at bus stops	3.8
Phones X medium reliability (<=10 headway)	-3.8
Phones X best reliability (>=10 headway)	-4.8
Phones X best reliability (<=10 headway)	-5.0
Countdown X medium reliability (<=10 headway)	-5.0
Countdown x best reliability (>=10 headway)	-5.3
Phones X medium reliability (>=10 headway)	-5.5
Countdown X best reliability (<=10 headway)	-6.7

Countdown X medium reliability (>=10 headway)	-6.9
Hail and Board	
Bus stops close to kerb	5.8
Bus branding	2.8
Low floor bus (v high steps)	2.4
Compulsory stop versus request	*1.7*
Split steps (v high steps)	*-0.3*
The driver	
Driver gives change when needed	4.0
Interaction: appearance X ID	2.5
Interaction: appearance X ID badge	*2.2*
Interaction: appearance X attitude	*1.9*
Helpful driver	*1.5*
Smart driver appearance	*0.1*
Driver shows ID badge	*-0.8*
Moving to seat	
Luggage area replaced with standing room	*2.0*
Some seats sideways on	-3.0
Medium crowded (v low)	-4.7
Medium smooth vehicle motion (v smooth)	-6.4
Highly crowded (v low)	-9.5
Rough vehicle motion (v smooth)	-10.5
Travelling in seat	
Roomy seats (v cramped)	3.0
Value of time, pence per minute	1.2
Bucket seats (v standard seats)	*-1.1*
Ventilation grille (v opening windows)	-2.5
Dirty bus interior	-8.5
Leaving the bus	
Two sets of doors	4.2
Electronic display of next bus stop name	3.9
Driver announcements on PA	*-0.9*

Source: adapted from SDG 1996.

Although the modelling does not appear to segment the sample – segmentations a re reported with respect to the perfect service values such that on average:

- Men have higher values than women
- Younger people have higher values – the highest values being reported by the 11-15 age group.
- Income effect is not consistent.

This is an important and influential study. There are some issues that are clearly of interest particularly relating to the assumptions made:

- The definition of the “perfect” service is limited to 2 to 4 attributes – this may not actually reflect an ideal but a considerable improvement – is it then a suitable upper cap?

- The derivation of values goes through a couple of steps with respect to ratings and assumes:
    - Importance ratings are directly convertible to values
    - Values for bundles may be decomposed assuming that the importance ratings for individual components also apply to bundles.
- Importance ratings will not necessarily reflect experience. A level of satisfaction with current provision might be more closely related to the respondents experience and hence willingness to pay.

There are also issues relating to design and the strength of preference question – which may lead respondents not to focus on the cost implications in the same way as a clear choice question. Moreover although the values are seen to be too high – there is little real consideration of why this might be and whether strategic bias is present.

The actual values in the Business Case Development manual are based on values from this 1996 study a later study in 1999 and work on other attributes. The values are shown in Table 3.10 are draft values derived from the current study (Cohen 2007b).

It is worth noting that the values used by the Australian Transport Council (2006) in their guidelines for the appraisal of urban transport schemes follow a similar pattern and use the Transport for London Business Case Development Manual as a source.

Table 3.10 Bus Attribute Values – London

Package	Attribute	Level From	Level To	WTP(p)
Bus Stop Shelter Infrastructure	Cleanliness of bus stops or shelters	Some dirty patches on shelter	Shelter spotlessly clean	1.5
Bus Stop Shelter Infrastructure	Cleanliness of bus stops or shelters	Some dirty patches on shelter	Shelter reasonably clean	1.5
Bus Stop Shelter Infrastructure	Timetable illumination	Bus timetable not illuminated	Bus timetable and bus stop sign illuminated	2.7
Bus Stop Shelter Infrastructure	Condition of stop and shelter	Stop or shelter in basic working order, some parts worn or tatty	Stop or shelter in excellent condition, looks like new	0.8
Bus Stop Shelter Infrastructure	Condition of stop and shelter	Stop or shelter in basic working order, some parts worn or tatty	Stop or shelter in good condition, perhaps slightly faded or signs of repair	0.2
Package	**Attribute**	**Level From**	**Level To**	**WTP(p)**
Bus Stop Environment	Surveillance cameras at bus stop or shelter	No CCTV	CCTV recording at all stops	5.6
Bus Stop Environment	Surveillance cameras at bus stop or shelter	No CCTV	CCTV recording at some stops	5.4
Bus Stop Environment	Lighting at bus stop/shelter	No stop or shelter lighting, street lighting only	Stop or shelter very brightly or reasonably lit	4.0
Bus Stop Environment	Litter at stop / shelter	Lots of litter at the bus stop or shelter	No litter at the bus stop or shelter	1.4
Bus Stop Environment	Litter at stop / shelter	Lots of litter at the bus stop or shelter	Small amount of litter at the bus stop or shelter	0.8
Bus Stop Environment	Graffiti on stop / shelter	Lots of graffiti and/or offensive graffiti on bus stop or shelter	No graffiti at all on bus stop or shelter	3.1

Bus Stop Environment	Graffiti on stop / shelter	Lots of graffiti and/or offensive graffiti on bus stop or shelter	Small patches of graffiti on bus stop or shelter	2.6
Package	**Attribute**	**Level From**	**Level To**	**WTP(p)**
Bus Stop Information	Countdown sign at bus stop	No countdown sign	Electronic display of up to the minute bus arrival times, delays & other information. Audio announcements also available for visually impaired.	5.3
Bus Stop Information	Countdown sign at bus stop	No countdown sign	Electronic display of up to the minute bus arrival times, delays & other information	5.2
Bus Stop Information	Information terminals	Printed timetable and route information at the bus stop	Touch screen terminal at some stops giving up to the minute timetable and route information, for buses and other local transport PLUS access to TfL website for other transport information	-0.2
Bus Stop Information	Information terminals	Printed timetable and route information at the bus stop	Touch screen terminal at some bus stops giving timetable and route information for all buses from that stop	0.1
Bus Stop Information	Mobile phone bus real time information service	No information about bus service available on mobile phone	Send text message with bus stop code and get return text with times of next buses and relevant delay information (your standard text rate will apply)	1.1
Bus Stop Information	Mobile phone bus real time information service	No information about bus service available on	Send text message with bus stop code and get return text with times	0.8

		mobile phone	of next buses (your standard text rate will apply)	
Package	**Attribute**	**Level From**	**Level To**	**WTP(p)**
Bus Environment	On-Bus CCTV	Posters indicating that bus is monitored by CCTV	Screens showing live CCTV views inside the bus, upstairs and downstairs (artic front & back)	2.2
Bus Environment	On-Bus CCTV	Posters indicating that bus is monitored by CCTV	Screens showing live CCTV views inside the bus, upstairs only (artic back only)	1.8
Bus Environment	Ventilation	Opening windows giving ventilation to some passengers	Air conditioning, circulating cool fresh air throughout the bus	3.1
Bus Environment	Ventilation	Opening windows giving ventilation to some passengers	Opening windows giving ventilation throughout the bus	2.5
Bus Environment	Wheelchair and Buggy space	Dedicated area for wheelchairs and/or buggies or up to six people standing	Large dedicated area for wheelchairs and/or buggies or up to ten people standing, with fewer seats elsewhere	1.1
Bus Environment	Wheelchair and Buggy space	Dedicated area for wheelchairs and/or buggies or up to six people standing	Dedicated area for wheelchairs and/or buggies or up to eight people standing, with fewer seats elsewhere	0.0
Bus Environment	Electronic information displays inside bus	No electronic information inside the bus about the next stop	Electronic sign and voice announcement of the next stop with some ‘alight here’ and route information with text, maps and diagrams. In addition to the	4.3

			electronic information, driver announcements on route diversions.	
Bus Environment	Electronic information displays inside bus	No electronic information inside the bus about the next stop	Electronic sign and voice announcement of the next stop with some 'alight here' and route information in text.	4.0
Package	**Attribute**	**Level From**	**Level To**	**WTP(p)**
Cleanliness of Bus	Litter	Lots of litter on the bus	No litter on the bus	4.7
Cleanliness of Bus	Litter	Lots of litter on the bus	Small amount of litter on the bus	4.1
Cleanliness of Bus	Cleanliness of interior	Some very dirty areas inside the bus	Very clean everywhere inside the bus	5.9
Cleanliness of Bus	Cleanliness of interior	Some very dirty areas inside the bus	Reasonably clean everywhere inside the bus	5.6
Cleanliness of Bus	Etching on windows	Lots of etching on all bus windows	Some or no etching on most bus windows	2.2
Cleanliness of Bus	Cleanliness of exterior	Some very dirty areas on the outside of the bus	Very clean everywhere on the outside of the bus	0.1
Cleanliness of Bus	Cleanliness of exterior	Some very dirty areas on the outside of the bus	Reasonably clean everywhere on the outside of the bus	0.2
Package	**Attribute**	**Level From**	**Level To**	**WTP(p)**
Driver and Quality of Journey	Crowding	Long wait of more than 5 minutes and a seat on the bus	Short wait of less than 5 minutes and a seat on the bus	2.9
Driver and Quality of Journey	Crowding	Long wait of more than 5 minutes and a seat on the bus	Short wait of less than 5 minutes and have to stand on the bus	2.1

Driver and Quality of Journey	Smoothness of driving	Jerky ride causing those standing to worry about losing their balance	Very smooth ride - no jerkiness	2.4
Driver and Quality of Journey	Smoothness of driving	Jerky ride causing those standing to worry about losing their balance	Fairly smooth ride	3.6
Driver and Quality of Journey	Noise	Engine produces intrusive noise or vibration throughout journey	No intrusive noise or vibration from engine throughout journey	2.8
Driver and Quality of Journey	Noise	Engine produces intrusive noise or vibration throughout journey	Engine produces intrusive noise or vibration only while bus is at stops	0.3
Driver and Quality of Journey	Attitude and behaviour of driver	Businesslike but not very helpful	Polite, helpful and cheerful	2.3

3.2 Infrastructure

In this section we examine the somewhat smaller number of studies that have examined bus infrastructure in the form of station and interchange facilities.

- Steer Davies and Gleave (2004) study of bus, rail and metrolink station facilities in Manchester.
- Wardman et al (2001) study of interchange for the Scottish Executive also values information and shelter facilities.
- Accent Marketing and Research (1992) study of bus station facilities for CENTRO.

The SDG (2004) study for GMPTE is clearly of direct relevance. SDG report that the existing GMPTE values were derived from the Bilston Bus Station study undertaken for CENTRO in 1991 by Accent (Accent 1992). The Bilston study commenced with two discussion groups with users in different locations to evaluate issues of importance to passengers. The second phase involved interviews with 150 passengers at two different locations, one with a new bus station. The stated preference exercise involved three levels of bus station facilities: Wednesbury (as now), Bilston (as now) and Bilston +, thus respondents will have experienced one of the levels of bus station. Fare and information provision were the only attributes to vary independently. The choices were presented as a plan of the bus station with additional text information. Each respondent was given 9 cards each with one choice set and asked to rank the cards in order of preference. The full models are not provided in the report. The analysis has been used to derive importance ratings for fare for the three attributes. The values have been adjusted using a scaling factor of 0.5, on the grounds that this survey only examined a small part of the journey and that had all the other elements been included, the values of the bus station would not have been so high (Accent 1992).The initial and scaled values are shown in Table 3.11:

Table 3.11 Values for Bilston Bus Station Pence per trip

Attribute	Unadjusted value	Adjusted value
Bus station		
Wednesbury to Bilston	13.2	6.6
Bilston to Bilston +	9.5	4.8
Static info to + PA	0.6	0.3
Plus PA to plus PA and electronic display	-	

The value for the Bilston station emerged at around 7 pence per journey or 12% of the average fare paid by respondents of 55 pence. The Bilston + bus station was worth an additional 5 pence per journey and a PA system about 0.3 pence per journey. The total value was decomposed using score a 5 point importance rating scale. This process tends to yield values with little variation.

The GMPTE has presumably rescaled the Bilston values to reflect the preferences of bus users in Manchester and inflated to 2001 values overall, see Table 3.12. Values from the Transport for London Business Case Development Manual are also included.

Table 3.12 Facility valuation pence per trip 2001 (Bilston Bus study values in 1991, pence)

Attribute	Bilston Bus	GMPTE
Bus stop information	1.9	1.27
Building	1.8	1.26
Maintained, clean	1.8	1.26
Well lit	1.7	1.26
Bus timetables – static	1.5	1.25
Toilets	1.4	1.24
Pedestrian crossing	1.3	1.24
Pelican crossing	1.2	1.21
Queuing areas	1.1	1.19
Telephones	1.0	1.18
Travelshop	0.7	1.16
Heated	0.7	1.16
How to use poster	0.6	1.10
Information point	0.6	1.09
Electronic display (countdown)	0.6	1.08
Modern seating	0.5	1.05
Staff presence (supervisor)	0.4	1.05
CCTV	0.4	1.04
Automatic doors	0.4	0.97
PA/departures	0.3	0.97
Café	0.3	0.95
With snacks	0.3	0.95
CTN	0.2	0.89

Source: adapted from SDG 2004, Accent 1992.

The SDG research (2004) was designed to derive values for "key station attributes". A workshop with GMPTE stakeholders was used to identify the key attributes. Ultimately 3 SP exercises were used:

- One focused on safety, security, information and staffing issues
- One focused on toilets, waiting facilities and staff availability to answer questions
- A final exercise looked at overall design and was intended as a "capping" exercise.

Simulation was used to ensure that expected values could be recovered.

Thus the method is similar to the approach of Bos et al (2004) in the construction of the experiments. Although in this case the final exercise is designed explicitly as a capping exercise rather than simply as a means of linking the experiments and values.

The survey included "bias filters" including the interviewers assessment of the respondents "performance", a direct question about the realism of the choices and the use of some cards with no differences except in the cost variable. Those who were thought not to have taken the exercise seriously or who didn't consider the scenarios to be realistic were excluded. As were

respondents with “unrealistically” high transfer prices, similarly high values in the SP and low or positive sensitivity to cost. The number of such respondents is not given.

The reported analysis is based on weighted multiple regression where the dependent variable is the response scale variable – rather than the choice made. The package models also tested interaction terms for the combination of high facilities and modern design, finding a negative coefficient, suggesting the combination is somewhat less then the sum of the parts. Table 3.13 shows the values derived from the capping SP and the recommended values.

Table 3.13 Bus Station Values Manchester: Capping Values and Recommended Values

Attribute	Value (pence)	Adjusted value (pence) low central, high
Facilities package Basic to high	61	15 42 61
Station design (non Rochdale) Unrefurbished and unmodernised to refurbished and modernised	19	5 13 19
Station design (Rochdale) Current to newly built	48	9 34 48
Package + design (Non Rochdale) Unrefurbished and unmodernised and basic to refurbished and modernised and high	69	20 48 69
Package + design (Rochdale) Existing and basic to newly built and high	64	24 44 64

Source: adapted from SDG 2004

SDG state that these values are high in relation to the average fare of 85 pence. This implies capping values of 69 pence or 81% of the fare outside Rochdale and 64 pence or 75% for Rochdale. The capping value in the London buses study was 25%. SDG suggest that this is in part because the Manchester study was starting from a low level of provision in the “basic” package, whereas in London the current offer was already reasonably good. An additional question in the SDG survey asked for a transfer price, giving values of around 20 pence, clearly far less than the values in the table above. The high values were not found to be the result of outliers or inconsistencies. SDG found some evidence that willingness to pay increases with fare level (but only at a 90% confidence level). This could reflect the link to distance travelled or could include a low willingness to pay by concessionary travellers who are likely to have lower incomes. Segmentations were run and eligibility for concessionary fare had an effect, but the models are not reported. The proportion of over 60s in the sample is low compared to the GMPTE tracking survey. The reported values have been weighted to reflect the bus user profile.

The average fare in the sample was 85 pence, somewhat higher than the overall GMPTE average of 59 pence. SDG then recommend scaling the values down to reflect the average fare 59/85 as the central case, with a lower level scaled to the transfer price question and an upper limit that is unscaled for use in sensitivity analysis. The attributes are then scaled in the same way yielding the values in Table 3.14 (central estimates only). SDG suggest that these values are similar to those found in London with the following exceptions:

- Staffing attributes produce higher values in Manchester
- Electronic information provision produced significant values in the London study.

Table 3.14 Shows the Unadjusted and Recommended Values (Insignificant Variables in Italics)

Attribute	Value (pence)	Adjusted value (pence)
Security cameras		
None to recorded CCTV	46	7.3
None to recorded and monitored CCTV	50	7.9
Bus station staff		
None to office staffed 0800 to 1600	53	8.5
None to office staffed 0700 to 2300	71	11.3
Service information		
Paper timetables to paper + electronic display	*2*	*0.3*
Help points		
None to help points with information and security buttons	11	1.8
Toilets		
None to provided, cleaned regularly, 20p a visit	32	5.1
None to provided, cleaned regularly, free	52	8.3
Roaming staff		
None to roaming staff providing general assistance	60	9.5
Waiting facilities		
Basic shelter to enclosed shelter	9	1.4
Basic shelter to glass cubicles under canopy	18	2.9

Source: adapted from SDG 2004

The SDG study also obtained values for similar facilities for rail and metrolink users. Prior to capping, the values for security cameras were similar for metrolink and bus users and slightly lower for rail users. Rail user values for staff were somewhat lower than for bus users as was the value of toilets. This variation might reflect experience by rail users of these facilities. Staff in a rail ticket office might not be viewed as helpful or reassuring whereas for bus users an information office and roaming staff might be seen as potentially both

helpful and reassuring. Information systems were valued more highly by fixed track users.

The very high values obtained by this study have been scaled in various ways – none of which is wholly convincing. There is no real consideration as to whether strategic bias might be present or whether the strength of preference style of SP question induces higher values than a straightforward choice question.

The study by Wardman et al (2001) for the Scottish Executive focussed on interchange facilities, some of which are bus station facilities. Four focus groups were held with users and non-users to explore perceptions of interchange. This was followed by 32 in-depth interviews. The resulting bus user SP focussed on three aspects of interchange:

- Time components
- Attributes of the facility
- How the above values vary with factors relating to the individual, the journey and the interchange conditions and facilities.

Different SP designs were used for car users and rail users. Three SP experiments were designed for bus users:

- One explored the time components of interchange alongside in-vehicle time, connections and through ticketing (SP1)
- One explored specific attributes in detail – with different designs depending on whether the user interchanged at a station or on-street (SP2).
- The final exercise sought to identify any package effect, looking at a package of improvements alongside journey time (SP3).

Responses were obtained from 242 bus users in Edinburgh from a total of 860 distributed questionnaires in November and December 1999. NML models were developed. The value of in-vehicle time was 3.8 pence per minute or £2.28 per hour (somewhat below current recommended values).

The third SP experiment valued a package of CCTV, toilets, RTI and staff at 3.79 minutes of in-vehicle time. This is a very similar value in terms of time to the result obtained by Evmorfopolous for a bus quality package in Leeds. In the second SP experiment the sum of the values of these improvements was 13.27 minutes. The values derived from the 2nd SP were then rescaled by multiplying by 3.79/13.27 and thus constraining the total value to that of the package on the third SP. Table 3.15 shows the values prior to and after scaling.

Table 3.15 Bus User Values of Interchange Facilities: Edinburgh

Attribute	Values from SP2		Rescaled values	
	Minutes of in-vehicle time	Pence	Minutes of in-vehicle time	Pence
Shelter with lighting, roof, end panel and seats	5.70	21.66	1.7	6.46
Real time up to date information monitors on bus arrival times	4.51	17.14	1.4	5.32
Printed timetable information	4.46	16.95	1.3	4.94
Shelter with lighting and roof	3.91	14.86	1.2	4.56
Good signs showing where buses go from	4.00	15.20	1.2	4.56
Staff presence	3.66	13.91	1.1	4.18
Closed circuit television	2.66	10.11	0.8	3.04
Toilets	2.44	9.27	0.7	2.66
Intercom connection to control room	1.71	6.50	0.5	1.90
Eating and drinking facilities	1.23	4.67	0.4	1.52
Newsagents	1.08	4.10	0.3	1.14
Change machine	0.47	1.79	0.1	0.38

Source: adapted from Wardman et al, 2001 and Wardman 2007.

Wardman et al (2001) also explored modifying factors finding that commuters tended to have lower values for facilities, presumably because they are familiar users who spend little time at the interchange. Women, older people and those travelling with children tended to have higher values. Information was more highly valued by irregular users. These all appear to be logical findings. Although the values have been scaled, prior to scaling they are substantially lower than those found in the SDG (2004) study. It is possible that this is related to the use of time as the numeraire instead of money.

An experimental survey by Colquhoun Transportation Planning (1992) applied a “standard” SP design involving frequency, fare and bus stop information and a priority evaluator (PE) approach. Two PE experiments were used one specified levels of information, seating, fares and frequency the other had four different types/level of information. 100 interviews were conducted in Leeds in 1992. The SP model did not have a significant cost coefficient. However, the PE did allow a value to be derived for a real time information display accurate to within 5 minutes of 4.7 pence for work journeys and 3.8 pence for other journeys. The relative values for different levels of information in the SP were then used to estimate values for 10 minute accuracy and 1 minute accuracy and shown in Table 3.16. The priority evaluator has the advantage of being able to consider a large number of attributes and thus perhaps minimise the risk of strategically biased responses and the disadvantage of linear dependency between attributes (Wardman et al 2003).

Table 3.16 Values for Accuracy of Information: Leeds 1992

Accuracy	Work journey	Non-work journey
10 minutes	3.0	1.9
5 minutes	4.7	3.8
1 minute	6.5	5.1

Source: Colquhoun Transportation Planning, 1992.

3.3 New and Relevant Evidence on Other Modes

Evidence on rail has not been actively sought. However, studies that offer methodological insights or innovative applications of stated preference are clearly of interest.

Douglas and Karpouzis (2006a) have used results from ratings of attributes by rail passengers in Australia to derive values in terms of in-vehicle time. This is interesting from a methodological perspective.

The aim of the study (Douglas Economics 2006) was to obtain relative values for train: frequency, service reliability, overcrowding, appearance and facilities, station appearance and facilities and personal security on vehicle and at stations.

Values for in-vehicle time were obtained from a stated preference survey of 1578 passengers (Douglas Economics 2004) for Railcorp NSW. A two phase survey approach was then adopted.

The first survey asked respondents to rate 46 quality attributes on a nine point scale (1 = very poor, 9 = excellent). Respondents were also asked how short their journey time would have to be to be rated as excellent. The results from 2,732 respondents were used to construct a ratings model. The ratings are expressed in terms of equivalent on board minutes for a one point change in an attribute. Further modelling produces the change in in-vehicle time that is equivalent to a 10% improvement in the attribute rating, for each of the 46 attributes segmented by peak and off-peak and by three journey distance categories.

The values thus derived were then used to value a timetable change in 2005, by using the results of the second phase “after” survey (1096 respondents). This study has attempted to address the problem of inflated values for individual attributes and clearly warrants attention when developing the methodology.

This study is particularly helpful in the way in which it addresses the problems of converting ratings to money values. Firstly through the use of a scale that rates perceptions of quality from very poor to excellent rather than an assessment of relative importance, thus reflecting experience of the system. Secondly, through the use a 9 point scale with verbal anchors which allows for greater discrimination. Thirdly, through directly asking the journey time that would be rated excellent on this 9 point scale and thus providing an anchor value for the rating scale. A specific change in journey time moves an individual along the scale. This seems to be the best method so far of giving a value to rated factors

Ratings such as those applied by Yahya et al (2007) on a bus corridor in Tyne and Wear could be used to decompose a top level value.

Douglas and Karpouzis (2005 and 2006b) have also estimated the cost to the passenger of crowding on rail stations and on train in Sydney.

Stated preference techniques have also been applied in the context of walking and cycling. Studies that examine quality factors in the environment include: Heuman et al (2005).

3.6 Conclusions

There are still only a relatively small number of studies that have sought to value aspects of bus quality and even fewer that have attempted to value a "complete" set of attributes.

Comparison across studies is hampered by the use of different definitions and levels of attributes and definitions of cost attributes. Annex 2 contains a table that derives a ranking of attributes for each study that examines the bus journey from the money values of bus users. Seat availability has the highest value in every study in which it appears (McDonnell et al, 2006, 2007; Bos et al 2004, Waerden et al 2007 and Hensher et al 2003). It also appears to drive the high value of a move from low to standard comfort in the Espino et al study. Whilst seat availability is partly driven by vehicle type and design it will also clearly be determined by frequency.

However, once beyond the chance of getting a seat that there is a high degree of variability in the order of attributes. This is likely to be in part attributable to context, but also to the descriptions used and possibly the size and nature of the choice set. There appears to be no research exploring these issues in this context.

Where car user preferences have been sought the value of packages has been found to be very high, around twice the average fare. McDonnell et al (2007a) found that non-users valued RTI more highly than users, but gave a lower value to seat availability. The Accent (2002) results showed car users with higher values across the board. In the Laird and Whelan (2007) reanalysis both bus users and car users placed the highest priority on driver attitude. In contrast to the McDonnell et al result, RTI has the lowest value of the five quality attributes and has a higher relative value for bus users. Table 3.17 summarises values of packages in terms of value of time where available. This includes only exercises that valued a package – not summed values of individual attributes. Table 3.17 illustrates the large range in values even for the exercises that seek to value a whole package.

