The Role of Soft Measures in Influencing Patronage Growth and Modal Split in the Bus Market in England

Final Report

Department for Transport

October 2009

Prepared by: .. Approved by: ......

Sarah Robson
Principal Consultant

Irvine Piczenik
Regional Director

The Role of Soft Measures in Influencing Patronage Growth and Modal Split in the Bus Market in England

Rev No	Comments	Date
1	Maps included in the appendices	01/05/09
2	Incorporation of final segmented and unsegmented values	16/10/09
3	Final Report	18/11/09

Lynnfield House, Church Street, Altrincham, Cheshire, WA14 4DZ
Telephone: 0161 927 8200 Fax: 0161 927 8499 Website: http://www.aecom.com

Job No Reference Date Created February 2009

Table of Contents

Executive Summary

Executive Summary

Study Overview

Whilst bus demand is growing within London, non concessionary bus demand is generally declining in all areas outside London. The picture however, is far from uniform and there are many localised exceptions which run counter to the underlying national trends.

The Department for Transport has a reasonable evidence base on the high-level drivers of bus patronage, such as car ownership, journey times, frequency of buses, fares, etc. The purpose of the research is to provide a better understanding of the importance of more qualitative ‘softer’ factors in determining bus patronage trends, particularly modal shift from cars, in order to improve the delivery and inform the development of departmental policies relating to bus patronage and modal shift, and to expand the Department’s evidence base further by enabling robust estimates of the economic value of the most important ‘softer’ factors to be incorporated into multi-modal transport models and forecasting models of bus patronage.

Overview

The key objective is to identify and quantify patronage changes attributable to soft measures. This has been done in five ways:

- Review of other research that has been carried out in this area (Literature Review);
- Asking the bus industry what they think, through structured consultations with key stakeholders;
- Asking people what they think – or more precisely, undertaking detailed research into people’s attitudes to soft measures;
- Assessing how people behave, by undertaking detailed modelling and research; and
- Analysing bus patronage data before and after implementation of soft measures.

Definition of Soft Measures

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.

It can be more useful to consider hard and soft outcomes rather than hard and soft measures. In this 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 0.1** provides some definitions of “soft impacts or outcomes” and the measures that could create them.

The term ‘Soft Measures’ pertains to the variables in bus travel that affect the awareness, accessibility and acceptability of bus services amongst individuals and societal sectors for example in terms of passenger information, driver quality and safety and security. This is in contrast with ‘Hard Measures’ which affect the availability and accessibility of bus travel through, for example, physical engineering, reliability and journey time.

There are a relatively small number of studies that have sought to value soft aspects of bus quality and fewer have attempted to value a complete ‘package’ of soft measures. In many cases those studies that have sought to value soft aspects of bus quality use different definitions of soft measures which have led to a lack of genuinely comparable values. Due to the independence of studies in this respect another current common problem in the valuation of soft measures is the availability of a wide range of values leading to potential inconsistencies in the manner in which bus schemes incorporating soft measures are developed and appraised.

Table 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.

Study Methodology

Phase 1 of the study was focused primarily on the collation of existing evidence on soft factors in relation to the bus industry, the identification of case studies from an initial list of potential prospects and consultation with operators and promoters of the selected case studies as well as qualitative research with users of these schemes.

The literature review was comprehensive covering all data sources from UK experience as well as overseas experience where relevant.

Ten case studies were required as the basis of the study. To enable the identification of suitable case study examples, selection criteria were drawn up by the project team; these included key soft and hard scheme features, data availability, scheme costs, perceptions of success and willingness of scheme promoters and operators to participate in the study.

Consultation was undertaken with a range of stakeholders and relevant databases of schemes owned by DfT and industry organisations were interrogated to produce an initial list of 56 potential schemes. Using the selection criteria this list was reduced to the following final set of ten case study schemes:

- **Warwick Goldline 66** (Stagecoach) – new quality bus initiative comprising new low floor vehicles, specially trained drivers, customer charter, leather seats
- **Leeds FTR (First Bus)–** new quality vehicle with specially trained drivers including ticket machines on the bus and real time information on and off the bus
- **Warrington Interchange** (Warrington Borough Council)– new bus interchange as part of a new shopping development
- **Cambridgeshire Citibus (**Stagecoach) – network simplification, branding of routes and real time information
- **Wiltshire and Dorset MORE** (Go-Ahead) – network simplification and rebranding including new vehicles with different seating types.
- **Kent Fastrack** (Arriva, Kent County Council) – revised network including new infrastructure and quality bus improvements in support of major housing development
- **Hull Interchange** (Kingston upon Hull City Council) – new bus interchange adjacent to the rail station
- **Nottingham Route 30** (Nottingham City Transport) – new clean fuel vehicles and smartcards as part of personalised travel planning programme
- **Go-Ahead North East** (Go-Ahead) – network rebranding including focussed marketing teams for each route

- **Lancashire Witch Way** (Blazefield) – new quality bus for longer distance journeys comprising branding and leather seats

Qualitative research with users was undertaken in each case study area. The key purpose of the qualitative research was to cover two key areas:

- Exploratory research to explore how soft factors and hard factors are perceived and interact; and
- Stated Preference (SP) survey issues.

Phase 2 involved Household Surveys in each of the ten case study areas, the integration of these survey results with NTS data to develop a trip rate model and further data analysis. The data analysis was at two levels:

- The development of models from the stated preference and revealed preference surveys; and
- The analysis of detailed passenger data from each of the case studies.

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.

The final stage of the study was to test the values produced from the various models on existing transportation models.