Table 3.17 Values of Bus Packages in Terms in In-Vehicle Time

Study and "package"	Values in in-vehicle minutes
Evmofopoulos (2007) in-vehicle quality package	4.27
Espino et al (2006, 2007) in-vehicle "comfort" low to standard Standard to high	 26.44 6.92
Laird and Whelan (2007) quality bus package stops and vehicles – urban bus users	27.86 (non-commuters) 11.5 (commuters)
Wardman et al (2001) and Wardman, (2007) interchange package	3.79
SDG 1996 "perfect service"	21.75

The use of SP has tended towards the use of conventional experiments. Studies that seek to value a large number of attributes tend to split them between a number of experiments to minimise the burden on respondents. This usually necessitates the use of a bridging or capping experiment and in some cases the use of ratings to estimate values for some attributes. Douglas and Karpouzis (2006a) seem to have addressed this issue most effectively.

There are exceptions to this which seek to include all attributes in one experiment namely: Hensher and Prioni, 2002, Hensher et al 2003, McDonnell et al 2007a and 2007b and Phanikumar and Maitra, 2006 and 2007. In these cases respondents face three or four choices within each experiment and 6 to 13 attributes.

Some studies have undertaken qualitative research ahead of the stated preference experiments often to identify the attributes. However, it is not clear that the attribute levels have been explored with potential respondents to ensure clarity of understanding and the perception of the differences between levels of provision. There is a need for clear and understandable specification of both attributes and levels in order to have results that are useful in that they are anchored to measurable levels of attributes. This applies to cost and time factors as much as to quality factors. However for quality factors there is also clearly a need to explore respondents understanding of descriptive terms – what constitutes a move from good to bad for example? It is also notable that some studies use a description based on perception (Espino and Ortuzar, 2006) while most attempt an objective description of the facility on offer. Unusual specifications of time and / or cost variables impede direct comparison of values between studies.

Responses may be discarded on grounds of inconsistency and / or extreme values –it is not always obvious what the decision rules are and these do not appear to be consistent between studies. The most obvious rule being if the model improves – do it.

The models used range from very simple logit models to sophisticated applications of random parameters logit. Where RPL and MNL have both been used the RPL models invariably have a better fit.

Only a few studies have examined interaction effects. The interaction between the value of in-vehicle time and comfort is apparent (Espino and Ortuzar, 2006, 2007). SDG (1996) illustrate the trade-off between real time information and reliability and a similar trade-off between driver attributes which are clearly not additive.

Similarly there is little attention paid to influential variables. Espino and Ortuzar (2006, 2007) find that men are prepared to pay more for comfort than women in Grand Canary, as does Evmorfopoulos (2007) in Leeds. Accent Marketing and Research (2004) find a clear income effect, as does Evmorfopoulos (2007). Laird and Whelan (2007) identify a higher value for a quality bus package amongst leisure users than other types of user through an interaction effect. This result is also found by Wardman et al (2001) in the context of interchange facilities, which might reflect the familiarity of commuters and minimal waiting times.

Where investigated there appears to be a clear preference for the current mode (Accent 2004, Alpizar and Carlsson 2001). It is possible to infer from the Accent study (2004) that simply modelling this habitual preference as an ASC in an unsegmented data set masks important variation relating to the current mode preference.

Studies valuing attributes in terms of in-vehicle time (Wardman et al, 2001) seem to yield lower values, although still requiring scaling. This could be because strategic response is more likely with respect to the cost attribute (Wardman 2001). It would be interesting to see some examination of the cost attribute – are respondents always taking the price change seriously? Do they disregard price decreases as implausible? Such an effect has been found in the valuation of externalities (Wardman and Bristow, in press) and the analysis proceeded based purely on the cost increases. If respondents do ignore price savings as implausible, this would bias values upwards. This would not assist in explaining results where the fare is always increased or the same (SDG, 2004, Accent, 1992).

The transformation of ratings into values requires a number of untested assumptions on the convertability of such scales. The use of fairly small range scales commonly 5 points for example, tends to diminish the level of variation between factors. Importance may not be the most directly transferable rating scale.

Most studies assume the presence of a package effect and use a capping exercise to value a package or ideal or optimum service. This value is then taken as the maximum and the value of individual attributes scaled accordingly. “Package” values relative to average fares range from 29% to 81% for bus users. Values for car users seem to be far higher, double the current fare levels. Accent (1992) did not have a capping exercise and scaled by 0.5 arguing that the bus station was only a part of the journey experience. A key question is whether to scale relative to fare or in-vehicle time. As the fare paid varies considerably between users and those using passes may not

have a good idea of the fare they are actually paying, time may prove to be the more appropriate numeraire. There appears to have been no research in the context of bus quality values to attempt to isolate strategic effects and design them out.

Most UK valuation evidence is from London. Studies elsewhere suggest that priorities, starting points and values may be different outside London.

Overall there are a number of valuation studies for a range of quality factors. However, these do not form a sufficient basis to derive values across the range of factors of interest. Some factors such as marketing, route and ticketing simplification appear not to have been the subject of valuation studies, although they may have been examined with respect to their impact on demand. Examples examining the impact on demand of season tickets / travel cards include Gilbert and Jalilian, 1991; Fitzroy and Smith, 1999 and 1998. More recent studies in the academic literature tend to examine the use that may be made of data from such cards rather than the impact on use.

4. IMPACTS OF SOFT FACTORS

In this chapter we will firstly examine the evidence on packages of measures and then assess each of the individual softer factors separately as far as this is possible. This is followed by a brief assessment of the growing body of work seeking to improve our understanding of how the bus is perceived and barriers to use. Finally, conclusions are drawn.

4.1 Packages and networks

Few attributes are introduced independently of other 'soft' or 'hard' interventions, so determining the actual effect of each soft factor proves difficult. An appreciation of how these packages can effect bus use is essential, given that much of the evidence in the literature is based on packages of changes.

UK policy has encouraged the use of Quality Bus Partnerships (QBPs), to develop a package of changes to encourage bus use (DETR 1998, 1999; DFT 2004). TAS partnerships define QBPs as "An agreement (either formal or informal) between one or more local authorities and one or more bus operators for measures, to be taken up by more than one party to enhance bus services in a defined area." (TAS, 1997) These local agreements dictate which measures are introduced, this often includes a mixture of soft and hard measures. Examples presented by the CPT (2006) include Brighton, 'hard' measures implemented there, include: bus lanes; bus priority at traffic signals; soft measures include: new city transport website; flat rate fare of £1.40 (with discounts); real time information and automatic vehicle location; accessible bus stops and low floor buses. This package has resulted in 5% growth in bus use year on year; 10% decrease in traffic flow in town centre over last 3 years plus journey time savings. Other similar combinations are detailed in the CPT report, include the package in Cambridge, reporting a 45% increase in patronage and the package in York reporting time savings of between four and 12 minutes.

LEK consulting reviewed 11 Quality Bus Corridors (QBCs). It included suggestions of where QBPs would be most effective, and highlighted the potential for 400 or more new schemes across the UK (LEK, 2002). In 1999 and 2000 TAS surveyed all QBPS in Britain, suggesting that patronage growth is dependent on investment, as illustrated in Table 4.1

Table 4.1: Patronage Change Achieved by QBPs by Level of Investment

Improvement Type	Worst case	Average	Best case
Minimal infrastructure improvement	-25%	5%	10%
Comprehensive conventional route upgrade	5%	15%	50%
The 'X' factor: something better than a conventional upgrade	20%	30%	45%

Source: TAS 1999

Whilst package changes can result in an initial increase in patronage it is estimated to take two years for the full affects to be appreciated as demonstrated by the disaggregated results in Table 4.2 (Cairns et al, 2004).

Table 4.2: Impact of Quality Partnerships on Patronage in Individual Corridors

Location	Description	Short-term patronage increase[1]	Medium-term patronage increase[2]	Proportion switched from car	Source
Review of 11 bus quality partnerships	Bus lanes, low floor buses, more frequent services, real time information, marketing		Most in range 7-30% (guided busway 90%; one scheme only 4%)[3]	Estimate 10&	LEK/CfIT (2002)
Birmingham	Line33	20%	40%	10%	TAS (2001)
Birmingham	Superline	18%			TAS (2001)
West Midlands	Primeline		5%		TAS (2001)
Birmingham	Three Showcase routes			29%	CENTRO, in Mackie et al (2002)
Cheltenham	Service 2	5%			TAS (2001)
Edinburgh	Greenways Scheme		7-15%		TAS (2001)
Hertfordshire	Lea Valley Green Route	20%			TAS (2001)
Hertfordshire	Elstree and Borehamwood Network		20%	3%	TAS (2001)
Ipswich	Superoute 66 (guided busway)		75%	33%	First, in CPT (2002)
Leeds	Scott Hall Road (guided busway)		75%	20%	First, in CPT (2002)
London	Route 220 (Harlesden – Wandsworth		Approx 30%[4]		Daugherty et al (1999)
London	Uxbridge Road		26%		Daugherty et al (1999)
Nottingham	Cotgrave Connection		10 – 15%		TAS (2001)
Nottingham	Calverton Connection	29%	48%	25%	TAS (2001)
Perth, Scotland	Stagecoach Kickstart pilot		63%		Stagecoach (2002)
Portsmouth	Portsmouth – Leigh Park service	25%			Stagecoach, in CPT

					(2002)
Rotherham	Rotherham – Maltby services		17%		First in CPT (2002)
Sheffield	X33 to Bradford		Nearly 50%		Arriva, in CPT (2002)
Telford	Redline		46%		Arriva, in CPT (2002)
Telford	Blueline	12%			Arriva, in CPT (2002)
Woking	Route 91		22%		Arriva, in CPT (2002)
AVERAGE		18%	36%		Arriva, in CPT (2002)

Reproduced from Sloman (2003)

[1]Patronage increases are considered short-term where they are described as “initial increases” or are for a period of 15 months or less.
[2]Patronage increases are taken as medium-term if the time period quoted is 18 months or longer, or if it is unspecified.
[3]LEK/CfIT (2002) data are not included in calculation of average patronage increase, since the unnamed schemes analysed by them may duplicate the named examples.
[4]Daugherty et al. quote “an increase of an average of about 7 to 15% per annum compared to the fleetwide total from about the middle of 1994 until the end of 1996.” Taking a middle figure of 11% per annum over 30 months gives an increase of 30%.
[5]Daugherty et al. quote an increase in patronage of “almost 30% “ compared to 4% patronage increase on control routes.

Wall and McDonald (2007), consider the QBP in Winchester, focussing on three Quality Bus Corridors (QBC), one of which is combined with a Park and Ride facility and two further control corridors. Patronage data from stagecoach reported as percentage change and results of a two-stage passenger survey demonstrate how effective they have been. The patronage data reported an overall increase on the QBCs of 12% between 2002 and 2005. When disaggregated by route this involved 25% increase on one QBC (X5), a 6% drop on a further QBC (X1) and a 42% increase in Park and Ride tickets purchased. The control Corridors experienced a 1% reduction in patronage (X6) and a 10% reduction in patronage (X7), over the same timescale. This demonstrates the success of X5 and the Park and Ride, and would suggest the remaining QBC service, X1, is following a similar pattern to the 'control' routes. However X5 also benefited from a change in frequency from 4 to 6 buses per hour and capacity at the Park and Ride site trebled over the time period.

Table 4.3 demonstrates changes in travel frequency on each of the route as detailed by the bus survey, which is broadly inline with patronage data.

Table 4.3: Changes in Passenger Bus Use

	X1	X5	P & R
Bus use same	128 (70%)	122 (61%)	140 (46%)
Bus use increase	18 (10%)	36 (19%)	29 (10%)
Bus use decreased	21 (12%)	17 (8%)	9 (3%)
New users	15 (8%)	26 (12%)	123 (41%)

Source: Wall and McDonald, 2007

Of the changes introduced passengers valued frequency of service, comfort of travel and bus traveller information most, the 'PT and pocket travel map' had a low positive rating.

FaberMaunsell (2004) were commissioned by the Greater Manchester Passenger Transport Executive (GMPTE) to evaluate the impact of three Quality Bus Corridors (192 Hazel Grove to Manchester; 135, Bury to Manchester; 582 Bolton to Leigh). This involved comparisons between the each QBC and a control corridor, use of patronage data from electronic ticketing machines (ETMs) and on bus survey. Secondary data was also considered, but not discussed in much depth. Secondary data either provided aggregate data for the whole of Greater Manchester, not corridor specific, or the data collected did not provide a continuous dataset capable of monitoring change.

Examination of ETM data showed that patronage levels, for two of the three QBCs, had increased more than the background increase for Greater Manchester (135 and 582), while the remaining QBC experienced a decline in patronage over the monitoring period. Of the control corridors, the 192 control (route 197) experienced the most growth of any of the controls and far exceeding the change in patronage for the 192. The author speculates that the reasons for this could include the different trip purposes on and the comparative patronage of each route. The 197, carries far fewer passengers than the 192. It operates via the universities, towards either Manchester or the main student residential areas, serving a growing student population. It experienced increased frequencies over some of the time period while the 192 stayed at the same frequency throughout. The differences in patronage levels meant that

small increases in use, are exaggerated as proportional increase. The report states that for these reasons the Control corridor provided an unsuitable comparison. The control corridor for 582 followed a similar increase to the 582, while the 135 control experienced decline until 2000, with slow growth since. This suggests that the 135 is the one QBC which has had significant impact upon patronage levels.

Passenger surveys revealed few sociodemographic differences between respondents onboard the QBC services and the control services; frequency of use data was also similar. Differences included the timescale over which the respondent had used the service with a greater proportion (37%) of respondents had started using the QBC route in the last five years, compared to 31% along the control corridors. This could be an interpreted as the QBC improvements resulted in a greater number of generated journeys. There were also differences between mode used if bus was unavailable and previous mode for each control corridor and QBC. Results indicated that this was dependent on which alternatives were available, with the tram featuring as a main alternative on route 135 and the train on 192. These results would indicate that of all respondents using the QBCs, who had previously used another mode, 52% travelled by car as a driver or passenger, 9% travelled by train, 8% by tram, 5% by another bus service, 8% walked and 7% cycled. However this would not indicate a significant modal shift as of the respondent on the control corridor that had previously used another mode, 55% had travelled by car.

Questions about perception of service showed the greatest difference between the QBC and the control corridors. A greater proportion of positive responses were given for how much the service had improved and people rating the service as performing ‘extremely well’ for the following attributes: Stops with shelters from weather, Feeling of safety at bus stops, Frequency of buses, Fast journey time, Information at bus stops, Pedestrian crossing facilities near to stops, High quality vehicles and Reliability of bus service.

“Routes to Revenue Growth” examined nine case studies involving either, route specific or network changes (The Ten Percent Club, 2006). Some related to Quality Partnerships, others were independent of them. Each was based upon existing routes or networks and each reported patronage growth against a background decline. Routes examined were:

- The Route 36, between Ripon Harrogate and Leeds reporting 18% increase in patronage per annum,
- The Witch Way, between Nelson, Burnley and Rawtenstall and Manchester, reporting 16% increase per annum,
- The ‘more’ routes between Poole and Bournemouth reporting a 10% increase per annum,
- Rainbow 5, operated by Trent Barton mainly between Long Eaton and Nottingham but diverging at Long Eaton to serve destinations towards either Derby or Loughborough, reporting a 8% increase per annum
- Bristol showcase routes serving Bristol and routes to the north and south, reporting 3% growth per annum

The networks examined are:

- The Corby star network reporting an increase of 30% per annum
- The Go2 network from Nottingham city centre, reporting 18% increase per annum
- The Brighton and Hove Network, reporting increases of 5% per annum
- The Medway towns network, reporting an increase of 4% per annum

Changes do include 'hard measures' such as improved frequency but combinations of soft measures have also been introduced. These include vehicle specifications, information provision, security improvements and marketing measures.

Vehicle changes include the introduction of luxury buses with tinted windows and reduced number of seats to provide more space, along some routes (the Witch Way and route 36, more), while mini-bus services compete with taxis in others (Corby). Some operators have chosen to provide leather, airline style seats (the Witch Way and route 36) while other have introduced a 2+1 configuration, similar to the rear seat of a car, assisting family groups or providing more space (more routes).

Information provision includes the use of on-board displays to inform customers and real time information and approaching stops, as well as paper timetables and other information provided by staff and electronically. In Brighton, for example timetable changes are restricted to April and September to provide consistency for passengers and RTI screens are situated so they are visible to non-bus users to advertise bus use and frequency. CCTV is the main security measure referred to in particular on bus CCTV, especially for buses with an upper deck.

Bus routes and networks are marketed through livery colours and branding, including the heritage of the Pendle Witches, providing the brand name of the Witch Way, accompanied by colours and vehicles distinctive to that route. Brighton and Hove have also restricted on-bus advertising to self-promotion moving away from commercial advertising, similarly the more routes use the back of their buses to advertise their product. Networks in particular, have adopted underground style route maps to advertise the routes with frequent services. These are often supplemented by less frequent services providing a feeder route or operating into estates. The Go2 network also rationalised their services, cutting services passing through the city centre, which were frequently delayed because of congestion. The report states that while there were objections to change, the alterations have allowed a more reliable service, which is appreciated by customers. This simplification also makes it clear where the end destination will be, the city centre. Brighton has also adopted a simplified fare system, in many cases it is £1.50 for a single journey, for short journeys this may be £1.50 return and other case study areas including the Go2 network operate a smart card system.

Each of the case studies maintained focus on the role of advertising the services to existing users and non-users. Trentbarton (rainbow 5), were recognised for their long term commitment to this, previously receiving awards. Similarly Brighton and Hove's choice to publish information and reading material for users, from when the company commences operation, was commended. Recent marketing included blanket coverage and targeted marketing. Information drops to households within a specified distance of

corridors, using the local media and events as tool to convey positive information provided blanket coverage. Additionally examples include a prototype bus, exhibited at local events before they were launched on the route 36 and more used billboards to advertise the changed services. Many of the advertising slogans used were designed to elicit a change in behaviour, so were targeted in that manner, for example: “looks like a bus, works like a dream”, (more), the “I’m on the bus… are you too”, (Brighton and Hove). The Witch Way and Route 36 launch was also accompanied by users guide to assist people back onto the bus and advertising the benefits, including frequency and reduced stress and also the destinations served. Individualised travel planning, also took place along the Bristol route, this is developed in more depth in Section 4.3.2.

Again figures for patronage are given as whole numbers and percentage figures and are not disaggregated to consider the impact of each individual change, thus providing not quantifiable and transferable figures for components. Data on ‘control’ routes or networks is not provided, though regional comparison suggests that the case studies are having an effect.

A recent assessment by Stagecoach (2007) of the performance of their Cambridge citi network, compares its cost and performance with that of buses in London. The changes since 2001 have included: new low floor vehicles, simplified network and fares structure, 10 minute frequencies, marketing and improved information and recently additional park and ride facilities. Patronage has grown by 77% from 2001 to 2006, compared to 34.4% in London. “Bus use has also been boosted by a strong partnership with Cambridgeshire County Council and other local organisations and businesses, which has included the introduction of important bus priority measures.” Stagecoach 2007.

Streeting and Barlow (2007) report an analysis of patronage growth in South East Queensland across bus, rail and ferry (though with the bulk of movements on bus). The analysis focussed on identifying the drivers of demand both exogenous and endogenous. The results are shown in Table 4.4.

Table 4.4 South East Queensland Patronage Effects

Driver	% impact 2004/5	% impact 2005/6
Exogenous		
Employment	2.1	1.2
Real income	0.3	0.0
Population	1.0	0.9
Interest rates	0.8	0.5
Tourism	0.0	0.1
Car ownership	-2.3	-1.8
Real fuel price	2.2	2.1
Exogenous total	4.1	3.0
Endogenous		
Real fares	5.0	1.0
Service levels	2.9	5.8
Service quality	2.4	2.1
Endogenous total	10.3	8.9
Unexplained error	-4.7	-0.4
Total growth	9.7	11.6

Source: adapted from Streeting and Barlow 2007

It is notable that the fares change impact in 2004/5 is primarily due to the development of a common fare structure across modes designed to be revenue neutral overall. It is also clear that service quality attributes appear to be contributing to demand growth. This one of few studies that have sought to identify individual drivers of patronage growth, including quality attributes.

Byatt et al (2007) report on the introduction of a pre-pay only limited stop service using articulated buses on the Sydney-Bondi route to supplement existing services. The new aspects were:

- Limited stop
- Pre-pay only (the first such service in Sydney)
- Articulated buses for higher capacity and ease of access.

Growth on the corridor as a whole average 4.4% over the 6 months from the launch in October 2006, with the highest growth month coinciding with the Sydney Ashes test match.

Conclusions

There are very few studies that examine the implementation of 'bus packages' alongside a 'control' route. Thus, most reported patronage uplifts tend to attribute the whole effect to the intervention. The AECOM study for GMPTE and the Wall and McDonald study suggest that this may be misleading as a number of control corridors have outperformed QBCs. Nevertheless it is clear that significant growth has occurred in a variety of networks and routes that would not otherwise have been expected as a result of packages of measures.

The Streeting and Barlow (2007) study attempts to identify the effects of a range of different drivers on patronage demand. This work identifies the impact of quality to be in excess of 2% and suggest an additional one off gain from fare integration.

4.2 In-vehicle Experience

4.2.1 Vehicle Quality

The packages of measures considered by the Ten Percent Club (2006), examined above, included a wide range of examples where vehicle quality was central to the upgrade and the resulting patronage uplift. These changes include luxury double deckers and single deckers with innovative seat configuration. A masters dissertation, Beale (2004), examined the effects of replacement of a relatively modern fleet of single-decker buses with luxury double-decker buses upon patronage and modal shift. The change occurred on Route 36, operating between Ripon, Harrogate and Leeds with intermediate stops between each. Frequency increases providing services between Ripon and Leeds, every 20 minutes increasing to every 10-15 minutes between Harrogate and Leeds had already had a positive increase on patronage as demonstrated in Table 4.5.

Table 4.5: Route Growth in Previous Years

Time period	Change	Patronage		Percentage change per annum
		Before	After	
1998-1999	Increased frequency from every 30 minutes to every 20 minutes	840,000	880,000	5%
1999-2001	None		1,000,000	7%
2001-2002	Disruption to rail service		1,080,000	8%
2002-2003	Problems with rail service resolved		1,080,000	static

Source: Beale, 2004

The new buses offered low floor, easy access with a designated area for wheelchair users and people with pushchairs. Downstairs there are regular seats with fabric covering, however upstairs there are leather executive seats with armrests near the aisle and window; there are fewer chairs than standard on upper decks, providing passengers with more space. The route benefited from Real Time Information, and there are information screens on each deck of the bus however technical difficulties prevented passengers receiving the full benefit of these at the time of the survey.

The survey data demonstrated that the new buses also increased patronage through both generated journeys and modal shift. Of the 274 respondents (24%) who did not use route 36 prior to the introduction of new buses, 44% were new to the route while the remaining 56% previously made journeys along the route using a different mode. Of these 15% had previously travelled by car, which translates into 8.5% of the new trips resulting from a reduction in car use.

Further exploration of individuals using the route and their journey purpose demonstrated that the route was attracting commuters and individuals from households with relatively high household incomes, reflecting the affluent areas

the serviced. Figures compared favourably to national figures drawn the National Travel Survey.

Existing and previous users gave positive responses to the new buses and respondents who had used both the old buses and the new buses, favoured the new. Comfort scored particularly well, as did ease of boarding and cleanliness. Comfort and cleanliness were also rated as the most improved aspects, as demonstrated in Table 4.6, which provides average values on a Likert scale, (where 1 = “It is much better now”, 2 = “It is slightly better now”, 3 = “There is not difference”, 4 = It was slightly better before and 5=”It was much better before”), so the lower the average is the more positive the response. The change people most wanted to see was a reduction in fares.

Table 4.6: Comparison of the quality of the new and old buses, average score

Aspect of Quality	Mean Improvement Rating
Comfort	1.46
Cleanliness	1.59
View	1.80
Relaxing journey	1.83
Ease of boarding	1.86
Smoothness of ride	1.98
Temperature	2.02
Information provision	2.11
Safety	2.12
Value for money	2.24
Punctuality	2.26

Source: Beale 2004

Earlier work by York and Balcombe (1998) examined the impact of low floor vehicles on routes in London and North Tyneside resulting in changes in patronage between -6.7% and +17.0%, but in the main positive. For a limited number of routes (3) these impacts were then assessed relative to a control route, in two cases the impacts was close to zero, whilst in the third growth of around 12% appeared to be attributable to the low floor vehicle. The authors suggest that the potential impact on demand would be greater where whole networks were converted giving passengers the expectation that any bus would be low floor. White (2007) suggests that the evidence base in the UK is sufficient to assume 5% growth from conversion to low floor vehicles.

In-vehicle access to wifi has been trialled on some coach and longer distance bus services including the Oxford Tube. Now the Southampton Uni-link service is to trial free access on a regular bus service (Transit 10/8/07).

Conclusions

Beale suggests that providing luxury buses can increase patronage and achieve modal shift when combined with a frequent, well marketed service. Efforts were made to distinguish the comfort provided by the new buses from the package of changes, this given comfort was viewed as the most improved aspect.

Similarly figures for low floor buses would suggest that they too can increase patronage; White estimates that they are capable of achieving a 5% increase in patronage.

4.2.2 Driver Quality

Driver quality encompasses driver attitude, driver presentation and smoothness of ride. Reports by NERA (2006) and the CPT (2006) each stress the role of driver training in terms of customer service and advanced driver skills. A large scale survey found polite drivers to be one of the most important factors affecting journey quality, second only to a high frequency service (Nellthorp and Jopson, 2004). Of the 'soft factors' discussed in this report, driver quality has been valued in previous SP studies, as demonstrated in table 3.3, section 3.3 and tables 3.11, 3.13 and 3.14, section 3.4. All consider driver attitude, in terms of a combination of friendliness / cheerfulness and helpfulness, the terms used depend upon the study. Table 3.13 also considers the driver's ability to provide change, smart driver appearance and whether the driver carries an ID badge. Table 3.11 considers the perspective of both bus users and car users whereas others focus on bus users only. Tables 3.3 and 3.14 also consider smoothness of ride.

Accent (2002), as remodelled by Laird and Whelan, (2007) find that car users value driver attitude more highly than bus users for all scenarios and types of model (however, they also find that car users value all quality aspects more highly than bus users). SDG, (1996), found that the driver's ability to give change is viewed as most important, and a driver showing an ID badge received a negative response. Hensher and Prioni, (2002) found that a friendly driver was given a greater monetary value than a smoothness of ride, however, Transport for London, (2007) give smoothness of ride a greater value than a polite and helpful or a very polite, helpful and cheerful driver.

Conclusions

Whilst driver attitude and smoothness of ride is valued using SP experiments, literature demonstrating an impact on patronage levels was not available.

4.3 Information Provision and Marketing

4.3.1 Information

Accurate and easily available travel information is an essential factor for quality public transport provision, it allows passengers to plan and execute their journey efficiently. Grotenhuis et al (2007) argue that integrated multi-modal travel information provides the most benefit to travellers. This would allow them to know of all alternatives and have information which would take them door-to door. Three distinct journey stages where information is required are defined as 'pre-trip' – the planning stage, 'wayside' – at stops or stations and 'on-board' – when in the vehicle. The pre-trip information is outlined as most important, particularly for individuals who are 'unfamiliar' with using public transport, using it occasionally or never.

An internet based survey, including stated preference exercise, to determine what types of information would be most valued at each of the three stages, was completed. The authors considered information which provided time and effort savings for the respondent. Students and staff at Utrecht University were

first targeted and knowledge of the survey was spread by chain referral. The authors recognised that this contributed to a unrepresentative sample, however, internet was chosen to increase response chances. 191 respondents completed questionnaires which were included in the data analysis. At the data analysis stage the results were segmented by age and also by familiarity of using public transport.

The research found that older people required more information than younger people at all stages of the journey. As expected those unfamiliar with public transport use required further information than familiar users who habitually travelled by public transport. Conversely familiar users required more information 'wayside', much of this information concerns interchange and alternatives which would allow them to alter their trip plans subject to delay whilst unfamiliar users were more interested in information particular to their planned trip. This was a similar case on-board where unfamiliar users required more information on location of connections and time remaining, whilst familiar users require a general overview of routes available.

The relevance this has to this study is the discussion of where information is most valued and what information would users and non-users prefer in the UK.

Information is currently available in three main forms, paper-based information, personal communication in terms of staff or by telephone, and electronic communication, such as online timetables or web-based journey planners which may rely on real time information.

Paper Based Communication

On a purely informational basis timetables and maps are generally available at stops and stations either affixed to the stand or to take away. Furthermore this information can be distributed more widely for marketing purposes, and similarly widened in scope to attract non-users as well as users. This will be discussed in more depth below. Since deregulation bus operators have greater flexibility to change services although they are required to give notice of plans to introduce, withdraw or alter services. In this context most timetables are produced as single service time tables. However there are examples of local authorities, such as East Riding which deliver a book with area timetables to make sure households are aware of the bus services in the area. Other areas, such as Brighton mentioned above, have local voluntary agreements which limit the time(s) of year that services and hence information will be changed.

Staff at Stops and Stations/Customer Service

Travel information lines, such as Traveline in the UK, provide public transport information over the telephone. Traveline is often advertised on timetables or on other public transport related media.

Electronic Communication

Communication of public transport information through the internet was considered using stated preference methodology, to consider passenger willingness to pay for defined types of information (Molin and Timmermans, 2006). Surveys were completed on Intercity trains; of 250 distributed questionnaires, 217 were returned and of these 184 included successful completion of the SP exercise. Results focussed on leisure travellers, as these were expected to have less knowledge of specific trips and therefore more need for information. The cost to access information was in price per minute, to

make comparisons between paying for telephone information and paying for web-based information, the authors did recognise the limitations of this. Results demonstrated that individual were less willing to pay for web-based information than telephone information. They also demonstrated that willingness to pay was highest for real-time information (25.5 cents per minutes) when compared to other attributes; this was followed by willingness to pay for planning options, which includes grouped attributes of mode, interchange and selecting cheapest possible alternative (11.3 cents per minute). The results appear to have been adversely affected by the choice of payment vehicle which may not have been suitable for access to web based information.

Real time information (RTI) systems are distinct from paper-based timetabling, though can inform other forms of web based information. RTI systems rely on Global Positioning System (GPS) to track vehicles progress and provide timing information to customers. Information can be transmitted via electronic displays at stops or stations or via the internet or SMS to mobiles. In their promotional report 'On the Move' the CPT (2006) provide a number of examples where real time information has been implemented alongside other measures to improve the quality of bus travel; locations including Brighton, South Yorkshire, West Yorkshire, East Midlands and the West Midlands. One example, the Star Trak, which was launched in 2000 with 20 buses and 15 signs over three routes in Leicestershire expanded regionally, now using over 250 buses and 400 signs covering 36 routes. Investment in the Star Trak system now exceeds £6 million.

Holdsworth et al (2007) argues that implementation of real time information is difficult to justify on a strictly commercial basis, conversely, Dziekan and Kottenhoff (2007) argue that the outlay can be justified. Evidence from a before and after survey which monitored the impact of introducing real time information on one tram line in The Hague, The Netherlands demonstrated this. Data was collected via traveller questionnaires completed one month before implementation, and then three and sixteen months after, with the same sample of travellers. The main finding was a significant reduction in the perceived wait time of 20% following the installation of the displays; this perception of wait time endured over time. The cost of installation was €200,000, however the cost of increasing the frequency of trams to counter traveller's exaggerated perception of wait time would be €1.1 million. So, Dzieken and Kottenhoff conclude that it is five times cheaper to improve the quality of public transport by reducing the average perceived waiting time using real-time information than by increasing by increasing the frequency of the service. Additionally, they also argue that real time information can have the following additional effects:

- Positive psychological effects
- Increased willingness to pay
- Adjust travel behaviour
- Mode choice
- Higher customer satisfaction
- Better image

Research into the customer benefits of real time information, including that of Dziekan and Kottenhoff, are discussed by Litman (2007) as well as vehicle quality. This is in support of his argument that greater levels of service on

public transit modes would provide a product which people would be willing to pay for and favour over private transport for some journeys. He argues that this was because of the reduced level of stress.

Tang and Thakuriah (2007) examine data from the 2002 Commuter Study by the Regional Transportation Authority in Northeastern Illinois on attitudes and potential demand response to the introduction of real time information. Results suggested that:

- There would be an increase in both transit users (used public transport within the previous 30 days) and non users, but the greatest increase from existing users. The research found significant positive relationship between being a transit user and the propensity to ride transit more given real-time information, the marginal effects varied between 59.6% and 62.1%, depending upon the model used
- People with safety concerns were expected to increase their use, the greater information providing feelings of security – The marginal effect of safety was found to be 15.4% on the propensity to increase transit use when given real-time information at the transit station, compared to 19.7% when give real-time connection information onboard
- People with high speed commutes would be more likely to increase their use, suggesting their high values of time.
- People who perceive the current service as infrequent would be attracted to using the bus more, given information at stations and stops providing greater certainty
- People with long commutes are less likely to use transit more, as are white people and / or people with higher education levels, for example white respondents were about 10% less likely than other racial groups to increase transit use when given the real-time information.

Conclusion

Information at all stages of the journey is essential to both regular and occasional transport users. The evidence recognises that demand for different types of information varies by segments of society. Investment in information may be effective where real time information for example can reduce perceptions of wait time and encourage people to feel safer. However there is little hard evidence to suggest that it can facilitate modal shift or increase patronage.

4.3.2 Marketing

The bus industry has been criticised for not marketing their product, relying on a captive market without access to private transport (Enoch and Potter, 2002; Morris et al 2005). Increased private transport ownership and the pursuing negative effects of a reliance upon cars, has progressively lead to both bus operating companies and local authorities to consider non-bus users as well as bus users, this provides benefits in terms of profits and achieving policy objectives. Marketing related to information provision is often the responsibility of the local authorities, however bus operators can promote themselves through combinations of route and fare simplification and appropriate branding; buses themselves provide a mobile advertising space. Marketing plays an important role in the development of Quality Partnerships between local authorities and bus companies (Davison and Knowles, 2006; Rye and Enoch 2004). This is demonstrated in Table 4.7, where investment into service simplification and

service promotion and branding provides a better return on money invested than 'hard' measures such as those providing bus priority.

Table 4.7: Return on £1 investment by intervention

Measure	Approximate Return per Pound Spent (£)
Service simplification	3.50
Effective service promotion and branding	3.10
High-quality signage information	2.80
Bus stop improvements	2.20
New buses	1.80
Bus priority measures, such as bus lanes and signal priority	1.60
Real-time passenger information / automatic vehicle location equipment	1.20

Source TAS 1998

There are two distinct categories of marketing, general marketing or targeted marketing. General marketing is concerned with improving the image of a product and providing greater brand recognition across the general public, and targeted marketing identifies segments of society, for example new residents, people predisposed to transferring to bus and often involves direct marketing (TCRP, 2007). The Routes to Revenue Growth (The Ten Percent Club, 2006) developed in Section 4.1, provide a number of examples of general marketing, some of which are developed further here.

Route simplification, generally involves concentrating on frequent services along popular arterial routes, supplemented by less frequent services through estates, perhaps acting as a feeder service to the high-frequency service. The simplicity makes them easy to market and facilitates the introduction of tube style maps. Examples include Glasgow's 'Overground' network and Brighton's 'metro' network of frequent services, which also adopt a flat fare system.

Branding of buses provides identification with a route, service or network, liveries can be applied by the bus operator to demonstrate this. Whilst generally added to one operators vehicles, it can also be applied more widely, for example the 'Moorsbus', across the North York Moors. There are a large number of operators who service the area, but provide a united front to encourage visitors to choose the bus over the car, this stretches to joint marketing and information provision.

In Nottinghamshire, Nottingham City Transport has combined route simplification with strong branding, with each of the frequent 'Go2' services being painted a different route specific colour. These services run at every ten minutes, or more frequently and are supplemented by less frequent neighbourhood services which feed into the Go2 services. This marks a move away from greater support of engineering measures from this operator and is considered a response to a competing firm, Trent Barton's support of marketing to gain patronage benefits. Firm figures are not included but Nottingham estimates that 50% of the increased patronage is a result of improved marketing. The network now received a annual increases patronage of 1.8%

compared to annual declines of 1% prior to the marketing and information campaign (Cairns et al, 2004).

Targeted or direct marketing is generally focussed upon geographical areas and is often narrowed down further to consider certain segments of society, as different segments have different needs and respond to different forms of marketing.

Perth, Scotland is often identified as an example where direct marketing has increased patronage above the expected level, when combined with an improved service, which included a doubling in frequency (Cairns et al, 2004; Balcombe et al 2004). Residencies along the route were generally owner occupied and the individual were often car dependent. Non bus users were contacted directly by telephone and offered a free trial on the buses, this resulted in conversion to public transport of 7-8% of the people contacted and the route experienced growth of 56% over the first two years. A similar approach was also planned in Buckinghamshire. Stagecoach has pioneered the use of such direct marketing in the UK (CPT, 2006).

Whilst completing an experimental study, considering the effectiveness of persuasive message to encourage public transport use, Beale and Bonsall (2007) discovered that people responded best to messages which did not criticise their current habits and choices, just highlighted opportunities when alternatives were more appropriate. The two-staged trial incorporated before survey interviews, to ascertain behaviour and perceptions prior to the dissemination of marketing material, and after survey interviews, to monitor how effective the material was, in terms of perceptions and behavioural change. In the first stage generic marketing material that 'corrected' myths of public transport aimed at overcoming barriers to use. The second stage, which responded to the results of the first, involves material which accepted cars as the preferred mode, and provided examples of occasions when public transport use may be more convenient. Each trial had a control group. The first a had target group who received marketing information and the second had two target groups, one that received marketing information and a second that received marketing information and a ticket providing a days free travel. The first was targeted at a random sample of people living in Horsforth, the second a group of people not predisposed to using public transport in Adel, each suburbs of Leeds.

In terms of frequency of bus use, the control and target group all reported a greater proportion of people reducing bus use than increasing bus use. In terms of net percentage reductions, only regular and occasional bus users and females had responded to the marketing with lower net reductions in the target than the control. Also the perceptions of habitual users and those whose initial rating were below average, held a positive net direction of change in perceptions. All other subgroups responded negatively to the marketing efforts in terms of patronage change and perceptions, this included, males and infrequent bus users, which the information was hoped to attract. The authors argued that according to Azjen's Theory of Planned Behaviour (Azjen, 1991), the information aimed to 'correct' people's perception reaffirmed the behaviour of existing bus users but offended the position of people who did not use the bus and chose other modes, for example by sending out and 'anti-car' message, hence it was not effective The authors attributed the gender difference to the inclusion of a photograph of a female using the bus in the

marketing material, therefore portraying it as a feminine activity. A further finding was that generic marketing information to the whole population was ineffective, thus the second stage provided specific information aimed at people who did not use public transport.

The second trial demonstrated positive overall effects at both 6 weeks and 6 months, on bus use, for the group which received marketing information and a ticket and those receiving just marketing information, when compared to the control group. Table 4.8 demonstrates this and the effect of the segments considered. Over a six month period the information elicited a positive response to bus use across all segments receiving marketing and tickets, and most segments just receiving information. On some occasion free tickets and marketing resulted in a smaller change than just marketing, particularly over a shorter time period. The authors speculated that in the case of those not favourably disposed to bus use or infrequent bus users, the free ticket may be viewed as a bribe.

Table 4.8: Net effect of marketing on bus use in trial two

Sample (defined in terms of information obtained at the time of the first interview	**% reporting they had used the bus (during the 6 weeks between interviews 1 and 2)**			**% reporting they had used the bus (during the 6 months between interviews 2 and 3)**		
Column number	1	2	3	4	5	6
C, control; L, leaflet; LT, leaflet & ticket	C	L	LT	C	L	LT
Whole sample	30.4	**48**	**47.8**	47.4	**61.9**	**61.9**
Favourably disposed people (whose attitude ratings were above average)	28.6	**41.7**	**66.7**	54.5	**80.0**	**75.0**
Unfavourably disposed people (whose attitude ratings were below average)	33.3	**53.8**	27.3	37.5	**45.5**	**44.4**
Recent bus users (had travelled to Leeds by bus in the previous 3 months)	33.3	**84.6**	**76.9**	75.0	75.0	**83.3**
Non-recent bus users (had not travelled to Leeds by bus in the 3 months)	27.3	8.3	10.0	27.3	**44.4**	**33.3**
Frequent travellers (travel to Leeds at least once per month)	33.3	**50.0**	**61.1**	57.1	**75.0**	**66.7**

Sample (defined in terms of information obtained at the time of the first interview	% reporting they had used the bus (during the 6 weeks between interviews 1 and 2)			% reporting they had used the bus (during the 6 months between interviews 2 and 3)		
Infrequent travellers (travel to Leeds less than once per month)	20.0	**40.0**	0.0	20.0	20.0	**33.3**
Males	14.3	**46.7**	**46.2**	40.0	**75.0**	**58.3**
Females	55.6	50.0	50.0	55.6	44.4	**66.7**
26–45 year olds	57.1	57.1	57.1	60.0	60.0	**66.7**
46–60 year olds	42.9	**50**	**66.7**	57.1	50.0	**77.8**
61+ year olds	0.0	**33.3**	**14.3**	28.6	**66.7**	**33.**

Bold results indicate that the publicity material had a positive effect
Source: Beale and Bonsall, 2007

Results for patronage do not correspond with improved attitudinal ratings between the interviews before and those after. The publicity material had a positive influence. when compared to the control in only three cases. The authors argue that the reason for this is that the wrong attributes were considered in the survey, given that bus use increased despite attitudes that the bus service was deteriorating.

Travel planning is a method of marketing alternatives to car use, they can be targeted at schools, workplaces, residential areas and individuals. For the purpose of this research the focus will be on personalised travel planning focussed on individuals identified through households. Personalised travel plans (PTPs) consider the information and support benefiting an individual, with the purpose of encouraging sustainable travel habits. The service provided is ideally tailored to an individuals needs rather than generic.

Two main providers of PTPs were recognised, the service provided by Socialdata and that provided by Steer Davies Gleave, though it was appreciated that the organisations providing these services were growing in number. Socialdata used an approach called individualised travel marketing (ITM) or “Indimark” and SDG use an approach originally referred to as travel blending but more recently as Living Change or Living Neighbourhood. While the Socialdata approach aims at achieving modal shift, the SDG approach also aims to reduce travel, so results are not directly compatible.

Cairns et al. (2004) consider a number of UK case studies including pilots; the main case study areas were Gloucester, Bristol and Nottingham although other DfT funded pilots are referred to. The three main areas involved targeting households generally within a geographic area. Other methods identified include schools and workplaces, not considered here. Details monitored consider, cost per head for each person targeted and effect. For the main pilot studies costs ranged from £20 per head to £68 per head (though examples costing between £11 and £133 were included), costs were comparatively higher for pilots including less people and in cases where suitable marketing

information needed to be commissioned as part of the project. Figures for Gloucester reported a drop in car use and an increase in public transport use of between 18% for the Bristol Bishopton and the Gloucester, large scale study, to 41% in the Gloucester pilot. Results for the aforementioned Nottingham study were not included but earlier results for travel blending (1997), demonstrated a 7.6% reduction in the number of trips by car. On the evidence provided it was suggested that ITM may have greater effect that travel blending, though this could be due to the early stage of development. Sustrans suggested that for personalised travel planning to be most effective it should be introduced in areas where traffic problems are recognised by the local community, there is a reasonable level of public transport with some spare capacity and where there are local facilities to serve the local community.

The Bristol VIVALDI PTP accompanied the introduction of 'showcase' bus improvements along a corridor. For the before and after monitoring, surveys which were ten months apart, both the target and the control group were selected from along the corridor. The results demonstrated that the PTP had an effect which reached beyond that of the corridor changes, both in terms of increased bus use and modal shift. Over the ten-month period, across the control group, bus use had increased from 9% to 11% of modal share. However car driver share also increased from 45% to 46%. The target group experienced a greater increase in bus use, from 9% to 13% of modal share and a fall in journeys as a car driver from 45% to 43%. Thus demonstrating that marketing in the form of PTP provides benefit over and above the other bus improvements.

Three sustainable travel towns, Darlington, Peterborough and Worcester, were selected from applications of over 50 authorities, following the smarter choices publication. The towns receive a share of £10 million, spread over the five year period of the project, to demonstrate the effect of soft measures on travel behaviour. Each of the towns / cities elected to introduce PTPs amongst other measures, to encourage sustainable travel. Monitoring of the PTPs in each of the three areas was completed by Socialdata with support from Sustrans, commencing with baseline monitoring in 2004. With the exception of Darlington where Steer Davies Gleave were responsible for the travel planning service on behalf of the council, Socialdata were also responsible for providing the service.

One interim evaluation report is available for both Worcester (Socialdata 2006a) and Peterborough (Socialdata 2006b) and two are available for Darlington (Socialdata 2006c and 2007), the first evaluates stage 1 of the process, the second stage 2. Reports for each include information on the target population, the contactable population and the participating population, information for Peterborough and Worcester also consider the number of visits to people's home to offer further assistance. These details are included in Table 4.9

Table 4.9 Sustainable Travel Towns, Personalised Travel Planning Market Audience

	Target	Contacted	Participated	Visited
Darlington Stage 1	11,500	7,800	4,600	
Darlington Stage 2	12,000	7,618	5,206	
Peterborough	6,500	5,336	2,761	93
Worcester	6,300	5,247	2,801	119
Total	36,300	26,001	15,368	212

Source: Socialdata 2006a, 2006b, 2006c, 2007

Methods of data collection, result analysis and discussion are similar but not the same for each of the towns. Each adopted a before and after methodology, including the target group and a control group. Target groups included people who ad declined to take part in the initiative as well as those receiving information. Darlington and Peterborough considered households with and without telephones in each group, it is not clear whether Worcester did the same, however this is unlikely since data was collected via telephone interview rather than postal questionnaire. Baseline information was collected from random sample of 4,125 (Worcester), 4,269 (Darlington) and 4,461 (Peterborough) people and subsequent surveys involved 1,000 people (1,150 in Worcester) from the target group and 500 (550 in Worcester) from 'control' areas within the towns who had not been subject to PTP. Response rates exceeded 60% in all groups with responses for Worcester being as high as 87%.

In Darlington and Peterborough data collection included the postal survey and completion of one day travel diaries for all members of selected households. Each household was given a designated day to complete their diary, with the intention of getting a reasonable spread across all days for analysis. Worcester varied using a telephone interviews to determine average travel behaviour for each member of a household. Results do not distinguish between different modes of public transport. Results discussed for Worcester were focussed upon frequency of use by mode and perceptions of marketing material provided, giving percentage values. Peterborough and Darlington results were based on trips made by mode giving a percentage number of trips and car usage per person per day which was factored up to per person per year. Each town supplied figures for the estimated current mode choice for the target groups had they not received ITM, as well as results with ITM. The estimated current mode choice was achieved through comparing before and after results for the control group and calculating the factor change for each mode. This was then multiplied to the before data for the target groups to compare actual changes with background change in the town. Results comparing relative increases not considering the control group effect and considering the control group effect are demonstrated by the results for Darlington in Table 4.10. Consideration of the control group effect was not detailed in the reports for Peterborough but has been calculated from trips per person per year 'before' and after for the target group. This was not possible for Worcester with the available information.

Table 4.10 Sustainable Travel Towns: Impacts of PTPs

	Darlington1		Darlington 2		Peterborough		Worcester
	Without CG effect (%)	With CG effect (%)	Without CG effect (%)	With CG effect (%)	Without CG effect (%)	With CG effect (%)	With CG effect
Walking	+1	+4	+25	+14	+19	+21	+17
Bicycle	-27	-27	+79	+14	+20	+25	+36
Motorbike	0	0	0	0	0	0	n/a
Car as driver	-3	-4	-11	-5	-12	-13	-12
Car as passenger	-14	-11	-10	-12	-5	-7	n/a
Public transport	+14	+17	0	+2	+11	+13	+22

Source: Socialdata 2006a, 2006b, 2006c, 2007

Results suggest that PTPs can reduce car use and encourage more sustainable travel. Results for increased public transport use varies, ranging from and increase of 2% (stage 2 target group in Darlington) and 22% (Worcester). This may also be a result of the different data collection methods and questions between towns. Maps provided by Darlington Borough Council suggest geographical reason for the differences in stage 1 and 2, with respect to modal shift, the stage 2 target included central Darlington, so participants may be able to access the central zone by foot or bicycle, more easily than the target group at stage 1, who therefore may have a greater demand for public transport as an alternative. Despite the changes in mode choice there has been little or change in activity levels, including time spent travelling, trips made and distance travelled for the target groups in Peterborough and Darlington; this information was not available for Worcester.

Whilst it is impossible to differentiate between different modes of public transport the target group in Worcester valued information to support bus use more than any other marketing information. With 30% valuing pocket bus timetables and 18% valuing bus stop timetables, information to encourage use of other modes was lower, ranging between 16% cycling routes, 15% for rail timetables and 10% for walking information and other cycling information.

Similar schemes have been implemented in both Australia and Japan, demonstrating similar results (Australian Greenhouse Office, 2005; Fujii and Taniguchi, 2006). Fujii and Taniguchi recognised systems which included a written behavioural plan for change as most effective and that in they may be most beneficial to non-user than frequent users.

Conclusions

Evidence of patronage change and in many cases modal shift exist for direct or targeted marketing but not for general marketing of public transport. Literature demonstrates that information and free tickets have influenced patronage in both Leeds and Perth, in Leeds this was also compared to a control group.

Evidence suggests that Personalised Travel Planning are capable of encouraging greater bus use a modal shift over and above the changes caused by QBC changes, as demonstrated in Bristol, where bus use had increased by 2% more than the control and car use had reduced, while it had increased in the control area.

The sustainable travel towns also demonstrate positive effects of PTPs when compared to a control; increases range between 2% and 22%. Other examples reported by the DfT also record change. This evidence would indicate that they are effective, however to date the UK evidence is limited.

4.4 Ticketing and Fare Structure

There is little evidence on the impact of innovative ticketing outside London. This is at least in part due to the difficulties of achieving network wide ticketing in a deregulated environment. Nevertheless, clearly the system wide flat fare offer in Brighton forms a critical part of the success of the overall package. Recent innovations include the introduction of Buzz Card in Northampton giving unlimited travel across services and “Easyrider Anytime” a pay as you go card introduced by Nottingham City Transport (CPT, 2006).

The London evidence is summarised in White (2004) where the additional growth attributable to travelcards was 33% on the underground and 20% on the bus service. White (1983) examines the experience in the West Midlands with travelcards in the early 1980s and concludes that patronage was 7 to 10% higher than it would have been had the original graduated cash fare system continued and a similar revenue target been required. Fitzroy and Smith (1998) examine the introduction in 1984 of a cheap and transferable travel pass in Freiburg, superseded in 1991 by a regional travel pass. They estimate that impact of the pass alone, removing the fare level effect to be between 7 and 9% for the initial local pass and 13.9 to 22% for the regional pass.

The impact of system wide travelcards seems clear. The current adoption of smart card technology should make such schemes even more attractive to users, in London very few cash transactions now take place.

4.5 Roadside Infrastructure

Section 3.4.1 indicates the range of values placed on the waiting environment, staffing and facilities. Security concerns also dictate requirements for the waiting area, as developed below. Passengers prefer well lit, comfortable, visible, staffed stations and stops with CCTV and accurate information. While help points were viewed positively research found there was demand for further information as to their purpose and how to use them (DfT, 2004).