Phase 1 Findings

The findings from Phase 1 provided the strong basis of the work in Phase 2 especially the approach to developing the questionnaires for the Revealed and Stated Preference surveys.

Literature Review Conclusions

- A relatively small number of studies have sought to value aspects of bus quality and even fewer 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. Most UK valuation evidence is from London and this is a concern as many public transport studies have shown a significant difference in behaviour between London commuters and those elsewhere in the United Kingdom.
- Most studies assume the presence of a package effect and use a capping exercise to value a package or ideal or optimum service. 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
- 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.

Consultation Conclusions

In general, based upon the consultation process, the following conclusions can be drawn:

- Soft factors are perceived by operators and local authorities to have the potential to deliver patronage and revenue increases and modal shift;
- The level of increase to be delivered is uncertain;
- Operators welcome this research into the impacts of soft factors as it will eliminate uncertainly from their future application of soft measures;
- The operators who have deployed soft measures differ in their views of the best environment for their deployment, e.g. inter-urban, urban;
- Operators prefer soft measures where a direct impact can be demonstrated; measures such as RTPI were viewed with a certain amount of scepticism by a large number of operators as they felt the gap between implementation and any impact upon patronage was too great to enable any reasonable estimate to be made; and
- Operators generally felt that network simplification was more important than other soft measures.

Qualitative Research Conclusions

- Threshold effects exist for non-bus users which have to be overcome before bus is considered a viable option. For example, a high frequency (10 min headways) reliable service. Only after that do soft factors come into play.
- Safety appears to override everything.
- Ease of boarding is a key issue for certain people. However, it's not just boarding but whether there is enough space to store an unfolded pushchair.
- There is an expectation that new buses will be comfortable and clean.
- Car drivers are sensitive to problems related to the car, i.e. congestion, cost of parking and availability of parking. Increases in these are likely to push people to the bus more than soft factors.

In summary, it seems that soft factors can enhance the bus journey experience however this mainly comes into play when certain hard factors, particularly frequency and reliability, have reached acceptable thresholds. The exceptions are travelling with children, in which case low floor buses are essential, and safety. If ever safety becomes an issue it overrides everything else. The findings of the qualitative research were very informative and were especially useful in the design of the stated preference and revealed preference questionnaires in Phase 2 of the study.

Phase 2 Findings

In the research on the performance of the ten case studies it was clear that the most influential factor in changing patronage was the change in the Concessionary Fares Policy in April 2006. This created significant problems as a few operators used the same input button on the bus for all passes, including the Concessionary Pass. This would affect adult and child volumes as passes have become more influential over the last 5 years.

Some of the study areas had demonstrated significant increases in patronage which can only be due to the softer influences on the route. The four demonstrating the strongest evidence were:

- Citibus in Cambridge highlighted that patronage over the 6 years since the launch of the number 3 service in November 2001 has seen a dramatic upward trend which is only beginning to level out.
- Kent Fastrack has seen a significant increase in fare paying patronage and the introduction of the Fastrack scheme is creating more public transport trips along the corridor. There has been an increase in overall bus mileage but passenger growth has outstripped this and as the elasticity of the increase in trips to the increase in bus mileage is not expected to be greater than 1 it can be stated that there has been a net growth in passengers per operational mile.

- MORE branding has created a proportional increase in patronage greater than the increase in the bus mileage. There has been a 36% increase in mileage on the M1 and 65% on the M2. However adult fare paying passenger numbers have increased by significantly more than these figures.
- Leeds ftr seems to show the beginning of an upwards trend in fare paying patronage. As the scheme was only officially launched in August 2007, it is too early to report with confidence that there is conclusive evidence, but patronage is increasing and it appears to have made a promising start.

The key influential positive factor from all the case studies is that the underlining trend for England outside London is generally downwards, and there was evidence that eight of the schemes were demonstrated to break this trend by either increasing or flat lining patronage; consequently these schemes were considered as successes.

A series of models were estimated as part of the study based on the primary data collated from the case study areas. The focus of the models was how the introduction of bus soft measures impact on bus demand. The final models estimated are as follows:

Elasticity-Based Demand Models: Separate demand models for car users and bus users. The car users' model examines the modal shift between car and bus when bus quality attributes are introduced to current bus services, whilst the bus users' model examines the reduction in bus demand when bus quality attributes are taken away from current quality bus services.

'Unpacking' SP Models: The valuation of soft bus attributes have been estimated from the unpacking SP experiments and cover a wide range of attributes ranging from CCTV to trained drivers.

Information SP Models: Values have been estimated for a number of specific information-related interventions e.g. real time passenger information (RTPI) in various locations (bus stations, bus stops and city centres) and smart text services that send real time bus travel information direct to the user's mobile phone.

Mode Choice-Based Demand Models: These models were estimated using the same dataset that were used to estimate the Elasticity-Based Demand models and represent a more conventional approach to the same issue. They also provide some context with regards the external consistency of the values of time.

Route Choice SP Models, Route Choice RP Models and Route Choice Joint SP/RP Models: These are based on the current experience faced by bus users of choosing which bus service to travel into work by. The quality bus services travel along one route and the non-quality bus along another route. These models estimate values of time and also the value of quality as presented by a quality ratings index. The aim here was not to use the results to forecast changes in demand but to demonstrate that quality bus does have real impact on bus patronage.

Fare Simplification SP Models: A complementary piece of research on fares simplification was commissioned as part of the study but which came on line half way through the project. The key findings from a SP and a stated response (SR) experiment are reported.