4.6 Safety and Security Throughout Journey

Personal security and perceived fear of crime act as a barrier to bus use; research distinguishes between incidents of crime and anti-social behaviour which each contribute to the issue. Stangeby (2004) recognises that feeling unsafe can encourage regular public transport users to find other means of transport or not make that journey. A survey of a sample of people, aged between 16 and 80 years old from both Gothenburg and Jonkoping revealed that 51 per cent of respondents who are regular public transport users have felt unsafe whilst using public transport. Of these, people living in cities (Gothenburg) women, relatively young people, were most likely to have felt unsafe; after dark is the time when most people have felt unsafe. Of these,

75% have felt unsafe on the vehicle, 54% have felt unsafe at the bus stop and 45% en route to the stop.

The aspect which makes people feel most threatened is the presence of intoxicated people. Other key issues include: lack of lighting features on access routes and when waiting and lack of people near the stop. Considering the environment where transport authorities or providers have some control: the waiting environment and on-vehicle, respondents felt unsafe because of a lack of staff or guards and a lack of CCTV particularly at waiting areas. On-vehicle bad driving was also considered as something which made travellers feel unsafe. The research considered what conditions are important for people to feel safe on public transport and differentiated results by people who had felt unsafe and those who hadn't. The group which had felt unsafe considered no drunk people and no underpass as important, whilst the group which had not favoured improvement in cleanliness. Good lighting was important to each of the groups. Good information made both groups feel safe at waiting areas and good driving and well maintained vehicles were important for the journey.

Nellthorp and Jopson (2004) report that focus groups indicated that on-vehicle security is just as important as that of the waiting environment expressing particular concern for lone travellers at night. The participants 'repeatedly' suggested that security had to be designed into waiting areas and vehicles. With regards to CCTV; the participants distinguished between immediate response and locally monitored systems and remotely monitored or unmonitored systems.

Similarly Cozens et al (2003) distinguished the main difference between car use and public transport use, which influenced risks or perceptions of risk, in a case study examining Crime Prevention Through Environmental Design (CPTED). These differences related to 'clustering' behaviour, which varied spatially, temporally and socio-demographically between car users and public transport users, with reference to five means can affect criminal opportunity (Brantingham et al, 1991). For instance, the fixed nature, therefore predictability of public transport routes and limited access and egress sites; the clustering of diverse groups of people, which includes "demographically high-crime-risk people", including teenagers, unattached males and those of low socioeconomic class, all make public transport users easier targets than car users.

The research defined six main types of stations on Valley Lines in South Wales and one of each type was selected for the research to provide a representative sample from the 66 stations on the local network. Virtual reality 'walk through' scenes were designed for the stations in question and the approach to the station. Train users, both regular and light users, living close to the station contributed to the research. The methodology involved open discussion focus groups with 6-10 participants, followed by the 'VR experience' and a short quantitative survey related to the environment, focusing on where and when people fear for their personal safety. The findings backed up previous research, finding that females felt more threatened than males in all but one situation and the threat appeared greater after dark than during the day. Females felt the greatest threat when accessing , waiting and using public transport while males were more concerned for the security of vehicles parked at station and when using the car park. When asked to consider how design could reduce fear, improved lighting was the main focus, followed by demand

for CCTV, and measures to improve visibility, such as cutting back or removing vegetation and providing transparent waiting areas.

Research by Crime Concern on behalf of the Department for Transport (2004), demonstrated similar patterns regarding male and female fear levels, and the affect that travelling after dark has upon concerns. However, for overall assessment of personal safety on public transport, the results showed that there was a reducing of gender gap, younger people made up a greater proportion of people that rated personal safety on public transport as 'rather poor' or 'very poor' on a five point Likert scale. With respect to specific concerns of travelling on public transport after dark, adults held the least concern for travelling on a bus, contradicting findings from Nellthorp and Jopson (2004) and indicating the access and egress and waiting phases were most threatening. Females were most concerned about walking through a multi-storey car park followed by waiting on an Underground platform, then train platform, males however were more concerned about waiting at an underground station or travelling on the underground than walking across a multi-storey car park. Again, there was demand for CCTV a demand which had grown between 1996 and 2002. There was also demand for better lighting and greater visibility at stops. The role of up to date and accurate information at stops was also valued as improving perceptions of safety, especially in smaller towns and villages; as was RTI providing the system was operational. Similarly the presence of people, other passengers but mainly staff both at stations and onboard provide greater feelings of security. The research recommended that a package of physical measures and publicity, estimating that measures to increase personal security could result in a 10.5% increase in patronage.

A London based survey, completed annually since 2003 by Synovate on behalf of Transport for London (2007), found that overcrowding of vehicles was a far greater barrier to use rather than safety concerns. Similar to other research, fear for personal safety was greater after dark and greater for females and other 'vulnerable' groups, e.g. mobility impaired and disabled and BME segments of society. While males, the under 35s and white residents in higher social grades felt less threatened. During the day, a greater proportion of people surveyed felt 'safe' or 'very safe' travelling round London by bus, compared to all other modes of public and private motorised transport and non-motorised forms of transport, however after dark, where perceptions of safety decreased for all mode types, the bus was then perceived as less safe than private cars, taxis, tube and train. This could relate to the number of incidents of antisocial behaviours and crimes people had observed or experienced while travelling and accessing all forms of transport. Considering the changes which respondents felt would encourage greater feeling of safety when using public transport, people stressed the importance of staff, both on vehicle and waiting areas, CCTV again was seen as beneficial, providing they were immediate response systems. Specific to buses, again better lighting was required and presence of people, particularly uniformed people with a community role, including police officers. The role of police officers and Community Safety Officers (CSOs) on vehicles was valued; police officers were viewed as a more effective deterrent to antisocial behaviour, however the gap between each had reduced since the 2005 survey.

A pilot between Middleton and Manchester, funded by the GMPTE, involved fully trained Safety Travel Officers (STOs), providing a uniformed security presence onboard buses. The pilot was on a route where anti-social behaviour was an issue and was seen to be having a negative impact upon patronage levels on the route. A before and after on-bus survey revealed that the (STOs) were well received. Even prior to their introduction they were viewed as positive move, with 89.6%, 90.1% and 82.4% viewing them as very effective and fairly effective respectively, and positive perception increased once the pilot had been carried out, rising to 93.7%, 97.9% and 93.8% respectively.

A study by Loukaitou-Sidaris et al (2001) of a stratified random sample of 60 bus stops in downtown Los Angeles, examines effects of environmental and land use attributes on crime rates. The theory being that incidences of crime rely on opportunities provided by spatial and target availability factors as well as social factors. Using GIS mapping of crime figures, alongside attributes expected to increase crime rates (on a crimes per 100 passenger basis), t-tests revealed significant relationships between crime and bus stops near alleyways, undesirable land use including, liquor stores and shops where you can get cheques cashed, multi-family households and where there is moderate to high levels of litter and graffiti. Matched pair analysis of bus stops close to each other also revealed that crime figures vary dramatically even within a small area; these differences were attributed to land use in the locality and the visibility of the stop.

Action research in Australia considered how crime and fear of crime acts as a barrier to encouraging greater use of public transport (Cooper et al., 2007). Considering four case study areas, near train stations on metropolitan lines into Perth, (Armadale, Gosnells, Joondalup and Swan) where anti-social behaviour presented a problem, research focussed upon how instigating partnership working can present solutions. The report identified the issues specific to each case study area, and discussed the solutions, revealed through a series of workshops with key stakeholders in each area including youth and community agencies and public transport authorities. Issues identified by the first two case studies were similar, centring around cultural and racial differences, conflict between youths and transit guards, fear of other people on the train or in stations, in Armadale those who were intoxicated presented a particular issue. In the third area, assaults on transit guards and lack of consistency and continuity in security provision presented a problem. Workshops in the fourth area recognised all of these problems plus more specific ones such as family violence encouraging youths to spend time on train and at train stations and unrealistically high fines for non-payment of fare leading to ‘identity theft’.

‘Inter-agency collaboration’ was found to be widely successful in all but one of the case study areas. In Armadale youth provision was presented as under-resourced, attendance of workshops was limited and identification of key partnership agencies occurred late in the process, however some success was reported including educational links and support for intoxicated passengers Solutions to prevent barriers to public transport use centred around information provision and education, cultural awareness raising, and defining positive roles. Interventions include:

- ‘Zip cards’ which folded down to credit card size, informing them what was expected of them and providing transport information were distributed to youths and guards in two case study areas
- Links forged with schools in all case study areas
- The PTA reversed the role to give transit guards a multifunctional role within stations and rosters which provided continuity and consistency in staffing were introduced;
- Transit guards got involved in community events in two areas and received positive media attention in a further one
- Employment strategies to encourage the cultural and racial background of transit guards to reflect the travelling public are in place, increasing the cultural awareness of all staff was introduced
- ‘Smartrider’ cards were introduced which limit access to station areas, reduce overall travel costs for youths and reduce identity theft
- Further local resources were provided for young people, particularly in Swan, where lack of local amenities were considered to contribute to incidents of anti-social behaviour.

The authors provide a number of recommendations broadly inline with the examples provided above, which stress the importance of collaboration, information and training and a systematic approach to respond to these issues. However they do not quantify effects on patronage, crime levels or incidents of anti-social behaviour.

Examples from the UK are discussed by the CPT (2006), however only qualitative outcomes are included in the report. Examples include:

- Piped music played after 7pm at Beverley bus station, East Riding to discourage anti-social behaviour, intimidation of passengers, graffiti and other acts of vandalism
- An educational bus travelling around schools in Aberdeenshire, with an interactive message discouraging vandalism and anti-social behaviour
- ‘Operation Trojan’, plain clothes police officers on-bus in St Helens to respond to antisocial behaviour
- “Operation Safe Travel” in the West Midlands, aimed at changing children’s behaviour on-bus, through school visits and encouraging close links with parents / carers
- Installation of CCTV, with particular reference to West Yorkshire and Glasgow

CCTV is not only helpful in enhancing real and perceived safety and security, it can also be cost effective for bus companies in deterring or providing evidence on fraudulent accident claims.

Conclusions

Safety and perceived safety for public transport users has received much attention, especially when compared to most other soft factors, perhaps with the exception recent discussion of PTPs. There is consensus within the literature about the importance of safety, however there is no real evidence of patronage change. Crime Concern (DfT, 2004), estimate that a patronage increase of 10.5% would be possible following a list of recommendations, however this relies on survey data on perceptions and concerns.

4.7 Perceptions of Bus Use

There is a growing body of research which considers perceptions of the bus product to define barriers to use. Through a self administered questionnaire, distributed in eight areas in Edinburgh serviced by a Quality Bus Corridor, Stradling et al (2007) report eight underlying factors which discourage people from using the bus. These are feeling unsafe; preference for walking or cycling; problems with service provision; unwanted arousal; preference for car use; cost; disability and discomfort; and self-image. Table 4.11 demonstrates the general findings.

Table 4.11 Factors Discouraging Bus Use

	Mean percent endorsement	Gender	Age	Household Income	Frequency of bus use
Safety	26.8	F > M	25-34 Hi; 65+ Lo	Lo > Hi	-
Independence	25.2	-	Y > O	-	I > F
Service provision	19.0	-	-	-	-
Unwanted arousal	18.4	-	-	-	F > I
Cost	15.6	M > F	Y > O	Lo > Hi	-
Control	13.9	-	-	-	I > F
Difficulties	7.0	-	65+ >	Lo-est >	-
Image	3.4	-	-	-	I > F

Source: Stradling et al., 2004

Using discourse analysis of the transcripts of ten focus groups held in a number of UK locations but mainly West Yorkshire, Guiver (2007) considers how people talk about bus use and car use differs. While scenarios of bus use often focus on the worst case scenario, the car is portrayed as a 'more consistent commodity', bus users were seen as vulnerable where as cars offered security. Research in Portugal demonstrated similar findings (Beirão and Sarsfield Cabral, 2007) using in-depth interviews of 24 users and non-users of public transport. Research for the Scottish Executive (Derek Halden Consultancy, 2003) identified soft factors that act as a barrier to modal shift namely, personal security, information and ticketing. Each of these papers also explores the positive side of bus and public transport use, this includes cost, it is cheaper to use the bus for certain journeys and the ability to relax rather than concentrate on driving. Whilst these studies develop a wider understanding of what will encourage bus use, including appreciation of softer factors, they do not seek to provide comparable quantifiable results for these factors.

Analysis of national survey data for the Department (2007) appears to confirm the dominance of harder factors. Aspects that users would most like to see improved gave the top priority to fare levels at 33% of respondents, followed by reliability and punctuality (20% and frequency (18%). The highest ranked softer factors were: cleaner buses (12%), better information at stops and stations (11%) and politer, more helpful staff (9%). Reasons for not using the bus centred on the convenience of the car rather than bus related factors and longer journey times by bus. When non or infrequent bus users were asked asked what would encourage them to use the bus the most common response was nothing (36%) followed by fare and frequency both on 25%, availability (14%). The highest scoring soft factors were better personal safety on buses

(5%) and better information on timetables/routes provided at stops (5%). Although these scores are low relative to harder interventions. The priority placed on safety and information echoes findings in valuation studies.

4.8 Conclusions

Evidence on patronage increase is often self-reported and usually attributes all of a change in patronage to the intervention. The use of control routes and /or a counterfactual is rare. Nevertheless the evidence suggests that:

- Packages of measures have delivered significant growth on some routes and networks.
- Of the individual measures probably the best evidence is available with respect to travelcards where significant increases in patronage have been achieved.
- Recent, albeit limited, evidence on the impact of personalised travel plans suggests that they may have significant impacts.
- Evidence on other measures is perhaps too entangled with package effects for impacts to be isolated.

5. CONCLUSIONS

This chapter examines the conclusions that can be drawn from the evidence on the value of softer attributes of bus services and their impact on patronage and the implications for future survey and experimental design.

Values

There are still only a small number of studies that have sought to value aspects of bus quality and even fewer that have attempted to value a "complete" set of attributes.

User values tend to be highest for issues relating to security and safety and in-vehicle comfort with respect to seat availability. However, there is variability between studies.

Most valuation evidence is from London. Studies elsewhere suggest that priorities, starting points and values may be different outside London.

Package Effects

Most studies assume the presence of a package effect and use a capping exercise to value a package or ideal or optimum service. This value is then taken as the maximum and the value of individual attributes scaled accordingly. "Package" values relative to average fares range from 29% to 81% for bus users. Accent (1992) did not have a capping exercise and scaled by 0.5 arguing that the bus station was only a part of the journey experience. These scaling factors are all less than 1 as expected and as was found in the context of rolling stock (Wardman and Whelan, 2001).

Nevertheless there remains the possibility that a package effect is valid and that the value may exceed the sum of individual interventions in circumstances where one or two interventions will not lead to behavioural change but when combined into a package an effect is found.

Package effects could be caused by: interaction effects, budget constraints, halo effects and the inherently artificial nature of stated preference exercises (Wardman and Whelan 2001).

There is limited evidence on interaction effects in the studies reviewed. Espino et al (2006 and 2007) find the value of in-bus time to interact with the level of comfort, such that a high level of comfort is associated with a reduced disutility of in-vehicle time. SDG (1996) identified interactions between attributes most notably the negative interaction between reliability and information provision at the bus stop which appear to be substitutes to a degree. SDG (2004) identify a negative interaction effect between a combination of a high level of facilities and modern design. Such evidence that there is suggests that interaction effects do have a depressing effect on the value of individual attributes.

The other possible drivers of a package effect, budget constraints, halo effects and the artificial nature of the SP exercise do not appear to have been investigated in the studies reviewed. The conclusions of Bates (2003) that further empirical work is needed to explore the budget effects, interaction effects and the number of attributes remain valid.

Non-User Values

Non-user preferences tend to be neglected. Where non-users are included in studies their preferences appear to be different from those of users. However, the results of Laird and Whelan (2007) suggest that the key difference is that non-users give higher values across the board than users – totalling around twice the average fare - rather than that the two groups have different priorities. This contrasts with the results of McDonnell et al (2007a) who find that non-users placed a higher value on RTI than users, whilst users placed a higher value on seat availability. This result would be expected given that relative levels of familiarity with the system would be higher for users.

Number of Attributes

The use of SP has tended towards the use of conventional experiments. Studies that seek to value a large number of attributes tend to split them between a number of experiments to minimise the burden on respondents. There are exceptions to this which seek to include all attributes in one experiment. Hensher and Prioni, 2002, Hensher et al 2003, McDonnell et al 2007a and b and Phanikumar and Maitra, 2006 and 2007. In these cases respondents face three or four choices within each experiment and 6 to 13 attributes.

Interpolating Values

Where attributes are split between experiments to reduce respondent burden or the sheer number of attributes is too many to cover even in multiple SP exercises a method is required to infer values for omitted attributes. For example, SDG (1996) used a 5 point importance scale to allocate values. The transformation of ratings into values requires a number of untested assumptions on the convertibility of such scales. The use of fairly small range scales commonly 5 points for example, tends to diminish the level of variation between factors. Importance may not be the most directly transferable rating scale satisfaction might reflect experience more closely. Neither is it necessarily obvious that importance ratings allocated to individual attributes would also apply to components of a bundle or package.

Douglas and Karpouzis (2006a) seem to have addressed this issue most robustly as follows:

- Using a nine point scale from very poor to excellent
- Establishing the journey time that would be rated excellent
- Then using time to establish the changes that would move respondents between categories.

If such an approach is to be applied there is clearly a need for research to explore the validity of the method.

Attribute Levels and Presentation

Presentation is normally through the use of verbal description. Drawings are used in the London bus quality work with testing of response to illustrations (SDG, 1996) and maps in the Bilston bus study (Accent 1992). Some attributes may be easily pretend and understood at different levels but for others, relating to comfort, security, staff etc this will not be obvious. There does not appear to

have been much, if any, qualitative work to test respondents understanding of different levels of attributes.

Values Over Time

It may well be the case that bus services need to continually evolve and improve quality standards in order to stand still. If expectations change over time this may influence values. No evidence was found on this issue. With respect to changes over time, values seem to be uplifted in line with GDP. Where this is done, the effect of quality factors will increase over time where linked to fare elasticity. Values expressed as time equivalents should not suffer this problem.

Models and Data

Responses may be discarded on grounds of inconsistency and / or extreme values –it is not always obvious what the decision rules are and these do not appear to be consistent between studies.

Some more recent studies have applied random parameters logit models. However, the implications need further exploration.

Revealed Preference

We have not found evidence on the influence of quality factors based on within mode revealed preference data. If the influence of quality factors is detectable possible ways forward might include: cross sectional examination of trip rates; before and after studies; revealed preference choice modelling and analysis of change in demand as a result of new interventions.

Patronage Growth

Reported patronage growth is invariably attached to a package of measures which in the vast majority of cases will include hard and soft attributes. Reported patronage increases tend to attribute all of the change in patronage to the implementation of the package. Few studies have examined a counterfactual or used control routes to attempt to isolate the impacts of interventions. Where this has been done the effect is usually to reduce the growth attributed to the intervention.

Nevertheless it clear that significant patronage growth has been achieved that would not otherwise have occurred through the implementation of well designed packages. It is possible that the key demand impacts are the result of a highly visible package rather than the result of the contributions of the individual attributes. It is also clear that for networks to grow as they have in, for example, Brighton and Cambridge, partnership working is essential.

Historical evidence suggests that low floor buses boost demand, however, these are rapidly becoming the “norm” so the scope is now limited. Travelcards appear to have a clear impact on demand, but implementation is difficult in a deregulated environment. Whilst marketing is clearly an important contributor to success, this is not easily quantified.

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ANNEX 1:

Table from Nellthorp and Jopson 2004

Table 4.9: *Unharmonised* Research Evidence on WTP for Journey Quality Attributes

Mode & Attribute	**Value** (& source)	**Context**	**Base Year**
Bus			
Information *at home*			
Timetables	5.5 p/trip (*)	London bus users, SP	1996
	or 22.0 p/trip (**)	Australia bus users, SP	1999
Maps	3.9 p/trip (*)	London bus users, SP	1996
Phone service	2.8 p/trip (*)	London bus users, SP	1996
Information *at stops*			
Up-to-date information	8.8 p/trip (*)	London bus users, SP	1996
	or 4.3 – 10 p/trip (*)	England bus users, SP	2001
Customised information	10.0 p/trip (*)	London bus users, SP	1996
'Countdown' (real time)	9.0 p/trip (*)	London bus users, SP	1996
	or 3.8 – 19.9 p/trip (*)	England bus users, SP	2001
Information *in-vehicle*			
Electronic display of next stop	3.9 p/trip (*)	London bus users, SP	1996
Information *at interchanges*			
Monitors (real time)	12 p/trip (*,†)	Edinburgh bus users, SP	2002
Printed timetables	11 p/trip (*,†)	Edinburgh bus users, SP	2002
Clear signposting	10 p/trip (*,†)	Edinburgh bus users, SP	2002
Comfort, security *at stops*			
Shelter	5.6 p/trip (*)	London bus users, SP	1996
Lighting	3.1 p/trip (*)	London bus users, SP	1996
Seats	3.4 p/trip (*)	London bus users, SP	1996
	or 3 p/trip (**)	Australia bus users, SP	1999
Cleanliness *at stops*			
Dirty bus stop	-11.8 p/trip (*)	London bus users, SP	1996
Facilities *at interchanges*			
Toilets	6 p/trip (*,†)	Edinburgh bus users, SP	2002
Food/drink	3 p/trip (*,†)	Edinburgh bus users, SP	2002
Security *at interchanges*			
CCTV	7 p/trip (*,†)	Edinburgh bus users, SP	2002
Intercom/help point	4 p/trip (*,†)	Edinburgh bus users, SP	2002
Customer service *at inter-changes*	9 p/trip (*,†)	Edinburgh bus users, SP	2002
Staff present			
Accessibility *of vehicles*			
Low floor	2.8 p/trip (*)	London bus users, SP	1996
	Pushchair: 4-12 p/trip (*)	London, Tyneside bus users	1994?
	Wheelchair: 1-57 p/trip	London, Tyneside bus users	1994?
Two sets of doors	4.2 p/trip (*)	London bus users, SP	1996
Wide entrances	7 p/trip (**)	Australia bus users, SP	1999
Comfort *in-vehicle*			
Seats (roomy vs cramped)	3.0 p/trip (*)	London bus users, SP	1996
Layout (some seats side-on)	-3.0 p/trip (*)	London bus users, SP	1996
Ride quality			

medium (vs smooth)	-6.4 p/trip (*)	London bus users, SP	1996
rough (vs smooth)	-10.5 p/trip (*)	London bus users, SP	1996
smooth (vs status quo)	16 p/trip (**)	Australia bus users, SP	1999
very smooth (vs status quo)	27 p/trip (**)	Australia bus users, SP	1999
Crowding			
medium (vs low)	-4.7 p/trip (*)	London bus users, SP	1996
high (vs low)	-5.7 p/trip (*)	London bus users, SP	1996
Air			
ventilation grille (vs window)	-2.5 p/trip (*)	London bus users, SP	1996
air conditioning	13 p/trip (*)	Australia bus users, SP	1999

Table 4.9 (continued)

Mode & attribute	**Value** (& source)	**Context**	**Base Year**
Bus (cont'd)			
Security *in-vehicle*			
CCTV	4.2-18.1 p/trip (*)	England bus users, SP	2001
Customer service *in-vehicle*			
Driver gives change	4.0 p/trip (*)	London bus users, SP	1996
Polite, helpful, cheerful	7.7-13.8 p/trip (*)	England bus users, SP	2001
Helpful	1.5 p/trip (*)	England bus users, SP	2001
Cleanliness *in-vehicle*			
Dirty bus interior	-8.5 p/trip (*)	London bus users, SP	1996
Clean enough	11 p/trip (**)	Australia bus users, SP	1999
Very clean	15 p/trip (**)	Australia bus users, SP	1999
Packages of attributes (bus):			
At stops:			
Shelter and seats	7 p/trip (**)	Australia bus users, SP	1999
Shelter, lighting and seats	14 p/trip (*,†)	Edinburgh bus users, SP	2002
CCTV on buses AND at stops	5.8-16.6 p/trip (*)	England bus users, SP	2001
Vehicles:	7.8-12.7 p/trip (*)	England bus users, SP	2001
New vehicles (vs status quo)	4.7-14.3 p/trip (*)	England bus users, SP	2001
New low-floor vehicles			
Rail	**By purpose: Commute / business**		
Information *at stations*			
Monitors (real time)	23/38 p/trip (*)	GB, National Rail	2000 q4
Comfort, security *at stations*			
Plenty of seats	17/25 p/trip (*)	GB, National Rail	2000 q4
Better lighting	3/4 p/trip (*)	GB, National Rail	2000 q4
Waiting room (heated+lit)	5/7 p/trip (*)	GB, National Rail	2000 q4
CCTV	10/14 p/trip (*)	GB, National Rail	2000 q4
Intercom	4/23 p/trip (*)	GB, National Rail	2000 q4
Customer service *at stations*			
Staff presence	10/15 p/trip (*)	GB, National Rail	2000 q4
Crowding *in-vehicle*			
at 80% load factor	0 all (***)	GB, National Rail, commuting	2000 q4
at 100% load factor	0.5 p/minute (seated)	GB, National Rail, commuting	2000 q4
	12 p/minute (standing)	GB, National Rail, commuting	2000 q4

at 120% load factor	1.0 p/minute (seated) 13 p/minute (standing)	GB, National Rail, commuting GB, National Rail, commuting	2000 q4 2000 q4
Rail vehicle quality – packages:			
Express Sprinter vs Sprinter	0.9% of fare (****)	GB, National Rail	1997
Express Sprinter vs Slam-Door	1.5% of fare (****)	GB, National Rail	1997
Mark 2 vs Slam Door	1.4% of fare (****)	GB, National Rail	1997
Rail vehicle refurbishment:			
Major refurbishment of Slam Door vehicles (changes to seating layout and comfort, ride quality, decor, ventilation and noise level)	2.5% of fare (****)	GB, National Rail	1997
Typical refurbishment	1.5% of fare (****)	GB, National Rail	1997

Key: (*) Balcombe et al (2004) ; (**) Hensher and Prioni (2002); (***) PLANET values quoted in SRA (2003); (****) Wardman and Whelan (2001); (†) values per trip derived using the DfT appraisal value of commuting time (TAG Unit 3.5.6, June 2004) = 8.4 p/minute.
Note: Table 4.9 excludes WTP evidence for reliability, which was given in Tables 4.7 and 4.8.

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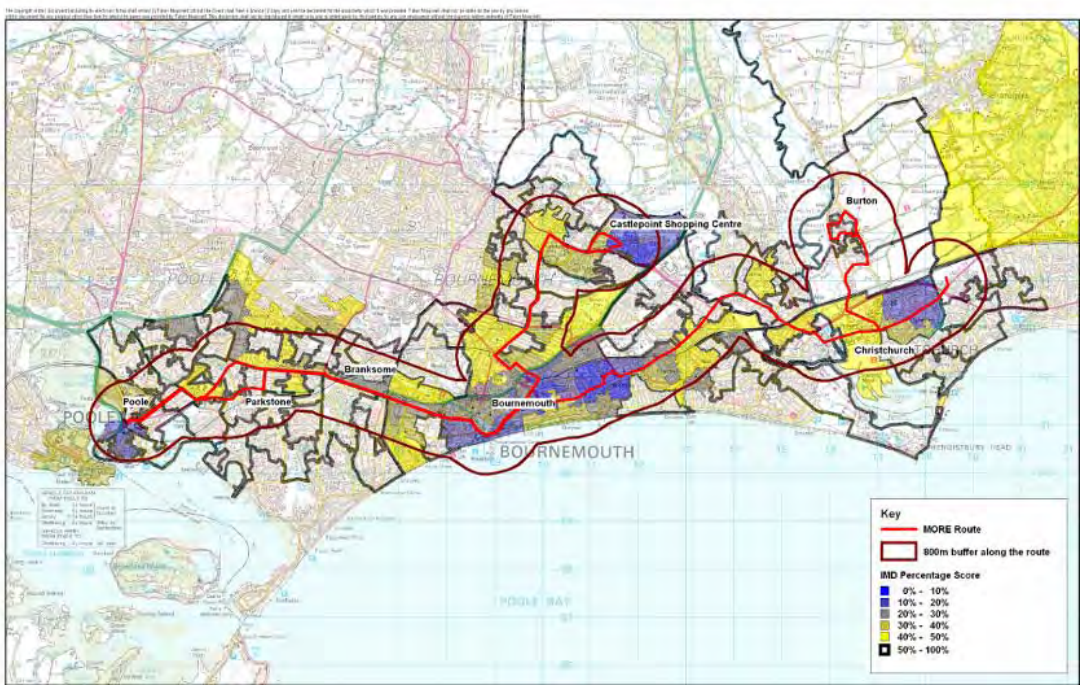
Appendix C: Case Study Route Maps

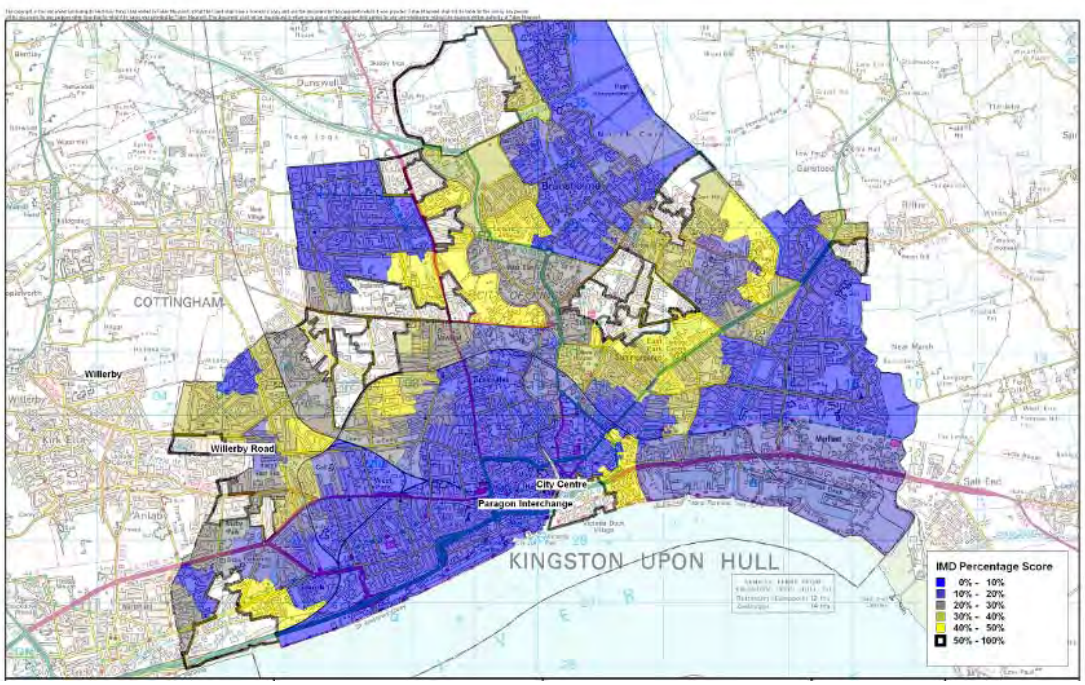
Appendix C: Case Study Route Maps

This appendix contains the route maps for each of the ten case studies.

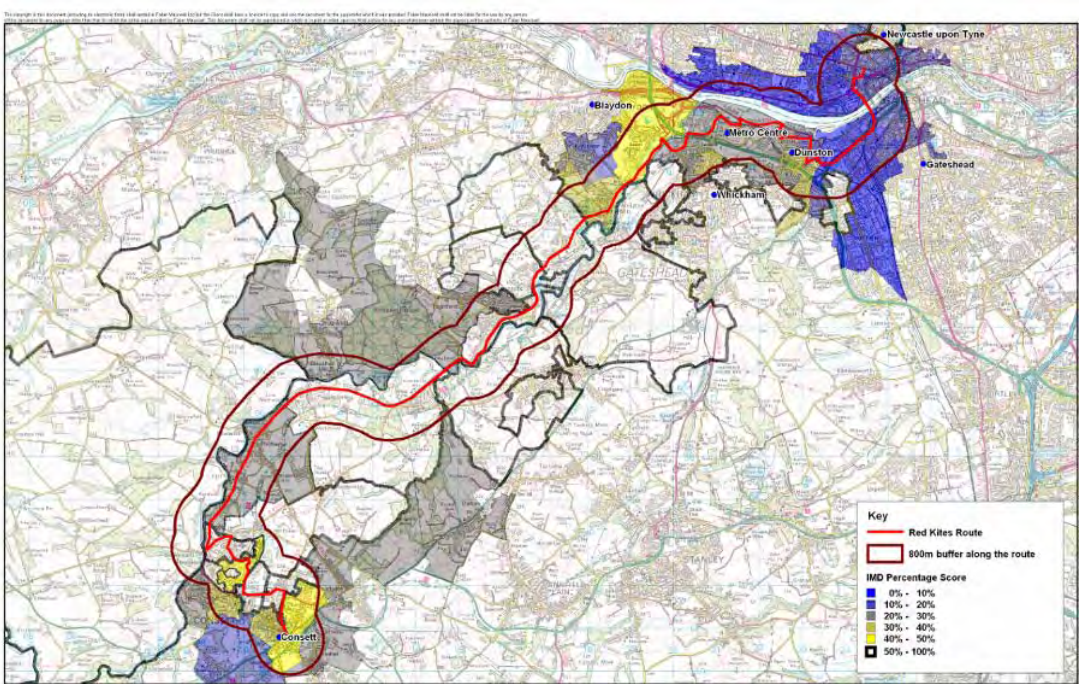
Area 1 Poole



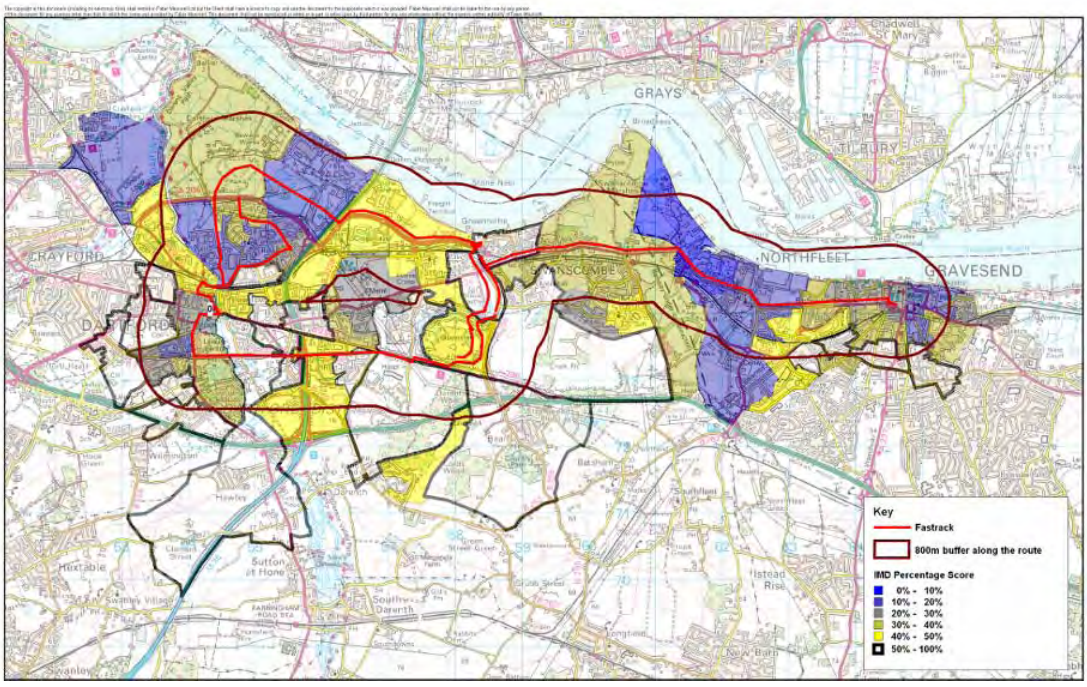
Area 2 Hull



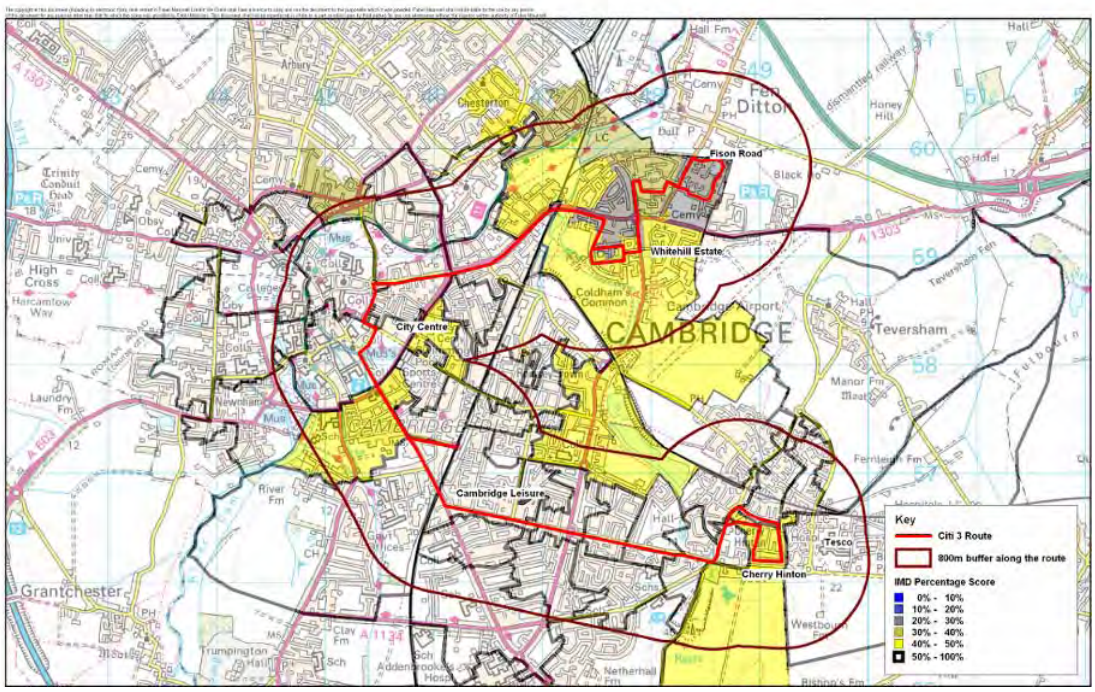
Area 3 Tyne and Wear



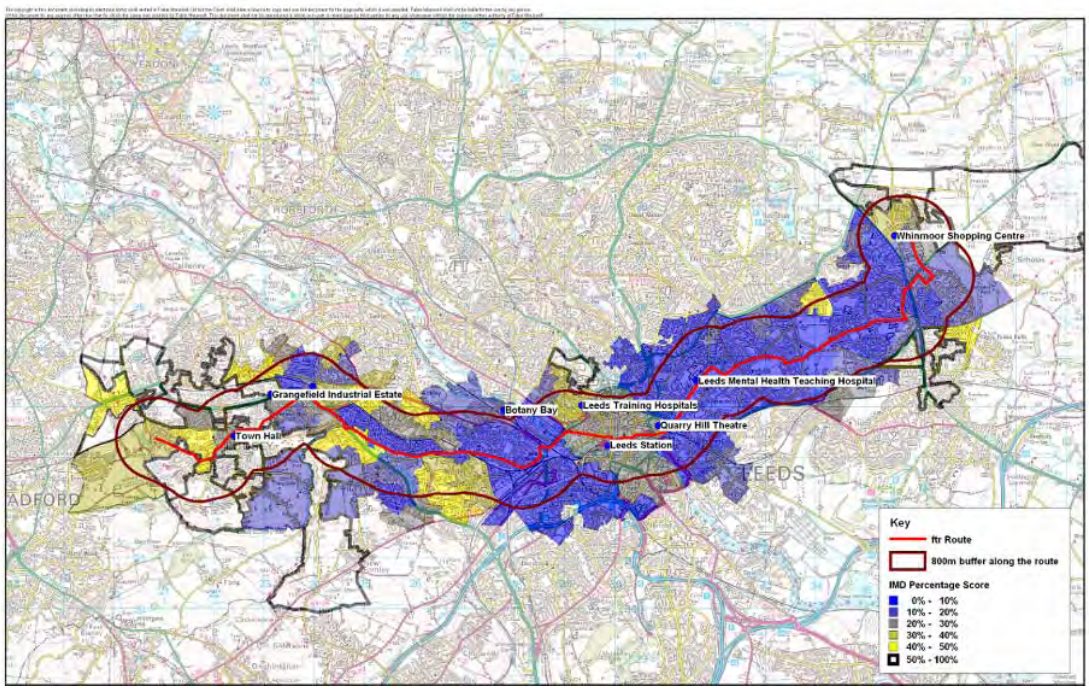
Area 4 Dartford



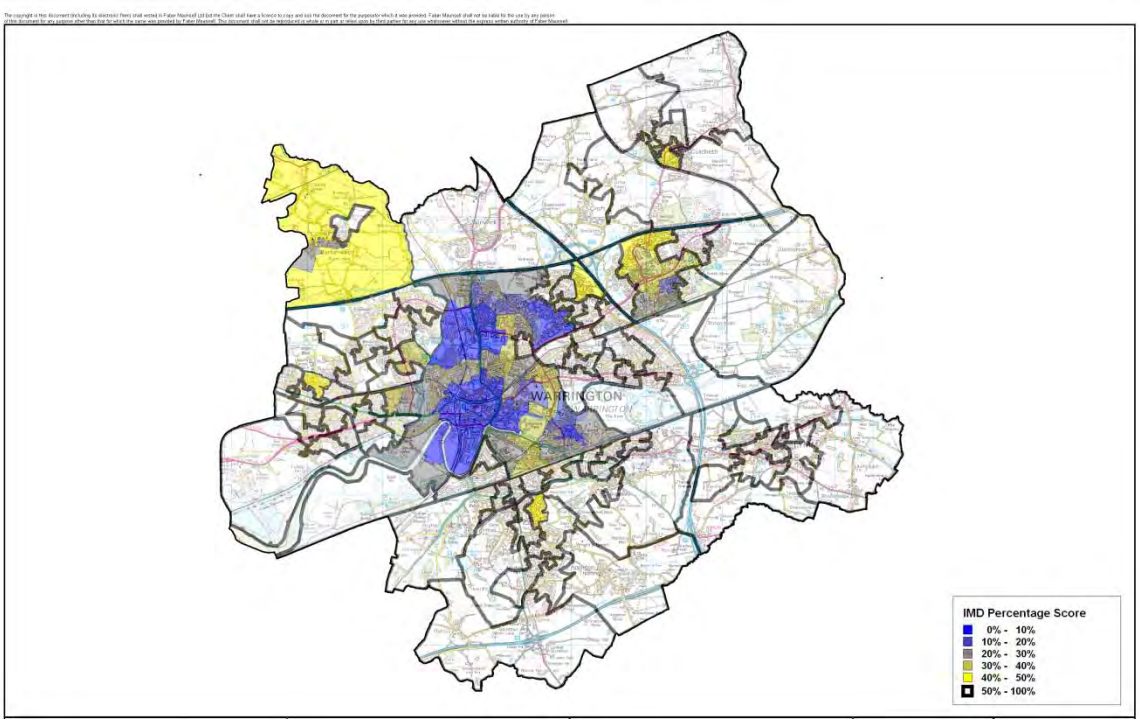
Area 5 Cambridge



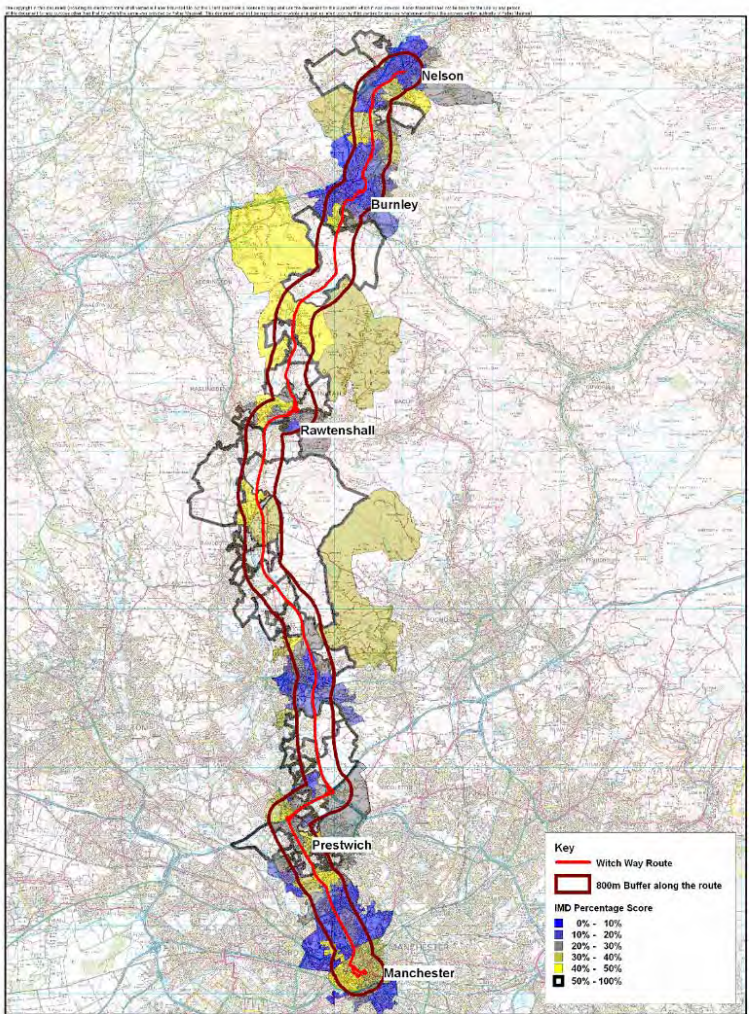
Area 6 Leeds



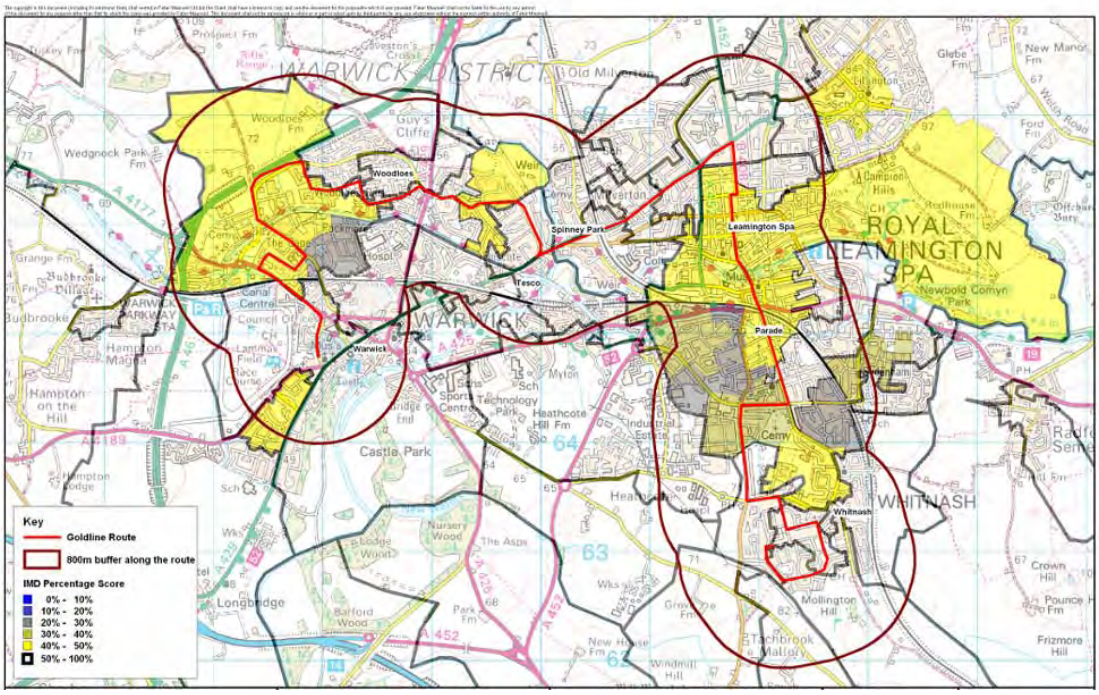
Area 7 Warrington



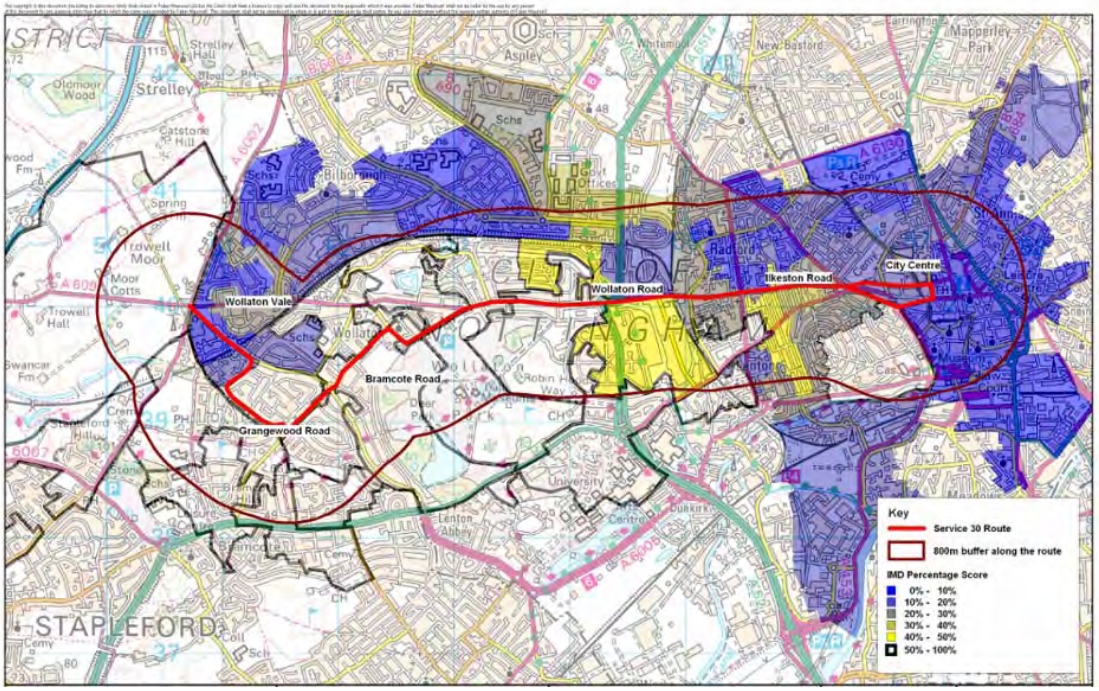
Area 8 Burnley



Area 9 Warwick



Area 10 Nottingham



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Appendix D: Attitudinal Awareness and Impact of Bus Features

Appendix D: Attitudinal Awareness and Impact of Bus Features

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Detailed information behind Table 5.3 in the report.