NTS Based Models: The results of NTS-style models which have been estimated on trip data collected during the study surveys are also reported.

From amongst these models it was the elasticity-based demand models that are recognised as the key forecasting models and that the unpacking models provide the key value inputs used in the predictions. The remaining models provide strong contextual evidence for informing the debate. For example the Route Choice model demonstrated that quality bus was a strongly material variable in determining choice.

Recommended Soft Measure Values

The tables below are the key outputs from those models with good statistical relationships and are in comparative analysis well supported. The **Tables 0.2** and **0.3** below are derived from the elasticity-based demand model results referred to above.

Table 0.2 Values of Bus Soft Measures

Attribute	Value in Mins (t stats)	Attribute	Value in Mins (t stats)
Audio Announcements	1.22 (2.2)	New Bus Shelters	1.08 (2.6)
CCTV at Bus Stops	2.91 (5.2)	New Bus with Low Floor	1.78 (6.9)
CCTV on Buses	2.54 (4.8)	New Interchange Facilities	1.27 (2.6)
Climate Control	1.24 (2.5)	On-Screen Displays	1.29 (2.7)
Customer Charter	*0.88 (1.2)*	RTPI	1.69 (5.3)
In-Vehicle Seating Plan	*2.21 (2.5)*	Simplified Ticketing	1.43 (3.7)
Leather Seats	*1.08 (1.2)*	Trained Drivers	2.63 (6.6)

Table 0.3 Segmented Values of Bus Soft Measures

Attribute	Value in Mins		Attribute	Value in Mins	
	Bus	Car		Bus	Car
Audio Announcements	1.22		New Interchange Facilities	1.27	
CCTV at Bus Stops	3.70	2.49	On-Screen Displays	1.90	0.89
CCTV on Buses	1.66	3.18	RTPI	1.47	1.74
Climate Control	1.24		Simplified Ticketing	0.84	2.06
New Bus Shelters	1.08		Trained Drivers	2.46	2.78
New Bus with Low Floor	1.19	2.23			

The t-statistic is the regression coefficient (of a given independent variable) divided by its standard error. The standard error is essentially one estimated standard deviation of the data set for the relevant variable. To have a very large t-statistic implies that the coefficient was able to be estimated with a fair amount of accuracy. If the t-stat is more than 2 (the coefficient is at least twice as large as the standard error), it would generally be concluded that the variable in question has a significant impact on the dependent variable.

Tables 0.2 and 0.3 illustrates that the highest value soft measures, which also have the higher levels of statistical confidence, are CCTV at bus stops and on bus and driver quality. This reflects a theme identified in the qualitative data collation in the research study which highlights that for a large proportion of travellers, safety and security issues are key to their decisions as to whether to use the bus, alternative modes or not make a trip at all where no alternative mode is available.

There is significant concern over the package effect of a large number of measures being introduced in combination and part of the research study has been to assess whether the full package produce results that are greater than the sum of individual part (i.e. individual soft measures). The study found very little evidence of this.

The stated preference surveys in each case study area were structured so that respondents ere only given a set of soft attributes based appropriate to the quality services in their area. The objective was to identify the value of the full package and to generate and to compare these with the summation of the individual values. On average the full package was only 1.3% higher than the sum of the individual effects. This did not support the evidence from the Literature Review.

In the current climate ticketing and information are soft measures that are of interest to most local authorities and bus operators. In many cases public-private partnerships and agreements need to be developed to facilitate the introduction of smartcards and real time information. The study produced a set of values of different forms of information provision which are presented in Table 0.4.

Table 0.4 Values of Information Interventions

	Valuation in Minutes (t-stats)		Valuation in Minutes (t-stats)
Real Time Information in City Centre	4.20 (4.5)	SMS Real T ime I nformation _10p	1.55 (1.7)
Real T ime I nformation at B us Station	4.30 (3.7)	*SMS Real Time Information _20p*	*-0.19 (0.17)*
Real T ime I nformation at B us Stops	5.05 (4.7)	*Audio Announcements on Bus*	*1.11 (1.1)*
SMS Real Time Information_Free	3.23 (4.16)	SMS_Timetable - free	0.64 (1.7)
SMS Real Time Information _5p	*1.37 (1.00)*	Web Based Information	1.44 (1.9)

Italics - insignificant

These values are higher than for RTPI in Tables 0.2 and 0.3 due the nature of stated preference research and the fact that the values in Table 0.3 assume no information as a base whereas the lower value in Table 0.2 is based on RP and SP and in the former case is seen as an increment on current levels of provision. It is recommended that the Do Minimum situation for a scheme is valued using an appropriate proportion of the values in Table 4.

Summary of Study Conclusions

The research set out to identify whether soft bus factors materially influenced patronage volumes especially in relation to modal shift away from the car. Overall the results have been positive with the SP and RP values being produced by the models being consistent with some of the studies identified in the comprehensive literature review. It can be concluded from all the sources that soft measures have a positive impact on demand even through the analysis fro the patronage data whilst positive it not overly strong in support.

Most importantly is that overall there appears to be a requirement for good hard quality factors such as frequency and journey time before soft factors can be introduced and have a further positive effect.

The different approaches to identify the materiality of soft measures in influencing modal shift are the strength of this study. The primary and secondary research and the qualitative and quantitative approaches have all demonstrated the significance of soft measures to some extent. The Literature Review showed the weakness and lack of depth in this area and hence justified the reasoning behind the DfT's requirement for this study. The detailed approach in Phase 2 combining stated preference and revealed preference techniques with actual performance data from schemes currently in operation strengthened the case for soft measures beyond that demonstrated in the studies identified in the Literature Review. Safety and personal security came through both the qualitative and quantitative processes as the most important soft issue.