Table 5.3a Awareness of Features by Area - Bus Information Improvements

	Audio announcements on the bus about the next stop	Real time bus information displayed inside the bus on a screen	Real time bus information displayed at the stop on a screen	Real time bus information via txt messages	Real time bus information displayed on a web page	Mean
Leeds	29	44	27	10	5	23
Hull	2	3	8	1	2	3
Nottingham	15	20	54	5	4	20
Cambridge	4	5	33	1	1	9
Dartford	57	54	47	14	9	36
Burnley	8	10	12	2	2	7
Warrington	16	21	29	2	1	14
Tyne&Wear	12	18	19	4	3	11
Poole	19	38	52	7	5	24
Warwick	31	41	35	25	28	32
All	19	25	32	7	6	18

Table 5.3b Awareness of Features by Area - Bus Interior Improvements

	CCTV	Air Conditioning	Leather seats	Mean
Leeds	43	29	11	28
Hull	18	3	0	7
Nottingham	58	9	13	26
Cambridge	17	6	1	8
Dartford	61	38	13	38
Burnley	31	18	21	23
Warrington	26	10	2	13
Tyne&Wear	43	17	8	23
Poole	39	18	3	20
Warwick	68	44	46	53
All	40	19	12	24

Table 5.3c Awareness of Features by Area - Bus Exterior/Bus Waiting Environment Improvements

	Modern bus stops	Modern bus stations	New bus vehicles	Low floor bus vehicles	Environmentally friendly bus vehicles	Mean
Leeds	27	25	51	49	13	33
Hull	16	22	22	34	9	20
Nottingham	45	10	47	44	39	37
Cambridge	17	5	24	54	16	23
Dartford	59	37	50	42	27	43
Burnley	13	42	51	40	7	31
Warrington	33	43	23	25	7	26
Tyne&Wear	22	23	32	30	4	22
Poole	32	11	46	57	10	31
Warwick	47	29	84	79	60	60
All	31	25	43	45	19	33

Table 5.3d Awareness of Features by Area - Bus Service Improvements

	Customer friendly drivers	Dedicated drivers for each bus route	Simplified ticketing	Simple fares	Simplified network or services & branded buses for each route	A customer charter	Mean
Leeds	33	19	16	15	6	4	15
Hull	14	2	3	4	1	1	4
Nottingham	39	9	16	18	10	3	16
Cambridge	29	3	37	39	3	7	19
Dartford	39	25	28	26	19	8	24
Burnley	19	4	9	6	3	1	7
Warrington	27	6	5	3	1	2	7
Tyne&Wear	16	5	4	4	4	2	6
Poole	31	9	9	10	4	2	11
Warwick	55	42	35	34	38	25	38
All	30	12	16	16	9	5	15

Additional tables to Section 5 of the Report

Table 5.8 % Saying Major Impact - Features by Area - Bus Information Improvements

	Audio announcements on the bus about the next stop.	Real time bus information displayed inside the bus on a screen.	Real time bus information displayed at the stop on a screen.	Real time bus information via txt messages	Real time bus information displayed on a web page	Mean
Leeds	81	71	75	56	64	69
Hull	0	0	21	0	0	4
Nottingham	16	15	13	9	20	15
Cambridge	57	23	20	0	50	30
Dartford	37	50	48	23	17	35
Burnley	25	39	26	0	0	18
Warrington	0	55	45	75	50	45
Tyne&Wear	27	29	25	25	30	27
Poole	55	57	54	67	54	57
Warwick	22	22	10	2	9	13
All	31	45	35	23	22	31

Table 5.9 Saying Major Impact - Features by Area - Bus Interior Improvements

	CCTV	Air Conditioning	Leather seats	Mean
Leeds	92	86	55	77
Hull	15	13	0	9
Nottingham	24	22	3	16
Cambridge	32	63	0	31
Dartford	46	32	8	29
Burnley	40	28	15	28
Warrington	50	21	0	24
Tyne&Wear	46	52	52	50
Poole	44	59	0	34
Warwick	47	32	14	31
All	46	44	18	36

Table 5.10 % Saying Major Impact - Features by Area - Bus Exterior/Bus Waiting Environment Improvements

	Modern bus stops	Modern bus stations	New bus vehicles	Low floor bus vehicles	Environmentally friendly bus vehicles	Mean
Leeds	59	65	71	88	91	75
Hull	15	14	18	38	9	19
Nottingham	10	19	21	33	28	22
Cambridge	14	50	40	36	79	44
Dartford	36	28	40	59	39	41
Burnley	29	18	27	45	42	32
Warrington	45	46	41	42	42	43
Tyne&Wear	39	41	42	49	38	42
Poole	55	52	60	52	85	61
Warwick	23	16	42	45	54	36
All	33	33	42	49	50	41

Table 5.11 % Saying Major Impact - Features by Area - Bus Service Improvements

	Customer friendly drivers	Dedicated drivers for each bus route	Simplified ticketing	Simple fares	Simplified network or services & branded buses for each route	A customer charter	Mean
Leeds	91	96	86	85	81	80	86
Hull	26	33	0	22	0	0	14
Nottingham	22	13	19	26	16	33	22
Cambridge	50	29	34	40	57	18	38
Dartford	50	37	39	43	37	55	44
Burnley	55	50	32	41	25	50	42
Warrington	52	38	29	29	0	0	24
Tyne&Wear	31	33	18	42	27	40	32
Poole	63	59	75	73	55	40	61
Warwick	48	39	29	32	22	8	30
All	50	47	38	43	31	26	39

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Appendix E: Final Unpacking Model Estimations

Appendix E: Final Unpacking Model Estimations

A1 Final Unpacking Model

Obs	14409			
LL	-8617.59			
adj. rho^2	0.133			
	estimate	standard error	t-rat (0)	t-rat (1)
asc_area_1	-1.16	0.230134	-5.04054	
asc_area_10	-0.759	0.130486	-5.81672	
asc_area_2	-0.288	0.110846	-2.5982	
asc_area_3	-0.364	0.179438	-2.02855	
asc_area_4	-0.402	0.151773	-2.6487	
asc_area_5	-0.429	0.168488	-2.54618	
asc_area_6	-0.0713	0.227697	-0.31314	
asc_area_7	-0.0605	0.134332	-0.45038	
asc_area_8	-1.63	0.552693	-2.9492	
asc_area_9	-0.316	0.208876	-1.51286	
beta_audio	0.187	0.083743	2.233022	
beta_cctvbus	0.389	0.080679	4.821555	
beta_cctvstop	0.445	0.085084	5.230143	
beta_charter	0.134	0.113663	1.178927	
beta_climate	0.19	0.075987	2.500424	
beta_interchange	0.194	0.074897	2.590213	
beta_leather	0.166	0.138323	1.200091	
beta_low_floor	0.272	0.039139	6.949525	
beta_onscreen	0.197	0.071689	2.747968	
beta_plan	0.338	0.136655	2.473378	
beta_rtpi	0.259	0.048711	5.317076	
beta_shelter	0.166	0.0642	2.58567	
beta_simple	0.219	0.058993	3.712286	
beta_timesaving	0.153	0.022119	6.917202	
beta_trained	0.402	0.061097	6.579704	
fp_1	2.21	0.100444	22.00231	
fp_10	1.42	0.178897	7.937545	
fp_2	1.18	0.192	6.145833	
fp_3	1.99	0.379236	5.247391	
fp_4	2.07	0.188332	10.99122	
fp_5	1	0.135367	7.387298	
fp_6	1.71	0.216832	7.8863	
fp_7	1.25	0.124996	10.00032	
fp_8	1.6	0.347858	4.599582	
fp_9	1.1	0.231681	4.747911	

Scale10	2.52	0.36136		4.206332
Scale2	1.7	0.31715		2.207159
Scale3	0.926	0.238594		-0.31015
Scale4	1.31	0.204375		1.516822
Scale5	1.56	0.186483		3.002951
Scale6	1.12	0.212479		0.564762
Scale7	1.41	0.176363		2.324747
Scale8	0.87	0.236541		-0.54959
Scale9	1.34	0.257721		1.319257

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Appendix F: Final Information Stated Preference Model Estimations

Appendix F: Final Information Stated Preference Model Estimations

Values of Information Interventions

Information				
Obs	2232			
LL	-1165.82			
adj. rho^2	0.229			
	est	s.e.	t-rat (0)	t-rat (1)
asc_area_1	-0.664	0.20304	-3.2703	
asc_area_10	-1.11	0.182971	-6.06652	
asc_area_2	-0.822	0.142303	-5.77641	
asc_area_3	-0.163	0.268388	-0.60733	
asc_area_5	-1.05	0.17794	-5.90085	
asc_area_7	-0.813	0.253152	-3.21151	
asc_area_8	-1.97	0.675693	-2.91553	
beta_RTI_centre	0.698	0.153435	4.549159	
beta_RTI_station	0.714	0.191445	3.729528	
beta_RTI_stops	0.839	0.176763	4.746464	
beta_SMSRTI_10p	0.258	0.147722	1.746521	
beta_SMSRTI_20p	-0.0314	0.182412	-0.17214	
beta_SMSRTI_5p	0.228	0.226122	1.008303	
beta_SMSRTI_free	0.537	0.129105	4.159407	
beta_audio	0.184	0.174283	1.055753	
beta_full_package_1	1.75	0.303638	5.763443	
beta_full_package_2	1.61	0.253567	6.349418	
beta_full_package_3	1.65	0.286433	5.760505	
beta_text_time	0.106	0.062405	1.698573	
beta_timesaving	0.166	0.041471	4.002837	
beta_web	0.239	0.124975	1.912386	
Scale10	1.38	0.2525		1.504953
Scale2	2.41	0.44945		3.13717
Scale3	1.49	0.465184		1.053347
Scale5	1.66	0.550146		1.199681
Scale7	1.04	0.404965		0.098774
Scale8	0.809	0.265744		-0.71874

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Appendix G: Full Mode Choice Models

Appendix G: Full Mode Choice Models

Introduction

The following tables show the full results for Tables 6.9 and 6.10 in the main report.

Table 6.9 Car Users' Mode Choice Models

Variables	Modal I Estimates	Model II Estimates	Modal III Estimates
ASC-Car	2.419 (16.2)	2.422 (15.9)	2.499 (15.9)
Car Walk	-0.0689 (8.9)	-0.0709 (9.1)	-0.0776 (9.4)
Car Search	-0.0077 (1.0)	-0.0083 (1.1)	-0.0183 (2.1)
Car Time	-0.0304 (8.1)	-0.0343 (9.0)	-0.0367 (9.3)
Car Cost	-0.0035 (11.3)	-0.0034 (10.8)	-0.0029 (8.0)
Bus Headway	-0.0108 (1.1)	-0.0104 (1.0)	-0.0015 (0.1)
Bus Av Late	0.0007 (0.0)	0.0027 (0.1)	0.0391 (0.8)
Bus All	0.1718 (1.8)	0.1975 (2.0)	0.2097 (2.1)
Bus Off	0.0481 (0.3)	0.0813 (0.6)	0.2372 (1.5)
Bus On	0.2667 (2.5)	0.2894 (2.6)	0.3902 (3.3)
Bus Time	-0.0323 (10.7)	-0.0339 (10.9)	-0.0331 (10.2)
Bus Fare	-0.0035 (7.0)	-0.0039 (7.6)	-0.0046 (8.1)
Ignore Terms			
Car Time			*0.0256 (3.6)*
Unrealistic Terms			
Car Search			*0.1801 (5.0)*
Car Walk			*-0.1162 (4.0)*
Car Cost			*-0.0033 (7.4)*
Bus Headway			*-0.0466 (3.7)*
Bus Av Late			*-0.4701 (3.2)*
Bus Time			*-0.0133 (3.4)*
Bus Fare			*0.0041 (5.9)*
Bus Off			*-0.5358 (2.3)*
Bus On			*-0.8416 (2.3)*
Adj R^2	**0.092**	**0.098**	**0.1313**
Obs	**8600**	**8314**	**8314**
Car Choices	*7681*	*7419*	*7419*
Bus Choices	*919*	*895*	*895*

Note: Cost in pence and times in minutes for a one-way journey; t-stats in ( )

Table 6.10 Bus Users' Mode Choice Models

Variables	Modal I Estimates	Modal II Estimates
ASC-Car	-0.7718 (7.2)	-0.7218 (6.7)
ASC-Train	-4.8120 (47.7)	-4.7771 (47.1)
ASC-Lift	-3.3571 (40.8)	-3.3224 (40.0)
ASC-Taxi	-5.2561 (46,8)	-5.2211 (46.3)
ASC-Cycle	-4.4964 (47.5)	-4.4611 (46.8)
ASC-Walk	-3.7002 (43.6)	-3.6667 (42.9)
ASC-Job	-6.2441 (40.1)	-6.2090 (39.8)
ASC-House	-7.7483 (26.0)	-7.7130 (25.8)
Car Walk	-0.0341 (2.2)	-0.0312 (2.1)
Car Search	-0.0311 (3.0)	-0.0288 (2.8)
Car Time	-0.0189 (3.8)	-0.0204 (4.1)
Car Cost	-0.0039 (11.9)	-0.0042 (11.3)
Bus Headway	-0.0189 (6.8)	-0.0204 (7.0)
Bus Av Late	-0.0401 (5.3)	-0,0429 (5.6)
Bus All	0.3786 (6.9)	0.4948 (7.9)
Bus Off	0.0317 (0.5)	0.0318 (0.4)
Bus On	0.3252 (5.4)	0.5378 (7.5)
Bus Time	-0.0004 (0.2)	0.0008 (0.6)
Bus Fare	-0.0054 (20.6)	-0.0046 (16.1)
Ignore Terms		
Bus Headway		*0.0248 (5.9)*
Bus All		*-0.3112 (4.2)*
Bus Off		*-0.5363 (5.9)*
Bus Time		*0.0095 (3.5)*
Unrealistic Terms		
Car Cost		*0.0011 (2.5)*
Bus Headway		*-0.0072 (2.2)*
Bus Fare		*-0.0022 (9.3)*
Adj R^2	**0.049**	**0.058**
Obs	**12,425**	**12,425**
Car Choices	*1010*	*1010*
Bus Choices	*9048*	*9012*
Train Choices	*226*	*226*

Lift Choices	*969*	*969*
Taxi Choices	*145*	*145*
Cycle Choices	*310*	*310*
Walk Choices	*687*	*687*
Job Choices	*54*	*54*
House Choices	*12*	*12*

Note: Cost in pence and times in minutes for a one-way journey; t-stats in ( )

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Appendix H: Fares Simplification Additional Work

Appendix H: Fares Simplification Additional Work

Introduction

Outline of the Project

Following discussions with the Department for Transport about an additional stated preference (SP) experiment that could be carried out under the umbrella of the wider Bus Soft Factors study, the Department indicated that a study of fares simplification would be of considerable interest to them and that a stand alone study examining this area might be considered for additional funding.

In response to this invitation the Institute for Transport Studies prepared a proposal in April 2008 which reviewed the issue of complexity in existing bus fares, identified the most common sources of complexity, set out a number of research issues and proposed a study including a review of literature and past results, qualitative survey work, a quantitative survey including stated preference and stated expectation questions, analysis and modelling.

A specification was agreed in with emphasis new data collection and analysis, and with a start date in July 2009. Depth interviews were conducted in July and, in the light of findings from these, a quantitative questionnaire was drawn up, approved by the Department and piloted in August. Some further modifications to the questionnaire were agreed in the light of experience gained during the piloting and the revised questionnaire was administered in October. Analysis and modelling began in November and was substantially completed by mid December.

The Problem: Sources of Complexity in Bus Fares

Complexity is the result of differentiation which is usually introduced for one or more of the following reasons:

- To reflect different costs of provision (e.g. reflecting the length of the journey)
- To reflect competition from other modes or operators (e.g. to make a bus journey competitive with rail)
- To capitalise on lack of competition (e.g. if no other operator provides night services)
- To seek to influence demand (e.g. to encourage some of the peak demand to shift into the off peak period)
- To reflect different elasticities (e.g. charging higher prices to commuters, and lower prices to the elderly)
- To reflect social/political priorities of a sponsoring body (e.g. to offer concessionary fares)

The most common forms of differentiation are:

- By distance (or number of fare stages passed)
- By time of day (typically peak and off peak)
- By passenger characteristics (eligibility for concessions)

- By journey frequency (inherent in the offer of reduced price season tickets, multi-journey tickets and return journey tickets)
- By operator (with different operators offering different fare structures)

Regular bus users become familiar with the fare(s) applicable to their regular journey and the existence of a range of other fares need not concern them. However, for non-bus users and for bus users making unfamiliar journeys, the apparent complexity of the fare structure can be an obstacle and the time and effort required to ascertain the correct fare can be off-putting. Not knowing what the fare should be, the potential passenger may be concerned about it being much higher than they are prepared to afford, about the risk of not having the correct fare available in cash or coins or about inadvertently paying more than they need to.

Fare structures can be simplified in various ways - though not without loss of ability to reflect local market conditions. Some of the main types of simplification are outlined below:

- At one level fare simplification might simply mean **rounding the fare** (e.g. to the nearest 50 pence) thus reducing the number of separate fare levels. This simplification is particularly helpful to passengers if the operator has a strict no-change policy.
- **Flat fare schemes** such as those in operation in Brighton and Edinburgh are often quoted as good examples of fare simplification. They offer travel anywhere within the city bus network for a flat fare. The problem is that, to maintain revenue, the introduction of a flat fare scheme involves pricing long journeys lower than the market would bear while pricing some short journeys off the system. This may, or may not be acceptable to the operators and their sponsors.
- **Zonal fare schemes** are widely used and offer some of the advantage of flat fares without having to depart so far from the “natural” market fare. However, zonal fares can create boundary problems and rely on the definition of the zones (along with rules on what constitutes a boundary crossing) being clearly understood.
- The introduction of **transferable tickets** covering all services, by all operators which are used to complete a specified journey.
- The introduction of period (day, week, month) **travel cards** removes the need for travellers to know what the fare is for any particular journey – although this advantage is lost if the user finds that the card is not accepted by all operators or for all journeys.
- The use of **stored value cards** similarly removes the immediate need for travellers to know the price of individual journeys (in that they do not have to have the correct cash fare available) but does not help those who wish to know at the journey is going to cost before they decide to make it. London’s Oyster card offers the traveller a smarter version of the stored value card by guaranteeing that they will be charged no more than the minimum amount necessary when travelling around the city.

The Depth Interviews

In-depth interviews were conducted to test people's understanding of the topic and to trawl for issues (a further set of interviews will be used for cognitive testing of pilot questionnaire). Interviewees were recruited for "A discussion about transport costs which will last about 30-40 minutes" and were offered a £10 incentive payment.

An interview script was devised based on the initial conception of the issues (and in the light of findings from the literature review) and was allowed to evolve after each interview as new issues emerged. The interviews were conducted face to face and were tape recorded (with the permission of the interviewees).

Lessons Learned From the Initial in-depth Interviews

- The main direct **beneficiaries of simplification** are occasional users or regular users without a travel card making an unfamiliar journey. People whose marginal journeys are free (holders of travel cards or free travel concessions, people whose trips are paid by others) see no benefit because price – and its complexities – are irrelevant to them. Determined non-users, and those who see bus use as a choice of last resort, saw little or no advantage in simplification (again, the fare and its complexities seem irrelevant to them as they suggested that they would never use bus unless they had no other option).
- Interviewees seemed **able to verbalise** whether and why simplification would benefit or disbenefit them. However, they often failed to mention "reasons" which, when prompted, they agreed to be relevant (suggests some lability of opinions?)
- Simplification appeals to people who like to know the cost before travelling (either because they want to make a fully informed choice or because they are discomforted by the thought of not having the correct change). Conversely, there are people, even among occasional users, who feel no need to know the fare in advance and see no reason to have precise change. This seems to be a **personality trait** linked to "Need for cognition".
- People appear **able to understand benefits and disbenefits** – when they are brought to their attention.
- The perceived **benefits of simplification** are: fare will be cheaper for some trips; makes it easier to predict fare for an unfamiliar trip (making it easier to make informed choice and to have correct change); speeds up boarding process and thus journey times for everyone (It was noted that some of these benefits are also achieved by replacing cash-on-board by tokens or tickets purchased in advance).
- A perceived **disbenefit of simplification** is that the fare will be higher for some trips (interviewees might not believe a scenario which postulated unrealistically low fare levels; they do not regard bus companies as charities!).
- The perceived **benefits of stored-value cards** are: makes it unnecessary to have correct change; speeds up boarding process and thus journey times; could, presumably, ensure traveller gets charged minimum applicable fare; may help with advance budgeting; could, presumably, be

purchased with credit card or by phone. Those with knowledge of Oystercard assumed that there might be a discount relative to cash fares).

- Different types of people (particularly with different ages or different need for cognition) value different aspects - e.g. young people particularly happy with idea of stored-value cards.
- The perceived potential **disbenefits of stored value** cards are: potential risk of loss or theft; potential problem if credit runs out; potential problem if system malfunctions or debits too much. (People with experience of Oyster card recognise that all these can be overcome via balance display, network of top-up points, cancellation and refund following loss or theft, and guarantee in case of malfunction).
- The need to buy separate tickets when change of bus is required en route is seen as a source of increased cost rather than as a complication, hence provision of **through tickets** is perceived almost entirely as providing an opportunity for affected passengers to reduce costs or extend their journey at no extra cost. Some users thought that introduction of such tickets would inevitably cause prices for single-vehicle trips to rise. Others noted that the existing DayRover ticket was more economical than paying 4 separate fares.
- Some **ticketing concepts needed clear explanation** - notably “through tickets”; “stored-value swipe cards”; and “fare stages”. Also, the definition of a bus journey needs to be clear (single /return, per bus or per OD?)
- **Awareness of the current fare structure**, even among regular users, was very low.
- **Estimates of the current fare for a sample journey** varied significantly (except among regular users – most of whom had good knowledge). Some people are clearly making decisions based on a misperception of the fare. Non-regular users’ estimates are usually based on memory of a similar journey.
- The **SP presentation** appeared to be working (in that different combinations of attributes prompted different choices) – particularly if the fare and the fare structure are presented as separate attributes – in the context of a hypothesised journey between known locations. It was noted that the frequency attribute had little impact for frequencies under 10 minutes. It was clear that different individuals were valuing the attributes very differently (reflecting their personality traits – see above).
- The **SP Scenario** was a one-off trip between known locations. It did not seem necessary to specify a trip purpose (indeed attempts to do so made the exercise seem more artificial because any given respondent might not find it credible). The scenario worked best if the respondent had <u>not</u> recently made that trip by bus (because if they <u>know</u> what services run along the route they find it harder to imagine different ones).
- The **SI presentation** appeared to be working but it was noted that a four week period was insufficient to pick up minor changes – interviewees who made little use of buses appeared comfortable extending this period up to 6 months – and that the wording could be improved. For most people,

simplification seemed to have less impact on their anticipated usage of bus than journey time, fare, and reliability.

- It was noted that interviewees' **verbalisations of the reasons** for their SP preferences and SI responses seemed to be helping them to make a choice (and helped the interviewer to understand the process).
- **Knowledge of London fares and of Oystercard** seemed to facilitate understanding of zonal fares and of stored-value cards.
- **Questions worked best if tailored** to the interviewee's experience and to their knowledge and perception of current fares.
- Most interviewees appeared to enjoy the exercise and showed no sign of **fatigue** even after 45-50 minutes others seemed to have had enough!

Implications for Main Questionnaire and Analysis

- Simplification is not an issue for people who:
    - Do not do much of their travel in the study area;
    - Have travel cards valid in the study area;
    - Have free travel concessions for the study area (e.g. over 60s, disabled);
    - Whose travel costs are paid by others, or whose travel decisions taken by others (e.g. under 18s?); and
    - Who are determinedly not-users of buses in the study area.

  There is thus little point in including them within the **sample** (it would be a waste of resources). However, for forecasting purposes, an estimate would be required of the number of such people in the population. Also, given that other modules of the project have focussed on regular bus users, the coefficients developed in this module will not be directly comparable with those from other modules (will require adjustment for heterogeneity).
- Interview script should be computerised (**CATI** or **CAPI**) to allow automatic branching and adjustment of question contents to reflect prior level of use, knowledge of locations, experience of sample journeys etc.
- Questions on age, gender, income, education, "Need for Cognition" and experience of zonal fares and stored-value cards could be used for possible **categorisation of respondents**.
- Should draw people's attention to potential benefits of simplification prior to SP and SI questions (as would be done via advertising if such simplifications were introduced).
- There is a case for using **SP and SI** questions (SP gives relative values, SI indicates likelihood of change in bus trips. Both methods seemed to be working).
- **SP scenario** should be a hypothesised one-off journey between locations which are known to the respondent but between which they have not recently travelled by bus.
- **SP attributes c**ould usefully include:
    - Fare structure ("as now", fixed, zonal, and per mile);
    - Fare level – interacting with fare structure using levels which imply that simplification would either bring no change in average fare paid (<u>or</u> include one variant implying an increase and one variant implying a decrease) frequency (high and low)
    - Walk time (high and low),

    - Journey time (fast, medium and slow).
- In the presentation of the fare structures within the SP and SI experiments, **respondents should be required to work out the implications of a given structure for themselves** (e.g. for distance-based fares they can be told the fare per mile but it is up to them to estimate distance and do the multiplication, similarly, for zonal fares they should be provided with a map and it is then up to them to work out how many zones their trip will traverse).
- The **SP design** could perhaps treat fare structure and fare level as a single attribute – all be it presented to respondents as separate attributes.
- It is worth testing **how many SP presentations** respondents can cope (the design is likely to require six presentations).
- The **SP experiment could be extended** to explore effect that simplification would have on people who already have a pre-paid card – but this would not be possible within the available budget).
- The **period used in the SI** question should reflect current usage level (e.g. 1 month for people making at least 1 trip per month, up to 12 months or more for those making less than 1 trip per year).
- **Scenarios for SI** questions could cover various types of simplification. For example, the "as now" could be compared with "fixed fare", "zonal fare"; "as now but with stored-value cards available"; "as now but with through tickets available"; "removal of peak / off-peak distinction" etc. However it may be too ambitious to include all these within a single questionnaire and so some prioritisation may be necessary (this prioritisation should also take account of how easy or difficult it is to explain each type of simplification).
- Should **include request for "reasons"** for preferences after the SP questions and for change in trip numbers following the SI questions.
- Even where they are to be retained, there is clearly a need to **rephrase** some of the questions and showcards used during the exploratory interviews.
- A case could clearly be made for **testing robustness of opinions/choices by using differential briefing** (though not possible within available budget).
- **The Analysis** should test effect of using perceived fare rather than actual fare to explain current usage.

The Pilot Interviews

The purpose of the pilot survey was twofold:

(1) To complete cognitive testing of draft questionnaire (i.e. to test people's understanding of, and ability to respond to, the draft questionnaire); and

(2) To get an initial feel for the ability of the questionnaire to obtain the required information (most particularly to test the efficacy of the SP design).

The pilot survey took place in Leeds between 11th and 22nd August. Interviews were conducted by phone rather than via a hall test because, since CATI now appeared likely to be the mode used for the main survey, it was judged better to pilot this rather than an approximation to it.

Respondents were recruited via face to face interviews (mix of door to door and on street) during which an appointment was agreed for the main interview. Briefing sheets were sent to respondents in advance of the telephone interviews so that they could be referred to during the interview.

The questionnaire was drafted following the depth interviews conducted in early-mid July. CATI software was prepared to enable the interviews to be conducted by phone. Using CATI, each interview lasts approximately 25 minutes.

Twenty-seven CATI interviews were conducted with respondents recruited via brief face-to-face interviews (43 people were recruited and 27 were interviewed – quotas having been applied to ensure a mix of person types). Strict eligibility constraints were applied to ensure that interviewees were prima-facie likely to be influenced by simplification of fares in Leeds (the requirement was that interviewees must be resident in Leeds but must not be pass-holders, eligible for free bus travel, under 18, or determined non-users of buses – i.e. people were excluded if they would not consider using buses even if they were cheaper, more comfortable and more frequent).

Seven cognitive interviews were conducted on university premises with respondents recruited (again with quota requirements and eligibility constraints) by local advertisement and personal contacts. The cognitive interviews differed from the standard CATI interviews in that respondents were asked to comment on their understanding of specific questions and to indicate any difficulties they experienced during the questionnaire (the cognitive interviewer, having observed them while they were answering the main questions, was able to home in on questions which appeared to have caused them to hesitate or to which they gave inconsistent answers). For 3 of the cognitive interviews the main interview was conducted as a CATI by the market research firm. For the remaining 4 interviews, the main interview was conducted, using variants on the CATI script, by the cognitive interviewer.

All (34) respondents were offered a £10 “thank you” for agreeing to participate in the process.

Lessons Learned from the Cognitive Interviews

- The questionnaire appeared to work well; the interviewees appeared to enjoy the exercise and to have understood the questions and there was no evidence of any respondent fatigue.
- Administration of the questionnaire via CATI (with briefing material sent out in advance) is feasible.
- A number of presentational or administrative/logistical issues arose in one or more interviews which indicated the need for colour-coding of briefing material, some minor rewording of individual questions and/or potential responses, some clarification of instructions to interviewers, and avoidance of dominance in the experimental design.
- Debriefing questions revealed that the existence of different fares charged by different companies was an issue for some respondents and that this could be covered by extending the questionnaire accordingly.

Lessons Learned from Basic Analysis of Data from CATI Interviews

- The recruitment procedures produced more women than men (57% v. 43%) – indicating that gender quotas should not be relaxed.
- Only a minority of respondents (8%) refused to divulge their income - suggesting that the question could be retained.
- Several results indicate that only a minority of the targeted sample are likely to increase their bus use as a result of fares simplification per se (as opposed to as a result of a change in their fares caused by simplification). This means that a majority of the sample will contribute little to the estimation of the value of simplification - and thus that it is likely to be difficult to produce statistically reliable estimates. The results which contribute to this conclusion are:
  - That a substantial proportion (47%) of respondents said that knowing the exact fare would not affect their decision about making a new bus journey – and a further 20% said that an approximate estimate would suffice;
  - That a substantial minority (20%) of the respondents had "no idea" of how fares were structured in Leeds – perhaps suggesting that they had not been motivated to find out;
  - That, although more than half (53%) of respondents said that, if current bus fares in Leeds were simplified to become £1.50 for each bus trip, it would it make a difference to the number of buses they would catch, closer examination reveals that, of this 53%, about three quarters said that this would be because their fare had become cheaper or more expensive (only 20% of all respondents said they would change the number of journeys because of simplification *per se* (i.e. because they expected it to be easier to remember the fare, or easier to have the correct change or because they expected the boarding times to be reduced);
  - That, although a substantial proportion (43%) of respondents said that, if current bus fares in Leeds were simplified to become £1 for each zone used, it would it make a difference to the number of buses they would catch, this figure is reduced when one allows for the fact that most of these 43% said that they would change the number of trips because they anticipated their fare would become cheaper or more expensive (only 6% of all respondents said they would change the number of journeys because of zonalisation *per se)*;
  - That less than half (47%) of respondents said that, if prepaid smart cards were introduced in Leeds, they would buy one, and of these 47% , only 25% said they would expect to make more journeys if they owned such a card. This implies that something around 11% of the target population might make more trips as a result of the introduction of smart cards.
  - That a substantial minority of the sample, when asked if they were "… the sort of person who likes to work out all the pros and cons before making a decision", said "no".
- The overwhelming majority of respondents assume that there is a differentiation between peak and off peak fares – the answer to this question is therefore unlikely to be of great value during the analysis. Given also that

the abolition of peak/off peak differentials is unlikely to be a realistic policy option, *this question could perhaps be deleted*.

Key Conclusions from Pilot

- The main conclusions were (1) that the draft questionnaire, with only minor changes to the wording and procedures, is likely to succeed in picking up any effect of fares simplification on bus usage; and (2) that implementation via CATI is wholly feasible.
- The less good news was that only a minority of the target population (which already excludes people who might be expected to be unaffected by fares simplification) apparently anticipate that fares simplification would make any difference to their behaviour other than via a change in fare levels.

The Main Survey

The sample for the main survey was specified as 300 individuals split equally between three areas (Warwickshire, Manchester and Leeds – these areas having been chosen to represent three un-simplified fare structures and to include a substantial sample from a non-metropolitan area to contrast with that from metropolitan areas). A recruitment questionnaire was used to screen out respondents who were entitled to free fares or who used a season ticket (neither of whom would find much benefit from simplification) , or who would not consider using buses even if they "…*cheaper, more comfortable, more frequent, and with simpler fares*". Respondents who were in scope were asked if they were willing to participate in the main survey (for which a £10 "thank you" would be offered) and, if so, an appointment was made to conduct the main interview by phone and appropriate briefing material was sent out to them.

The main survey was conducted, using the main questionnaire (see below), as aCATI (Computer Assisted Telephone Interview), in October 2008. The characteristics of the achieved sample are summarised in the following tables.

Area	Respondents	Percentage
Warwickshire (Leamington Spa area)	100	33.22
Leeds	102	33.89
Greater Manchester	99	32.89

Gender	Respondents	Percentage
Male	134	44.52
Female	167	55.48
Total	301	100.00

Age group	Respondents	Percentage
Rather not say	7	2.33
Under 18	6	1.99
18-25	80	26.58
26-40	105	34.88
41-60	99	32.89
Over 60	4	1.33
	301	100.00

Annual household income (£)	Respondents	Percentage
Rather not say	49	16.28
Under 15,000	89	29.57
15,001 - 20,000	32	10.63
20,001 - 30,000	47	15.61
30,001 - 50,000	50	16.61
50,001 - 70,000	22	7.31
70,001 - 100,000	7	2.33
Over 100,000	5	1.66
	301	100.00

Highest educational qualification claimed	Respondents	Percentage
Rather not say	22	7.31
No formal	36	11.96
O	79	26.25
A	55	18.27
Diploma	37	12.29
Degree	47	15.61
Postgrad	25	8.31
	301	100.00

Access to Car	Respondents	Percentage
No car	108	35.88
One car	105	34.88
More than 1	88	29.24
	301	100.00

Possession of License	Respondents	Percentage
No Driving License	146	48.50
With Driving License	155	51.50
	301	100.00

Frequency of bus use	Respondents	Percentage
Every day	91	30.23
Once a week	106	35.22
Once a month	35	11.63
A few times a year	48	15.95
Less than once a year	21	6.98
	301	100.00

Analysis of Quantitative Data

Tabulated Results

The raw results (other than for the SP questions) are tabulated below.

Claiming to be sure of cost	Respondents	Percentage
Certain	37	12.29
Not Certain	264	87.71
	301	100.00

Average uncertainty (of those not claiming to be certain who gave logical responses)	
$\Sigma_{responses}$((MaxGuess-MinGuess)/Guess) N responses	($\Sigma_{responses}$MaxGuess)-($\Sigma_{responses}$MinGuess ($\Sigma_{responses}$Guess)
51.10	47.48

Source of information to estimate cost	% of 362 Responses from entire sample	% of 42 Responses from people claiming certainty	% of 334 Responses from people not claiming certainty
Similar Journey in Study Area	25.69	23.81	24.85
Similar Journey Elsewhere	11.05	7.14	11.08
Memory	2.49	4.76	2.10
General Knowledge	16.02	33.33	17.37
A Guess	35.08	X	38.02
Other	9.67	30.95	6.59
Total	100.00	100.00	100.00

Knowledge of fare required before travelling by bus for first time	Respondents	Percentage
Exact	96	31.89%
Approximate	68	22.59%
No knowledge required	137	45.51%
	301	100.00%

Whether like to have exact fare before boarding	Respondents	Percentage
Yes Always	86	28.57%
Yes Usually	127	42.19%
doesn't worry as long as close	50	16.61%
doesn't worry at all	38	12.62%
	301	100.00%

Sure about zone boundaries Description (only asked of those who thought fare was zonal)	Respondents	Percentage
Yes	13	24.07
Not sure	12	22.22
No	29	53.70
	54	100.00

Think that need to give exact fare	Respondents	Percentage
Yes	258	85.71
No change	28	9.30
No idea	15	4.98
	301	100.00
(Correct answer for study area is yes – except in a very small number of cases)		

Sure whether need to give exact fare	Respondents	Percentage
Certain	186	65.03
Quite Sure	83	29.02
Not sure	16	5.59
No idea	1	0.35
	286	100.00

Think that that different companies charged different fares	Respondents	Percentage
Yes - variation by company	176	58.47
No - uniform charge	67	22.26
No idea	58	19.27
	301	100.00
(correct answer for study area is yes)		

Sure whether different companies charged different fares	Respondents	Percentage
Certain	115	47.33
Quite Sure	93	38.27
Not sure	32	13.17
No idea	3	1.23
	243	100.00

Think that smart cards are available for bus use in study area	Respondents	Percentage
Yes	114	37.87
No	109	36.21
No Idea	78	25.91
	301	100.00
(We believe that the correct answer for study area is no –probably some misunderstanding of the question)		

		Thinking that smart cards can be used – by area				
		Yes	No	No Idea	Total	% yes
Area	Leamington Spa	34	29	37	100	34.00
	Leeds	43	38	21	102	42.15
	Manchester	37	42	20	99	37.37
	Total	114	109	78	301	37.87

Thinking it is easy to predict fares	Respondents	Percentage
Yes	118	39.20
No	183	60.80
	301	100.00

Reason for fares being difficult to predict (only asked of those 183 thinking it difficult)	Responses	Percentage of Responses
Not sure of structure	8	2.92
Not sure where fare stages are	12	4.38
Not sure where zone boundaries are	13	4.74
Not sure of journey length	14	5.11
Not sure about time periods	5	1.82
Variety of types of tickets and special offers	3	1.09
Variation between companies	33	12.04
Not sure about concessions	27	9.85
The companies keep changing their fares	38	13.87
The fares are not widely publicised	17	6.20
Other	104	37.96
	274	100.00

Saying they would make more bus trips if fares were simpler (only asked of those 183 thinking it difficult)	Respondents	Percentage
Yes	91	49.73
Maybe	51	27.87
No	41	22.40
	183	100.00

Reason for making more trips if fares were simpler (only asked of the 142 who said yes, or maybe, they would make more trips)	Responses	% of Responses
Easier to make decision	32	19.28
Correct Change	54	32.53
Quicker to board	7	4.22
Other	73	43.98
	166	100.00

Would harmonisation of fares to those of dominant operator affect bus trip making?	Respondents	Percentage
Yes	52	17.28
No	249	82.72
	301	100.00

Why would harmonisation of fares affect trip making? (only asked of the 52 people who said it would)	Responses	Percentage of Responses
Cheaper	21	36.21
More expensive	6	10.34
Easier to remember	4	6.90
Sure have right change	5	8.62
Quicker to board	0	0.00
Other	22	37.93
	58	100.00

Would introduction of fixed fare of (x) make any difference to your bus trip making?	Respondents	Percentage
Yes	167	55.48
No	134	44.52
	301	100.00
A different value of x was used in each study area – it was set to be approximately the same as the average fare paid (e.g. x = £1.60 in Leeds)		

Why would introduction of this fixed fare affect your trip making? (only asked of the 167 people who said it would)	Responses	Percentage of Responses
Cheaper	75	35.71
More expensive	47	22.38
Easier to remember	13	6.19
Sure have right change	15	7.14
Quicker to board	3	1.43
Other	57	27.14
	210	100.00

Would introduction of zonal fares (description) make any difference to your bus trip making?	Respondents	Percentage
Yes	128	42.52
No	173	57.48
	301	100.00

The description referred to a zone map and said they would have to pay X each time you get on a bus and an extra x each time they cross a zone boundary.
A different value of x was used in each study area – it was set such that the average total
fare paid would be approximately the same as the average fare paid (e.g. x = 90p in Leeds)

Why would introduction of this zonal fare affect your trip making? (only asked of the 128 people who said it would)	Responses	Percentage of Responses
Cheaper	49	33.79
More expensive	55	37.93
Easier to remember	4	2.76
Sure have right change	2	1.38
Quicker to board	1	0.69
Other	34	23.45
	145	100.00

Would you purchase a Smart card if they were introduced? (only asked of the 109 who thought they did not already exist)	Respondents	Percentage
Certainly	33	30.28
Probably	43	39.45
Probably Not	16	14.68
No	17	15.60
	109	100.00

Would having a smart card would make any difference to your bus trip making? (not asked of the 17 who said they wouldn't buy one)	Respondents	Percentage
Yes	36	39.13
No	56	60.87
	92	

Why would having a smart card affect your trip making? (only asked of the 36 people who said it would)	**Responses**	**Percentage of Responses**
Cheaper	5	9.43
Wouldn't think about cost	8	15.09
No need to have right change	13	24.53
Quicker to board	6	11.32
Other	21	39.62
	53	100.00

When planning a journey that you have not made before, which of the following might make you decide <u>not</u> to do it by bus?	**Responses**	**% of responses**
Wanting a quicker journey (door to door)	154	13.07
Wanting more comfortable journey	66	5.60
Wanting a cheaper journey	82	6.96
Wanting convenience and flexibility of car	109	9.25
Wanting a more frequent bus service	91	7.72
Not wanting to walk to and from bus stops	46	3.90
Not wanting to wait at bus stops	107	9.08
Not knowing the timetable	144	12.22
Not being able to rely on the services to run to time table	104	8.83
Not wanting to travel by bus at night	93	7.89
Not being sure what the cost will be	86	7.30
Not being sure how to pay	17	1.44
Not wanting the hassle of paying separately for each bus	79	6.71
	1178	100.00

In general, would you say that you are the sort of person who likes to work out all the pros and cons before making any decision?	**Respondents**	**Percentage**
Yes Certainly	114	37.87
Yes	111	36.88
No	56	18.60
Certainly Not	20	6.64
	301	100.00

Analysis of responses to Stated Response questions

Expected responses if fixed fares (as defined) were introduced:

Response	Respondents	Percentage
More Trips	71	52.99
Less Trips	31	23.13
No Change	32	23.88
	134	
Spend More	73	54.48
Spend Less	51	38.06
No Change	10	7.46
	134	

Deduced assumption about change in average fare due to introduction of fixed fares	Respondents	Percentage
Fixed is higher	69	51.49
Fixed is lower	57	42.54
No Difference	8	5.97
	134	

Expected responses if zonal fares (as defined) were introduced:

Response	Respondents	Percentage
More Trips	41	37.27
Less Trips	43	39.09
No Change	26	23.64
	110	
Spend More	43	39.09
Spend Less	56	50.91
No Change	11	10.00
	110	

Expected responses if fares were harmonised to those of dominant operator:

Response	Respondents	Percentage
More Trips	24	51.06
Less Trips	9	19.15
No Change	14	29.79
	47	
Spend More	25	53.19
Spend Less	8	17.02
No Change	14	29.79
	47	

Expected responses if a smart cards was purchased:

Response	Respondents	Percentage
More Trips	28	77.78
Less Trips	2	5.56
No Change	6	16.67
	36	
Spend More	23	63.89
Spend Less	8	22.22
No Change	5	13.89
	36	

Models Estimated on the SP Data

Models were estimated on the SP data from 286 respondents (15 cases from the original data set of 301were incomplete or otherwise unusable). Models estimated for each of the three areas and for the combined dataset are outlined in the table below**.** The utility function for these models is:

*V = (deltafixed * fixedD) + (deltazonal * zonalD) + (betatime * time) + (betacost * asnowD * (fareEst + alpha * deviation)) + (betacost * fixedD * farefixed) + (betacost * zonalD * gamma * farezonal)*

Where:

- *deltafixed* and *deltazonal* are estimated constants for fixed and zonal fares
- *betatime* and *betacost* are estimated time and cost sensitivities
- *asnowD, fixedD,* and *xzonalD* are dummy indicator variables set to 1 when the alternative's fares are, as nowm fixed or zonal respectively (otherwise 0)
- *time* is the specified journey time
- *farefixed* and *farezonal* are the fares payable for the specified journey under the fixed and zonal fare structures respectively
- *fareEst* is the respondent's estimate of the current fare
- *deviation* is given by 0.5*(*fareEst – farelower*) + 0.5*(*fareupper – fareEst*) where *farelower* and *fareupper* and lower and upper boundaries on estimated fare for given respondent
- *alpha* is estimated as a random coefficient with a discrete distributions, and three mass points, at -1, 0 and 1. For a respondent with very little uncertainty, the mass at 0 would be high, and the degree of risk aversion and risk proneness depends on the relative masses at -1 and 1
- *gamma* is estimated as a random coefficient with a discrete distributions, and two mass points, at 0.5 and 1. A respondent believing the journey to cover only one zone is likely to have a large probability for the first mass point, with the opposite applying for a respondent understanding that the journey covers two mass points

The *gamma* correction was found to be necessary because it was clear that some respondents had assumed that, under zonal fares, a journey crossing one zone boundary would be charged as a "one zone" journey, while others believed that it would be charged as a "two zone" journey. The fact that there is currently some confusion about the interpretation of zonal fares is itself an important result. The probabilities for the different mass points suggest some slight asymmetries, but these are not significant at any reasonable levels of confidence.

Final Models Built on SP Data

	Warwick		Manchester		Leeds		Full data	
Observations:	588		558		570		1,716	
Respondents:	98		93		95		286	
LL(0):	-407.57		-386.78		-395.09		-1,189.44	
LL(beta):	-358.85		-331.32		-347.69		-1,058.30	
adj. rho^2(0):	0.097		0.12		0.097		0.103	
Parameter	**Estimate**	**T-ratio**	**Estimate**	**T-ratio**	**Estimate**	**T-ratio**	**Estimate**	**T-ratio**
betacost	-0.7060	-5.65	-1.5100	-7.74	-2.1400	3.03	-1.0500	-10.59
betatime	-0.0760	-4.94	-0.1100	-5.82	-0.1520	2.00	-0.0941	-8.75
deltafixed	0.6110	2.68	0.5640	2.27	0.6160	1.01	0.4790	4.25
deltazonal	0.4640	1.78	-0.2390	-0.67	-0.4650	-1.00	0.1210	0.86
gamma1	0.5490	0.40	0.6040	0.96	0.6820	2.01	0.5600	0.92
gamma2	0.4510	-0.40	0.3960	-0.96	0.3180	-2.01	0.4400	-0.92
alpha1	0.4940	0.55	0.4120	0.43	0.3820	0.26	0.3340	0.01
alpha2	0.0000	-0.68	0.0852	-0.95	0.5130	0.66	0.2680	-0.45
alpha3	0.5060	0.60	0.5030	0.92	0.1050	-1.40	0.3970	0.61
VTTS (pence/min)	10.76	4.18	7.28	6.08	7.10	4.96	8.96	8.19
VTTS (£/hr)	6.46	4.18	4.37	6.08	4.26	4.96	5.38	8.19
WTP fixed (p)	86.54	3.08	37.35	2.46	28.79	3.27	46	4.55
WTP zonal (p)	65.72	1.68	-15.83	-0.68	-21.73	-1.63	12	0.92
Fixed vs time (min)	8.04	2.50	5.13	2.29	4.05	2.94	5.09	4.04
Zonal vs time (min)	6.11	1.69	-2.17	-0.67	-3.06	-1.42	1.29	0.85

Note that t-ratios for gamma1 and gamma2 are taken w.r.t. 0.5, t-ratios for alpha1, alpha2 and alpha3 are taken w.r.t. 1/3

The performance of these models is satisfactory and the model built on the combined data set has an adjusted r square value of 0.103.

The results show significant negative marginal utilities for cost and time. The values for time savings are high (at 8.96 pence per minute for the combined data set) but is reasonable in the light of the fact that the respondents included who do not use buses on a regular basis (the higher value of time for the Warwickshire population is similarly consistent with the fact that that areas has higher incomes than Manchester or Leeds).

The fixed fare structure has a significant positive utility for the fixed fare structure of 46 pence (or 5.09 minutes) indicating that, *ceteris paribus*, the

introduction of fixed fares might attract significant numbers of new passengers for medium length bus journeys. Comparison of results for the three areas indicates that the deduced willingness to pay for fixed fares varies from 86.54p in Warwick to 37.35p in Manchester and 28.79 in Leeds – confirming that, as would be expected, the more complex the existing fare structure, the more people are prepared to pay more for fixed fares.

The estimated utility for the zonal structure is also positive but, in the model built on data from all three areas, at 12 pence (or 1.29 minutes), it is only significantly different from zero at the 61% level. Comparison of results for the three areas reveals that, in Manchester and Leeds, the utility for zonal fares is actually negative. Although this result may indicate that zonal fares are not viewed positively in conurbations (where zone boundaries may be hard to define), it would be unwise to read too much into results which are not statistically significant.

The utilities for fixed and zonal fares, at 5.09 minutes and 1.29 minutes respectively, compare with a value of 1.43 minutes deduced for “fares simplification” in the “Unpacking SP” strand of the work

Models Estimated on the Stated Response data

Regression models based on data from the SR questions were run using a stepwise procedure in which all variables describing the respondent and his/her travel patterns were available for inclusion. The models were run with the inclusion criterion set at 5% (significance of new coefficient) and exclusion criterion set at 10%.

Eight Models were explored. They were to predict the net annual increase in bus trips, and the net annual increase in spend, under each of four scenarios: (1) if the current fare structure was replaced by a specified fixed fare – the fare specified was approximately the same as average fare currently paid; (2) if the current fare structure was replaced by a specified zonal fare structure - specified such that neither the average fare payable nor the fare payable for a medium length journey would change significantly; (3) if fare structure and levels were harmonised to those of the dominant operator; and (4) if smart cards were introduced.

Four of these eight models were successful and are summarised in the table below (models for annual spend under the zonal fares, harmonised fares and smart card scenarios, and for annual trips under the Smart card Scenario, could not be created). Note that the level of explanation is low - reaching 5% only for model 1.