AECOM

1 Introduction

1 Introduction

1.0 Introduction

Whilst bus demand is growing in London, non concessionary bus demand is generally declining outside London. The picture outside London however is far from uniform; there are many localised exceptions which run counter to the underlying national trends.

The key objective of this study is to explore the role of so-called “soft” measures in influencing bus demand. These soft measures may include: passenger information in which real time information is increasingly important; vehicle and ride quality; marketing and customer service; driver training and attitudes; cleanliness; security and safety; fares simplicity; route simplicity; and accessibility of bus stops. In addition, Operator/Authority relationships and strong, visionary management also appear to be significant factors.

There are a wide range of challenges that affected this research. 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. Strategic response bias is primarily suspected but other forms might be present. This is not 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.

Thirdly, soft variables might not influence demand in the same way as fare and journey time. For example, there might be an element of soft variables having to achieve minimal standards or else improvements in them are required in modern consumer driven societies simply to stand still. 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.

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.

1.1 Study Objectives

The objectives of this study are:

1. An explanation of general trends in bus patronage use, including an explanation of:

- Differences which have led to bus patronage falling in some areas but rising in similar ones, and provide recommendations on how the declines could be reversed; and
- Factors that have generated a mode shift from car.

2. A review of available literature and evidence, to assess the role of soft measures in influencing the level of demand for bus services identifying:

- Areas where soft measures may have influenced bus patronage and mode share;
- Types of soft measures that have had the largest influence on bus patronage and mode share;
- Values that quantify the impact of soft measures and which can be transferred into a modelling or economic context; and
- The quality of literature and evidence on soft measures and current knowledge gaps.

3. On the basis of initial qualitative research in relevant case studies, allowing for variances in responses due to socio-economic and regional differences, an explanation of:

- Attitudes to bus travel; and
- Bus service attributes that are most important in influencing bus travel demand.

4. Through detailed analysis in each of the case studies, an explanation of:

- A detailed understanding of the role of soft measures in determining bus patronage demand and mode shift from car;
- The quantifiable impact of soft measures on bus patronage demand relative to more traditional hard factors such as journey time;
- How soft measures have been used by bus operators to increase bus patronage; and
- What environment is required to increase the impact of soft bus measure initiatives and the transferability of such initiatives to other areas.

5. Use of valuation techniques, in particular stated preference choice experiments, to determine:

- The economic value of the most important soft measures; and
- Interaction/synergy between different types of soft measures.

6. Preparation of guidance notes on:

- Key factors that boost bus patronage and that lead to a modal shift from car;
- The results of the valuation exercise; and
- Implications, transferability and applicability of these results in a transport modelling and planning context.

1.2 Methodology

The project has been undertaken in two phases.

Phase 1 comprised:

- A literature review to assess the relevance of recent research into the impacts of soft measures;
- Consultation with the bus industry to gather views on what soft factors are believed to influence patronage and mode split, and to identify recent and proposed bus service improvements incorporating soft measures; and
- Qualitative research into 10 case studies, to obtain views of the travelling public on soft measures.

Phase 2 looked at the 10 case studies in more detail to provide a more thorough understanding of the role of soft measures. It comprised:

- Analysis of existing patronage data and National Travel Survey data to quantify the impacts of the measures;
- Collection and analysis of revealed and stated preference data to understand perceptions and attitudes, and how they influence people's use of bus services; and
- Assembly of parameters to enable / improve the modelling of soft measures for forecasting and scheme appraisal purposes.

The detailed methodology has been provided in **Appendix A** and is also reported in Sections 3 and 6 of the Phase 1 Report. The methodologies are also presented in each of the following chapters.

1.3 Format of Report

The format of this report, following this introduction, is as follows:

- **Section 2:** Literature Review provides a summary of the findings of the Literature Review including definitions for soft and hard interventions
- **Section 3:** Case Study Analysis covers the background and performance of ten operations
- **Section 4:** Case Study Qualitative Research including focus groups
- **Section 5:** Qualitative Research Phase comprises household surveys in each of the case study areas
- **Section 6:** Modelling Outputs from the stated preference, revealed preference and National Travel Survey models
- **Section 7:** Comparative assessment covering primary and secondary research
- **Section 8:** Conclusions and Recommendations on the effectiveness of soft measures and the approach to applying the models in the future forecasting processes

Appendices are also provided to support the main. There is also a guidance note for use by local authorities and bus operators.

2 Literature Review

2 Literature Review

2.0 Introduction

The literature review was 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 concentrated on uncovering evidence in the UK context as being most transferable, but also sought to identify key international evidence and best practice examples to assist in building the evidence base.

The full Literature Review can be found at **Appendix B**; this summary:

- Identifies the issues and challenges associated with analysis of soft factor impacts and values;
- Explores potential definitions of softer factors or impacts;
- Identifies new sources of money values for softer factors over and above those identified in previous reviews and assesses them alongside key earlier studies; and
- Examines the evidence on the impacts of softer factors on patronage and modal shift in the academic literature.

2.1 Soft Factor Analysis: Issues and Challenges

The literature review sought to shed light on some of the issues and challenges associated with any analysis of the impacts and values of softer factors.

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.

After correcting for package effects, stated preference based valuations of soft factors can still be very high. This is as found in the earlier Public Transport Quality Literature Review Study (Faber Maunsell 2003). Strategic response bias is primarily suspected but other forms might be present. This is not 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).