Regression Models Built on the Stated Response Data

Model	**1**		**2**		**3**		**4**	
Dependent variable	*ETripF*		*ESpendF*		*EtripZ*		*EtripH*	
	B	T	B	t	B	t	B	t
Constant	-14.29	-0.76	-19.35	-0.85	-53.88	-3.78	11.87	2.59
Independent variables (all IVs were offered to the stepwise procedure, the values is shown if it was included, an asterisk is shown if it was not)								
DriveD	*61.25*	*3.24*	*		*58.41*	*2.93*	*	
MetroD	*-41.28*	*-2.09*	*		*		*	
Rich D	*		67.35	2.16	*		*	
EasyD	*		*		*		-13.58	-2.47
KnowD	*		*		*		-11.57	-2.16
FreqUserD	*		*		*		*	
QualD	*		*		*		*	
ChangD	*		*		*		*	
CarD	*		*		*		*	
Number of observations	246		246		246		246	
Adjusted R square	0.051		0.015		0.030		0.029	
Std error of estimate	148.4		244.2		156.7		41.7	

Definition of dependent variables:

ETripF = additional trips per year if current fare structure was replaced by a fixed fare structure *ESpendF* = additional spend per year if current fare structure was replaced by a fixed fare structure *ETripZ* = additional trips per year if current fare structure was replaced by a fixed fare structure

EtripH = additional trips per year if fare structure and levels were harmonised to those of the dominant operator

Definition of independent variables (all dummies):

DriveD = 1	if respondent has a driving license (otherwise =0) (true for 51% of sample)
MetroD = 1	if respondent lives in Leeds or Manchester (otherwise =0) (true for 67% of sample)
RichD = 1	if respondent had income above £20,000 per year (otherwise =0) (true for 44% of sample)
EasyD =1	if respondent finds existing fares easy to predict (otherwise =0) (true for 39% of sample)
KnowD =1	if respondent likes to know fares before travelling (otherwise =0) (true for 54% of sample)
FreqUserD = 1	if respondent uses buses at least once a week (otherwise =0)
QualD = 1	if respondent is qualified to “A level” or above (otherwise =0)
ChangD = 1	if respondent likes to have correct change before travelling (otherwise =0)
CarD = 1	if respondent’s household had 1 or more car, (otherwise = 0)

Recruitment questionnaire: (Text assumes interviews are in Leeds. Script could be used in pencil and paper form or computerised for CAPI. Text to be spoken is in **bold**. Branching instructions are in yellow. All data to be coded - including recruitment interviews which do not lead to a main stage interview. Each interview should have an ID so that it can be associated with the subsequent main stage interview. Software should not include a "refused to answer" code except where indicated)

Record:

- Interview location:
- Interviewer:
- Date
- Interview ID:

Categorise visually: Male Female

Categorise age visually: up to 25 years 25-40 years Over 40 years

Read Intro statement (mentioning DfT as sponsor)

1. **Do you live in Leeds?**

   Yes (→3) Don't Know No

2. **Who do you pay your Council tax to?**

   Leeds City Council Other Council (→End) Don't know (→End)

3. **Do you ever use buses in Leeds?**
   Yes (→5) No

4. **Would you use buses in Leeds if they were cheaper, more comfortable, more frequent, and with simpler fares?**

   Yes (→8) Perhaps (→8) No (→End)

5. **Do you have a travel card or Season ticket for buses in Leeds?**

   Yes (→End) No

6. **Are you entitled to free travel on Buses in Leeds?**

   Yes (→End) No

7. How often do you use buses in Leeds?

   a. Every day
   b. Every week
   c. Every month
   d. A few times a year
   e. Less often than that

8. **Do you own a car?**

   Yes No

9. **Would you mind taking part in a short telephone interview about travel costs in Leeds on 18th or 19th August at a time to suit yourself - we would be able to pay you £10 for your time?**

   a. Agrees to participate

   b. Does not want to participate(→End)

10. **What name and address should we send the payment to?**

11. **What number should we phone?** (*get landline number if possible*)

12. **Please can you repeat that** *(make sure it is the same!)*

13. **Who should we ask to speak to? (***name***)**

    END. **Many thanks for your help**

Briefing pack: (To be posted to willing participants).

Contents of pack:

1) Explanatory letter (Mention the DfT and the University, the fact that they have agreed to phone interview, that will receive £10, that it is all confidential and that they should have the briefing material to hand at time of interview)
2) SP options (one green A4 sheet) with a code number (Must record SP code number in interview file)
3) A4 map showing zone system for city on card
4) Lists (Showcards) :
   - Reasons for non-use
   - Household income
   - Age
   - Education

Main questionnaire: (to be coded as a CATI script, Text to be spoken is in **bold**. Branch instructions are in yellow, Inserts and other software functions are in green)

Important general instruction to interviewers: Some questions have several potential responses. Do not read the options out unless this is specified, but do probe to make sure you are coding to the right one.

Software to allocate an Interview ID and then record:

- ID of recruitment interview
- ID of any previous attempts to interview this person (unless there is another way of recording the reasons for earlier attempts having been aborted)
- Time (to the second)and Date of this interview
- ID of interviewer

1. Am I speaking to [name from Q10 of recruitment questionnaire] ?

2. **Thank you, on behalf of the Department for Transport for agreeing to help us with this interview. I should start by assuring you that this interview is completely confidential and no data will be released or stored in a way that it could be traced back to you**. (*pause*) **Have you received the briefing material we sent you?**

   Yes (→4) No

3. **Perhaps it has been delayed. When would be convenient for us to call back?**

   a. Record new date and time(→70)

   b. Respondent does not want us to call back(→71)

4. **Have you got it in front of you?**

   Yes (→8) No

   Can you fetch it please?

   a. (They fetch it) (→8)

   b. They cannot find it

6. **If we call back later or on another day, do you think you will be able to have found it find it?**

   Yes No (→71)

7. **When would be convenient for us to call back?**

   Record new date and time (→70)

8. **Please can you read out the number at the top left corner of the green sheet?**

   (record it)

   Thanks, we will send the £10 payment to you at [address from Q10 of recruitment questionnaire]. I would like to start the interview by homing in on a journey that you might make in Leeds. If, at any stage in the interview, you are unsure what the question means please feel free to ask for clarification.

9. Do you know where [X] is?

   (X is inserted by software from randomised list of locations in zone B of the map – see list at end of questionnaire)

   Y N (→9)

   Software should repeat question 9, changing X to next place from list, until they say "Yes"

10. Have you travelled by bus between [X] and Leeds city centre by bus in the last year?

   Y (→9) N

If they have travelled it by bus, the software should repeat question 9, changing X to next place from list, until they say "Yes" to Q9 and "No" to Q10.

11. How much do you <u>think</u> it would cost to travel by bus from Leeds city centre to [X], one way at 11 in the morning?

Are you sure about that?

a. Certain (→16)

b. Not certain

12. What is the most you think it might be, at that time of day?.....

13. What is the least you think it might be at that time of day?.....

14. **How did you arrive at those estimates?** (*code all that apply*)

a. Similar journey in Leeds (→17)

b. Similar journey elsewhere (→17)

c. Memory of this journey (→17)

d. General knowledge of fares in Leeds (→17)

e. A guess! (→17)

f. Other (→17)

15. **How did you know that it was [Q11]?** (*code all that apply*)

a. Similar journey in Leeds

b. Similar journey elsewhere

c. Memory of this journey

d. Knowledge of fares in Leeds

e. Other

16. When you are thinking about making a bus journey for the first time, do you want to know the exact fare before you decide?

a. Yes – I want to know the exact fare

b. Yes but only approximately

c. No – it doesn't affect my decision

17. When you are making a bus journey and paying by cash, do you try to have the exact fare available before you get on the bus?

a. Yes always

b. Yes usually

c. Doesn't worry me provided that I have something close to the right fare

d. Doesn't worry me at all

18. Fares are structured in different ways in different cities, for example some cities have fixed fares for all journeys, others charge according to the length of the trip, the number of fare stages or the number of zones you travel in. How do you think the fares are structured in Leeds? *(code first that applies)*

a. Fare stages
b. Zones
c. Distance-based
d. Fixed
e. No idea (→22)

19. How sure are you about that?

a. Certain
b. Fairly Sure
c. Not Sure
d. No idea

20. *(if Q19=d - i.e. they thought Leeds has zones*)

Do you know where the zone boundaries are?

1. Yes
2. Not sure
3. No

21. In some cities bus drivers will give change if you do not have the exact fare. Do you think this is the case in Leeds?

a. Drivers do give change
b. Divers will not give change
c. No idea (→24)

22. How sure are you about that?

a. Certain
b. Fairly Sure
c. Not Sure
d. No idea

23. In some cities different bus companies charge different amounts for the same journey. Do you think this is the case in Leeds?

a. Yes – different companies do charge different fares for some journeys
b. No - they all charge the same for all journeys
c. No idea (→26)

24. How sure are you about that?

a. Certain
b. Fairly Sure
c. Not Sure
d. No idea

25. In some cities you can buy a pre-paid card which is automatically debited with the correct fare whenever you use a bus. You simply top up the card with extra credit whenever necessary. Do you think that such cards can be used on Leeds buses?

a. Yes

b. No

c. No idea (→28)

26. How sure are you about that?

a. Certain

b. Fairly Sure

c. Not Sure

d. No idea

27. Would you say that it is easy to predict the fare for bus journeys in Leeds?

a. Yes – it is easy (→32)

b. No – it is difficult

28. **What makes the Leeds fares difficult to predict?** *(don't prompt, code all that apply)*

a. Not sure of structure

b. Not sure where fare stages are

c. Not sure where zone boundaries are

d. Not sure of journey length

e. Not sure about time periods

f. Variety of types of ticket and special offers

g. Variation between companies

h. Not sure about concessions

i. The companies keep changing the fares

j. The fares are not widely publicised

29. Do you think that you would consider making more one-off bus journeys if the fares were easier to predict?

a. Yes

b. perhaps

c. No (→32)

30. **Why?** (*don't prompt – code all that apply*)

a. Easier to make a decision

b. Easier to know what Fare to have ready (correct change)

c. Quicker to board

d. Other

31. **Now I want you to imagine that you have to make a single journey, by bus, from Leeds City Centre to [X] at about 11 o'clock on a cloudy but dry morning.**

I want you to imagine that there are two bus services available to you, each going from a different bus stop.

Can you look at the green sheet please (*pause*)

Imagine that you have choice between services A and B (*pause*)

You will see that service A has a journey time of 20 minutes, involves 10 minutes walking to and from bus stops and has a fixed fare of £1. (*pause*)

Service B has a journey time of 30 minutes, involves 15 minutes of walking and has the "as now" fare - which you have estimated as [XXX]. (*pause*)

XXX= Q11 if they were certain, otherwise XXX = " between Q14 and Q13"

Faced with this choice, which would you use?…. Please take your time. (T*hey must choose one of them. In this and subsequent questions, DON'T help them to estimate costs but if they ask about "the map" tell them it's the map of Leeds on the card we sent out.* A B

32. **What factors did you take into account in that choice?** *(code <u>all</u> that apply)*

    a. Fare structure (e.g preference for fixed, zonal or as now)

    b. Fare level (wanting cheapest)

    c. Journey time (wanting quickest)

    d. Walking time (wanting shortest)

34. **For the same journey, if the choice was between service C and service D , which would you choose …Please take your time …** (they must choose one of them). C D

35. **What factors did you take into account in that choice?** *(code <u>all</u> that apply)*

    a. Fare structure (e.g preference for fixed, zonal or as now)

    b. Fare level (wanting cheapest)

    c. Journey time (wanting quickest)

    d. Walking time (wanting shortest)

36. **For the same journey, if the choice was between service E and service F , which would you choose …Please take your time …** (they must choose one of them). E F

37. **What factors did you take into account in that choice?** *(code <u>all</u> that apply)*

    a. Fare structure (e.g preference for fixed, zonal or as now)

    b. Fare level (wanting cheapest)

    c. Journey time (wanting quickest)

    d. Walking time (wanting shortest)

38. **For the same journey, if the choice was between service G and service H , which would you choose …Please take your time …** (they must choose one of them). G H

39. **What factors did you take into account in that choice?** *(code <u>all</u> that apply)*

    a. Fare structure (e.g preference for fixed, zonal or as now)

    b. Fare level (wanting cheapest)

    c. Journey time (wanting quickest)

    d. Walking time (wanting shortest)

40. **For the same journey, if the choice was between service I and service J , which would you choose …Please take your time …** (they must choose one of them). I J

41. **What factors did you take into account in that choice?** *(code <u>all</u> that apply)*

    a. Fare structure (e.g preference for fixed, zonal or as now)

    b. Fare level (wanting cheapest)

    c. Journey time (wanting quickest)

    d. Walking time (wanting shortest)

42. **For the same journey, if the choice was between service K and service L , which would you choose …Please take your time …** (they must choose one of them). K L

43. **What factors did you take into account in that choice?** *(code <u>all</u> that apply)*

    a. Fare structure (e.g preference for fixed, zonal or as now)

    b. Fare level (wanting cheapest)

    c. Journey time (wanting quickest)

    d. Walking time (wanting shortest)

44. **Thank you! Now I want to ask you about the bus journeys that you currently make in Leeds. How often do you use buses in Leeds?**

    a. Every day (Y=4 weeks)

    b. At least once a week (Y=4 weeks)

    c. At least once a month (Y=8 weeks)

    d. A few times a year (Y=6 months)

e. Less than once a year (Y=12 months)

(Y is needed in 14 of the following questions - software should set it on basis of response to Q44)

45. **With the fares as they are now, how many bus journeys do you expect to make in Leeds in the next Y? (take your time, and give me the best estimate you can – remember each round trip is likely to involve at least two bus journeys)…. The question is "how many bus journeys do you expect to make in Leeds in the next Y?"** ……. (→48 if zero)

46. **How many of these (Q45) would be during weekday peak hours (that's 7 a.m.to 9.30 a.m. and 3 p.m. to 6 p.m.)?**

47. **And so, how much, in total would you expect to be spending on buses in Leeds in the next Y? (peak and off peak combined) ……**

48. **If all the bus companies in Leeds charged the same fares as Firstbus** (=dominant operator)**, would that make any difference to the number of bus journeys that you would make in Leeds in the next Y?** Yes No(→52)

49. **Why would it make a difference?** (*do not prompt but code all that apply*)

    a. Cheaper

    b. More expensive

    c. Easier to remember

    d. Easier to be sure I have the right change

    e. Quicker to board the buses

    f. Other (record)

50. **You said that, with the fares as they are now, you might use Q45 buses in the next Y. If all the operators charged the same fares as Firstbus, how many bus journeys do you think you would make? ……..**

51. **How many of these (Q50) would be during weekday peak hours?**

52. **And so, how much, in total would you now expect to be spending on buses in Leeds in the next Y? (peak and off peak combined) ……**

53. **If the current bus fares in Leeds were simplified to become £1.50 each time you get on a bus, no matter how far you travel, would that make any difference to the number of bus journeys that you would make in Leeds in the next Y?**

    Yes No (→57)

54. **Why would it make a difference?** (*do not prompt but code all that apply*)

    a. Cheaper

    b. More expensive

    c. Easier to remember

    d. Easier to be sure I have the right change

    e. Quicker to board the buses

    f. Other (record)

55. **You said that, with the fares as they are now, you might use Q45 buses in the next Y. If it cost £1.60 for each bus, how many bus journeys do you think you would make? ……..**

56. **How many of these (Q55) would be during weekday peak hours?**

57. **And so, how much, in total would you now expect to be spending on buses in Leeds in the next Y? (peak and off peak combined) ……**

(Software should calculate {Z} as 1.5 x [Q55]. If [57] is within plus or minus 15% of Z, GO TO59)

58. **Actually, the computer estimates it at £[Z]. Do you want to reconsider the number of journeys that you might make if each bus cost £1.60?**

    Yes No (→62)

59. **You said that, with the fares as they are now, you might make Q45 bus journeys in the next Y. If it cost £1.60 for each bus, how many buses do you think you would use? ……..**

60. **How many of these (Q59) would be during weekday peak hours?**

61. **And so, how much, in total would you now expect to be spending on buses in Leeds in the next Y? (peak and off peak combined) ……**

62. **If the current bus fares in Leeds were replaced by the simple zoning system shown on the map on the card in your pack, with a 90 pence fare each time you get on a bus and an extra 90 pence each time you cross a zone boundary, would that make any difference to the number of bus journeys that you would make in Leeds in the next Y?**
    Yes No (→66)

63. **Why would it make a difference?** (*do not prompt but code all that apply*)

    a. Cheaper

    b. More expensive

    c. Easier to remember

    d. Easier to be sure I have the right change

    e. Quicker to board the buses

    f. Other (record)

64. **You said that, with the fares as they are now, you might use Q45 buses in the next Y. If it cost 90 pence on each bus and a further 90 pence each time you cross a boundary, how many bus journeys do you think you would make? ……..**

65. **How many of these (Q64) would be during weekday peak hours?**

66. **And so, how much, in total would you now expect to be spending on buses in Leeds in the next Y? (peak and off peak combined) ……..**

67. (if Q26 = Yes or No Idea, GO To 73) **If pre-paid smart cards were available for buses in Leeds, would you buy one?**

    a. Certainly

    b. Probably

    c. Probably not

    d. No (→73)

68. **If you did buy such a card, do you think that it would that make any difference to the number of bus journeys that you would make in Leeds in the next Y (assuming that the fares stay as they are)?**

    Yes No (→73)

69. **Why would it make a difference?** (*do not prompt but code all that apply*)

    a. Cheaper

    b. Wouldn't think about the cost so much

    c. No need to worry about having the right change

    d. Quicker to board the buses

    e. Other (record)

70. **You said that, without a prepaid card, you might use Q45 buses in the next Y. If you had a prepaid card, how many bus journeys do you think you would make? ……..**

71. **How many of these (Q70) would be during weekday peak hours**

72. **And so, how much, in total would you now expect to be spending on buses in Leeds in the next Y? ……..**

73. **And now a more general question: Please look at list 1 on the card. When you are planning a journey that you have not made before, which of the following might make you decide <u>not</u> to do it by bus? – please read out the code letters of all that apply. *(code all that apply*)**

a. Wanting a quicker journey (door-to-door)

b. Wanting a more comfortable journey

c. Wanting a cheaper journey

d. Wanting the convenience and flexibility of a car

e. Wanting a more frequent bus service

f. Not wanting to walk to or from bus stops

g. Not wanting to wait at bus stops

h. Not knowing the timetable

i. Not being able to rely on the services to run to timetable

j. Not wanting to travel by bus at night

k. Not being sure what the cost will be

l. Not being sure how to pay

m. Not wanting the hassle of paying separately for each bus

74. Thanks, that's all the difficult questions but I do have some background questions.

Do you have a driving license? Yes No

75. How many cars are available to members of your household?

a. None

b. One

c. More than one

76. In general, would you say that you are the sort of person who likes to work out all the pros and cons before making any decision?

a. yes certainly

b. yes

c. no

d. certainly not

77. And now, with reference to list 2 on the card, would you mind giving me a code letter to indicate your household income before tax?

78. **And now, with reference to list 3 on the card, would you mind giving me a code letter to indicate your age?**

79. **And finally, with reference to list 4 on the card, would you mind giving me the code letter, or letters, which match your educational qualifications? (***may be several – code all that apply***)**

80. **Many thanks for your help. That was the final question. You should receive your £10 payment within next few days.** (→82) **(software to record time to the second)**

81. **Thank you for your help, we will call you back**. (→82) **(software to record time to the second)**

Thank you for your help (→82) **(software to record time to the second)**

82. *Interviewer to record their impression of how well the interview went (tick one):*

    a. Excellent (stop)

    b. Good

    c. poor

    d. very poor

83. *Interviewer to record any particular problems encountered (tick all that apply)*

    a. Interviewee did not have cards ready

    b. Interviewee found it difficult to understand the questions about current bus system in Leeds

    c. Interviewee found it hard to do the pairwise comparisons

    d. Interviewee found it hard to estimate current number of trips

    e. Interviewee found it hard to give a useful estimate of future number of trips

    f. Interviewee resented the questions on personal characteristics (age, income etc)

    g. Interviewee was becoming fatigued

    h. Anything else – please specify……

    Stop

Locations for list of places "X" at question 9

1. Far Headingley (Cottage Road Cinema)
2. Kirkstall Sports Centre
3. Gotts Park (by KFC on Stanningley Road)
4. The Tommy Wass on Dewsbury Road
5. Hunslet Hawks Ground
6. Tescos and Homebase on Roundhay Road
7. Selby Road (where it joins York Road)
8. Chapel Allerton (at the main junction where Stainbeck Lane comes in)

Briefing pack content

(1) Letter

(2) SP presentations:

Six Pairs of services. Labelled A & B, C & D, E & F etc. All on same sheet of paper , coloured green – text as big as possible, unique code number for each version must be in top left hand corner. There will be several different versions in order to implement the statistical design. First presentation fixed (see question in script)

Each presentation would be of the form:

	A	**B**
Fare structure:	**Fixed**	**As now**
Fare level:	**£1.60**	**As now**
Journey time (average at this time of day):	**30** minutes	**20** minutes
Total walking time (to and from bus stops)	**10** minutes	**20** minutes

Likely attributes and levels:

- fare structure ("**as now**", "**fixed**", "**zonal – see map**")
- fare level (these values are chosen to avoid new fare structures from yielding fares for the target journey which are unrealistic or falling exclusively to one side of – higher or lower- the existing true fare):
    - if structure is "**as now**": as now
    - if structure is "**fixed**": £1.20, £1.40, 1.50 or £1.60 or £1.80.
    - if structure is "**zonal – see map** " : 60/ 70/ 80 /90 pence per zone used
- journey time: 20 or 25
- total walking time: 10 or 15

NB true distances for the 8 locations X are 2.7, 2.7, 2.5, 2.5, 2.5, 2.6, 2.7 and 2.7 miles respectively.

1. **Card (s) (can be one sheet double sided if we don't use list 1, otherwise map on one card, lists on another – list 1 on one side , lists 2, 3 and 4 on the other)**

Map

A4 size Map of city showing three concentric zones – (distinguished by wash colours which doesn't obscure the detail. Boundaries at about 2 miles from city centre and at Leeds District Boundary)

List 1

A	Wanting a quicker journey (door-to-door)
B	Wanting a more comfortable journey
C	Wanting a cheaper journey
D	Wanting the convenience and flexibility of having a car
E	Wanting a more frequent service
F	Not wanting to walk to or from bus stops
G	Not wanting to wait at bus stops
H	Not knowing the timetable
I	Not being able to rely on the services to run to timetable
J	Not wanting to travel by bus at night
K	Not being sure what the cost will be
L	Not being sure how to pay
M	Not wanting the hassle of paying separately for each bus

List 2: Household Income

	Annual income (£)	Weekly income (£)
S	Rather not say	Rather not say
G	Under 15,000	Under 290
K	15,001 - 20,000	291 - 380
X	20,001 - 30,000	381 - 580
O	30,001 - 50,000	581 - 960
Z	50,001 - 70,000	960 - 1,350
W	70,001 - 100,000	1,351 - 1,900
M	Over 100,000	Over 1,900

List 3: Age

S	Rather not say
G	Under 18
K	18-25
X	26-40
O	41-60
M	Over 60

List 4: Educational qualifications

Q	Rather not say
K	No formal qualifications
X	“O” level, GSCE ,or equivalent
M	“A” levels or equivalent vocational qualification
H	Diploma, HNC etc
Z	University Degree
W	Post graduate qualification

AECOM

Appendix I: Additional Fares Simplification Findings

Appendix I: Additional Fares Simplification Findings

Other Findings from Fare Simplification Work that are Relevant for Forecasting

- Only 12% of respondents claimed to be sure of the cost of a specified journey and, for those who were not sure, the average range (upper-bound estimate minus lower-bound estimate) was around half the estimate (e.g. if they thought the fare would be about £1, they would be confident only that it was in the range £0.75 to £1.25).
- A third (35%) of respondents said that their estimate was a guess.
- Almost a quarter (24%) of respondents claimed to have no idea of the structure of bus fares in their locality.
- Almost a fifth (19%) of respondents claimed to have no idea whether different bus companies would charge the same fares for a journey in their locality.
- A substantial majority (61%) of respondents claimed that it was not easy to predict bus fares in their locality (8% of respondents identified the problem of variation between companies, and 7% mentioned uncertainty about concessions, very few identified problems caused by the variety of ticket types (1%) or uncertainty about time periods (1%)).
- Almost a third (32%) of respondents said that they would want to know the precise fare (and a further quarter (23%) would want to know the approximate fare) before making a journey by bus, This leaves almost half of respondents (46%) saying that they would not need to know the fare before travelling. One might assume that such people are unlikely to be influenced by any simplification of fares – or, arguably, by any marginal change in fares, however, a substantial majority (71%) of respondents said that they would always (29%), or usually (42%), try to have the correct change before travelling by bus and a further 17% said that they would not worry so long as they had approximately the right change. This result, from a differently phrased question, would indicate that fares simplification or the introduction of smart cards could benefit a substantial proportion of potential travellers.
- Half (50%) of the respondents who said that they found the current fares difficult to predict said that they would make more trips if it was easier to predict fares (and a further 28% said that they might do); prominent among the reasons why they might make more trips was the fact (mentioned by a third (33%) of respondents) was the fact that they could be sure of having the correct change.
- More than half (55%) of respondents said that the number of bus trips they make might be affected if the current fares were replaced by a specified fixed fare (the specified level approximated to the average fare currently paid); of those who said they might change the number of trips made, over half (57%) identified a change in fares as a reason for this change. Those who said their trip numbers might change were then asked to reflect more carefully and, having done so, 53% said they expected to increase their use of buses and

23% said they expected to decrease their use of buses. 54% were expecting to spend more and 38% were expecting to spend less.

- Rather less than half (43%) of respondents said that the number of bus trips they make might be affected if the current fares were replaced by a specified zonal system (the specified system was designed to have little impact on the average fare paid); of those who said they might change the number of trips made, most (72%) identified a change in fares as a reason for this change. Those who said their trip numbers might change were then asked to reflect more carefully and, having done so, 37% said they expected to increase their use of buses and 39% said they expected to decrease their use of buses. 39% were expecting to spend more and 51% were expecting to spend less.
- A substantial minority (17%) of respondents said that the number of bus trips they make might be affected if small bus companies' fares were harmonised to match those of the dominant operator (of this minority, about half (46%) identified a change in fares as a reason for this change). Those few who said their trip numbers might change were then asked to reflect more carefully and, having done so, 51% said they expected to increase their use of buses and 19% said they expected to decrease their use of buses. 53% were expecting to spend more and 17% were expecting to spend less.
- Among respondents who thought smart cards were not yet available for bus use in their locality, a substantial majority thought that, if such cards were introduced, they would buy one (30% said "certainly" and 39% said "probably"). Of these, a substantial minority (39%) said that having a card would probably affect the number of trips they made by bus. Of these, about a quarter (24%) identified "not needing to have the right change" as a reason for this change. Those who said their trip numbers might change were then asked to reflect more carefully and, having done so, 77% said they expected to increase their use of buses and 6% said they expected to decrease their use of buses. 64% were expecting to spend more and 22% were expecting to spend less.
- Only a small minority (7%) of respondents identified "not being sure what the cost will be" as a reason for not making more trips by bus; this suggests that simpler fares is likely to have a limited impact on bus usage (compared with, say, reduced journey ties, better knowledge of the timetable or more predictable arrival times – which were identified by 13%, 12% and 9% of respondents respectively). However, it is interesting to note that, at 7%, the proportion who might be influenced by greater certainty as to the cost is similar to that who might be influenced by a lower cost.