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 to fare elasticity, as is commonly done, would therefore be inappropriate.

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 is important in this context to explicitly model heterogeneity of preferences even within a sub-market such as existing car users.

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. Complementing the traditional approach 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 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 override some of the 'harder' variables in particular circumstances?

2.2 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 can 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.

Given the lack of a widely accepted definition the initial distinction between hard and soft factors used in the study 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.

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 in five main classifications as set out in **Table 2.1**. These are by no means exclusive classifications, and there is some overlap between sections due to interactions.

2.2.1 Quality of 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 vehicle 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. Bus operators place significant value on these attributes as evidenced by the level of customer relationship training expenditure in their account.

2.2.2 *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, 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 stations, 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[1] and the internet or through information at bus stops.

Marketing includes other promotional material in-vehicle, and at stations and stops and also information, including timetables, which are more widely distributed e.g. to households. 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 are included, though arguably a sixth category regarding the network is required.

2.2.3 *Ease of Use*

Fare levels have a well defined effect upon demand and are not within scope of this review although it has been considered under Fares Simplification in the modelling (see Section 6). 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 are considered in terms of effect. 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 are also considered. 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.

2.2.4 *Quality of the Walking and Waiting Experience*

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 are discussed elsewhere, but are 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.

2.2.5 *Safety and Security Throughout*

Crime or fear of crime can present an effective barrier to bus use. The study examines 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 in detail in **Appendix B**.

2.3 Evidence on Values of Softer Interventions

The body of evidence on the values of soft interventions was examined in the literature review process. The focus was on developments since the last review in this area in 2003 (Faber Maunsell) and also covers key earlier studies. Evidence from earlier reviews Litman 2007, Balcombe et al 2004, Nellthorp and Jopson 2004 and Faber Maunsell 2003 and an additional

[1] Short message service or text message

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 informed the 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 1 of **Appendix B**) although most of the values are derived from a further secondary source (Balcombe et al 2004). A full list of studies reviewed in relation to the valuation of softer factors can be found in the full report.

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 of the Appendix 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 there is a high degree of variability in the order of attributes. This is likely to be in part ascribable 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) analysis 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 2.2** 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 2.2** illustrates the large range in values even for the exercises that seek to value a whole package.

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.

Table 2.2 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

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 Revealed Preference Logit and Multinomial Logit have both been used the Revealed Preference Logit 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 Gran Canaria, 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 – it is possible that respondents do not always take price changes seriously if, for example, they regard 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 convertibility of such scales. The use of fairly small range scales, commonly five points for example, tends to diminish the level of variation between factors. Importance may not be the most directly transferable rating scale.

The majority of 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.

2.4 Impacts of Soft Factors

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 Faber Maunsell 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.

Beale (2004) 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 (2007) estimates that they are capable of achieving a 5% increase in patronage.

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

Information at all stages of the journey is essential to both regular and occasional transport users. The evidence reviewed 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.

Evidence of patronage change and in many cases modal shift exists 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.

The literature reviewed suggests that personalised travel planning (PTP) is 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.

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. The impact of system-wide travel cards 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.

Safety and perceived safety for public transport users has received much attention, especially when compared to most other soft factors, perhaps with the exception of recent discussions 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.

There is a growing body of research which considers perceptions of the bus product to define barriers to use. 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.

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; and
- Evidence on other measures is perhaps too entangled with package effects for impacts to be isolated.

The following sub-sections examine 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.

2.4.1 *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.

2.4.2 *Package Effects*

As previously stated 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.

2.4.3 *Non-User Values*

As previously stated, 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.

2.4.4 *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.

2.4.5 *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; and
- 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.

2.4.6 *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 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.

2.4.7 *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.

2.4.8 *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.

2.4.9 *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.

2.4.10 *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.

As indicated above it is 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.

2.5 Conclusions

A relatively small number of studies have sought to value aspects of bus quality and even fewer 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. Most UK valuation evidence is from London.

Where car user preferences have been sought the value of packages has been found to be very high, around twice the average fare.

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. 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. 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 stated preference exercise do not appear to have been investigated in the studies reviewed.

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?

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.

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 include exploring the impact on demand of season tickets / travel cards. More recent studies in the academic literature tend to examine the use that may be made of data from travel cards rather than the impact on use.

AECOM

3 Case Study Analysis

3 Case Study Analysis

3.0 Introduction

This section of the report sets out the results and key characteristics of the 10 case studies. This provides information on the following topics:

- Scheme Description;
- Patronage Change Statistics; and
- Summary of Analysis Results.

3.1 Goldline 66 Warwick

The 'Goldline' concept is being trialled by Stagecoach in two areas in the UK – Perth, Scotland and in Leamington Spa, Warwickshire. The former service – the number 66 – was renumbered as G 1 and commenced operation on 12 November 2007. The service operates between Warwick, Woodloes, Percy Estate, Leamington, Whitnash and South Farm. The service frequency – up to 10 minutes during the day Monday to Saturday – remains unaltered as a result of implementing the Goldline concept. In September 2008 the service frequency was reduced to less than 8 minutes due to the success of the implementation. Similarly, the fare structure and prices have remained the same. The end to end journey time is approximately 45 minutes, although the main passenger movements are between Whitnash and Leamington.

The new vehicles deployed on the service are low-floor purpose built Optare Solos, which are painted in gold metallic paint. The seats are Italian-designed, high-back, blue leather seats. A total of 50 drivers have received special training to drive on the G1 service, of which 40 will drive the route regularly. All drivers wear a 'chauffeur-style' uniform when working on the service.

A customer charter has also been introduced for passengers of the G1, which includes minimum performance standards and refunds for passengers whose bus is delayed for more than 20 minutes.

Table 3.1 highlights that total patronage for the G1 service has increased by 35% since 2004. A significant proportion of this is due to the change in the Concessionary Fares policy, but total non concessionary adult passengers have increased by around 10%, whilst Child patronage has decreased by around 40%. The fall in Child patronage is mainly due to the reallocation of ticket types, as drivers are recording Child Megarider ticket as passes which can not be differentiated from other passes in the system.

Table 3.1 Patronage Change of the Goldline Service (Based on 2004)

Period	Adult	Child	Concessionary	All Passengers minus Concessionary	Total
2005	0.7%	-20.3%	-3.8%	-2.3%	-2.9%
2006	9.2%	-22.5%	50.6%	4.7%	21.1%
2007	3.7%	-33.5%	70.1%	-1.7%	24.0%
2008	9.7%	-39.2%	93.5%	2.6%	35.2%

Figure 3.1 highlights the significance of the change in the Concessionary Fares Policy on concessionary travel on the G!, it also highlights the minimal fluctuations in total tickets sales (excluding concessionary) over the four years since 2004.

Figure 3.1 Proportional Change in Number of Tickets Between May 2004 and September 2008

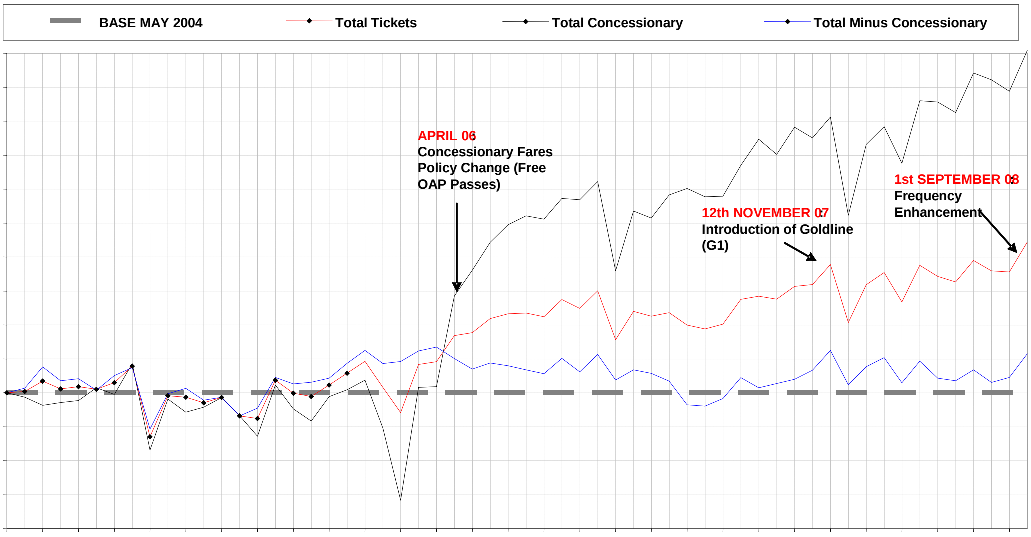
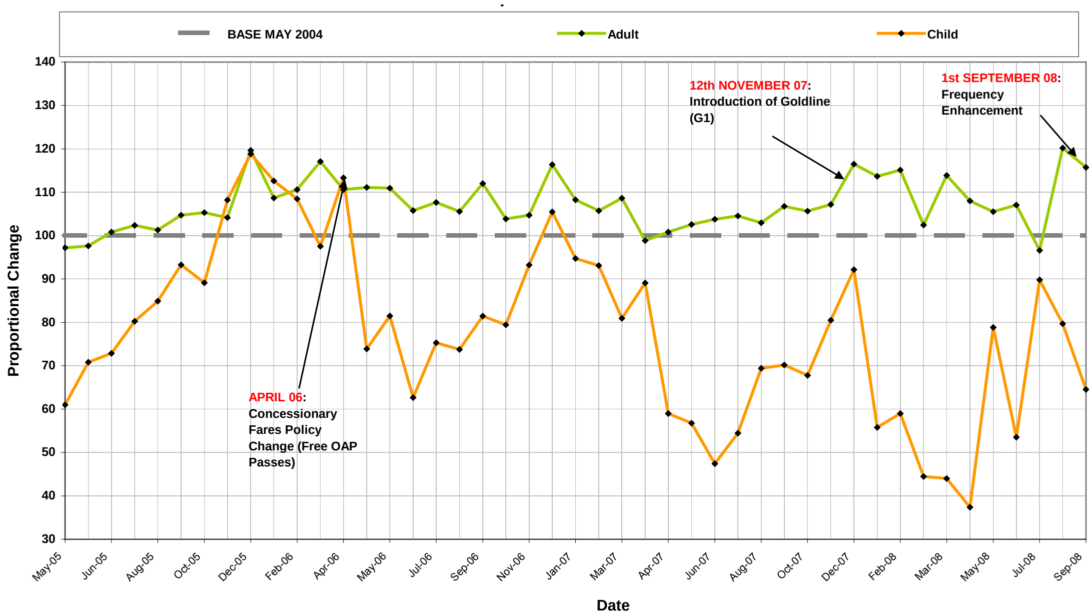


Figure 3.2 highlights the fluctuations in adult and child patronage after being de-seasonalised to the 2004 data. The adult data shows that between April 2005 and September 2008, tickets sales were generally higher than the 2004 level. The sudden drop in child patronage from year to year is explained above.

Figure 3.2 De-Seasonalised Change in the Number of Adult and Child Tickets Between April 2005 and September 2008



The results show total tickets continued to increase after the launch of the Goldline service, this is mainly due to more concessions using the service, but this is unlikely to be due to the change in the Concessionary Fares Policy, as this would have been factored in throughout 2006 and 2007. All things being equal it should have levelled off in 2008 therefore the increase in total tickets, especially the concessions, could be due to the better livery, reliability, service level and marketing.

Stagecoach highlighted that they increased the service frequency on the 1st September 2008 from 6 to 8 vehicles per hour: this demonstrates clearly that the operator believes that the launch has been a success or they would not have introduced more vehicles.

Stagecoach Warwickshire were targeting a 7% increase in fare paying passengers after the launch of the Goldline. It does not appear that this has been achieved as there has only been 4.4% increase when comparing the first 6 periods of 2007 against the respective 2008 period. In this same period, adult patronage has increased by 5.8% and child patronage has decreased by 8.7%. Taking into account the recent fare increase of 6.6% which is comparative to previous years, there are proportionally more adults travelling at the higher fare rate, consequently revenue would have increased significantly more than the 4.4% quoted.

The decrease in child patronage of 8.7% has been experienced across most routes within the area: this is due to a numerous reasons which are:

- No child day return available before 9am;
- Child megarider and scholar tickets cannot be purchased on the bus, but at the local travel offices in the areas, as they want to minimise the number of money transactions on the bus and reduce the boarding time; and
- The child megarider and scholar tickets are recorded as a pass, which can not be split between the other passes in the analysis. As the market share of adults is significantly larger than the child market share then any decrease in child tickets would not be as significant in the adult totals.

3.2 FTR Leeds

On the 4th January 2007 the second ftr pilot scheme was introduced in the UK by First and was launched with two futuristic ftr articulated vehicles running in Leeds on Service 4 between Whinmoor, the city centre and Pudsey.

Since the full ftr service went live in June 2007, there has been a 10% increase in patronage in comparison to the same time period in 2006.

On 15th August 2007 a 17-strong fleet of ftr's was introduced to Service 4. This was a significant financial investment of £5.4 million in the ftr project in Leeds.

There were initial problems associated with the ticket machine equipment; this led to the deployment of customer service "hosts" on board the ftr vehicles to sell tickets and provide general information to the travelling public.

In addition to the new vehicles, a number of soft measures were introduced in response to detailed consultation with consumers. The key soft elements of the scheme include:

- The internal layout of the vehicles which incorporates specific zones to cater for the requirements of different types of traveller;
- A team of dedicated ftr drivers (known as 'pilots') who are required to obtain a special First licence before being able to drive an ftr;
- A team of 40 conductors (known as 'customer service hosts') who sell tickets and provide information to passengers once they have boarded the bus;
- On-vehicle ticket machines plus the option of purchasing tickets off-vehicle; for example the bus stops;
- A Real-Time Passenger Information (RTPI) system providing updated information to customers waiting at ftr stops along the route and via SMS messaging on mobile telephones;
- RTPI also available via advertising columns at four points along the ftr route, which also provide access to other public transport and council information;
- Two next stop departure screens on each vehicle;
- Audio announcements (which are triggered when a passenger with an RNIB fob boards the bus);

- CCTV screens which present the images being recorded intermittently between advertising displays; and
- Air-conditioning on all ftr vehicles.

A separate fares structure was introduced when the service was launched but the fares system is likely to revert to the standard First fare structure for simplicity. The design of the livery was not intended to promote the First brand, although the colour scheme sits within the First family of colours.

Table 3.2 shows the adult fare paying patronage change from 2005/06 to 2007/08 for all the services operating along the corridor. This table highlights that:

- There has been an overall decrease in adult patronage along the corridor; and
- There has been an increase in adult patronage in 2007/2008.

Table 3.2 Percentage Change of Passengers from 2005/06 in the Corridor

Time Period	Adult	Child	Concessionary	All Passengers minus Concessionary	Total
2006/07	-4.0%	-20.1%	36.2%	-6.5%	0.2%
2007/08	1.5%	-19.1%	66.3%	-1.6%	8.9%

Figure 3.3 shows a near doubling in concessionary fares when the Concessionary Fares Policy was amended in March 2006. Whilst total tickets excluding concessionary shows an increase in tickets after the official launch of the ftr, only with more data can it be determined if this is producing a long term upward trend.

Figure 3.3 Proportional Change in the Number of Tickets Between the Period of April 2005 and April 2008 for the COMBINED SERVICE 4 and ftr

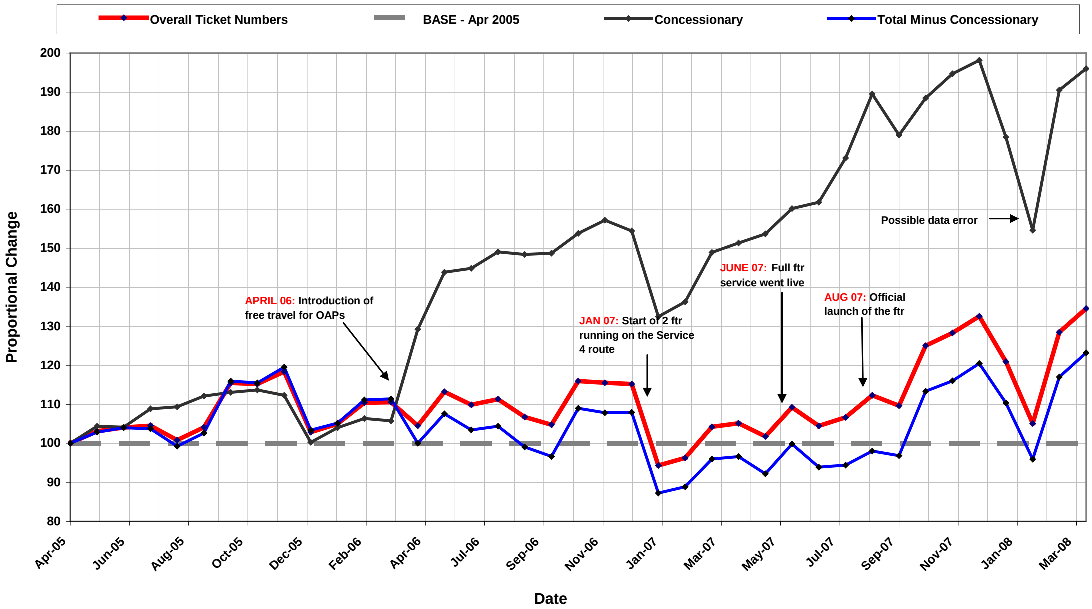
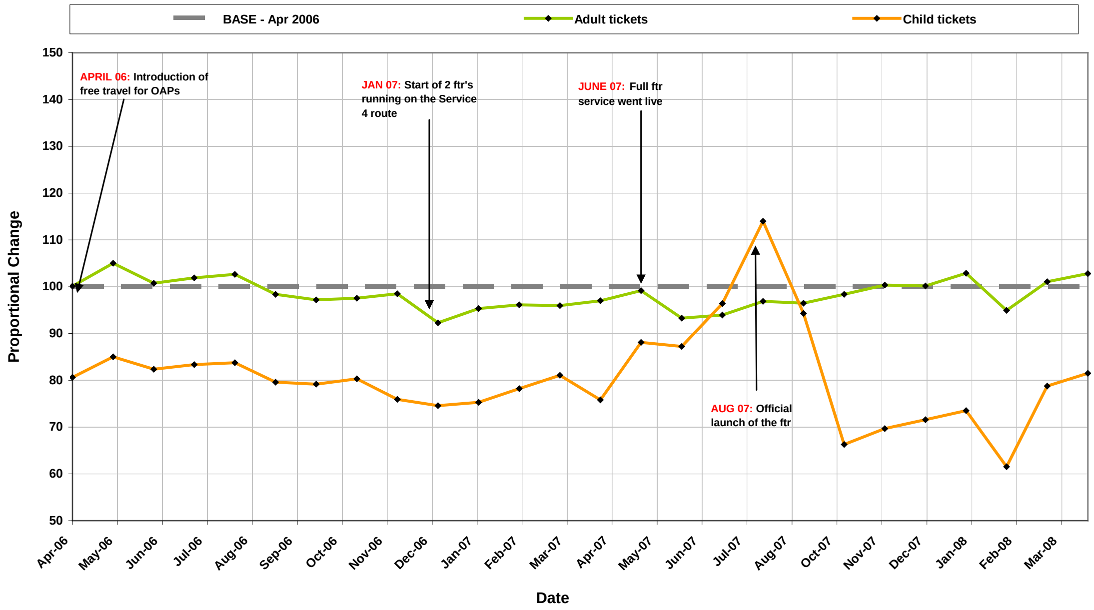


Figure 3.4 shows that there was a slight decrease in adult tickets after the Free Concessionary Fares Policy was introduced, but after the launch of the ftr there was a slight increase in adult numbers. **Figure 3.4** highlights the significant increase in child numbers until the official launch of the ftr service, and then it dramatically dropped off after the launch. The peak in the child tickets even after data was de-seasonalised shows that between January 2007 and July 2007 there was an up trend in child tickets, this shows that children were trying out the service for the novelty factor, but this was not sustained in the long term.

Figure 3.4 De-Seasonalised Change in the Number of Tickets Between the Period of April 2006 and April 2008 for the Combined Service and ftr



This analysis summarises the change in patronage growth over the last 3 years, and shows an increase in patronage after the ftr was introduced gradually in 2007. The growth is generally accounted for by the change in the Concessionary Fares Policy in April 2006. The journey to work analysis shows that the proportion of public transport users is 7% higher than the National UK average. This shows a greater willingness to use public transport.

In summary, there seems to be the beginning of an upwards trend in fare paying patronage. As the scheme was only officially launched in August 2007, it is too early to report with confidence that there is conclusive evidence, but patronage is increasing and it appears to have made a promising start.

3.3 Warrington Interchange

In August 2006, a new public transport interchange opened in Warrington, following a year of operation of a temporary on-street bus station. The interchange was developed as part of the new 'Golden Square' shopping development which is directly accessible from the interchange concourse.

There are 19 departure stands and all bus services from Warrington now depart from the interchange. Each of the departure stands has an electronic display showing scheduled passengers information. In addition, high quality standardised timetable and service departure information is available via information 'totems' at each departure stand. For the safety of passengers, the interchange concourse is fully enclosed, with access to the buses being via departure stand doors which only open when a bus is on the departure stand. Real time information is provided for passengers utilising the Interchange.

The interchange is fully accessible for those with a mobility impairment and includes high quality accessible toilets with the first accessible hoist facility in the country for wheelchair users. All of the facilities in the interchange were designed in consultation with the Warrington Disability Forum.

The interchange includes an integrated travel and visitor information centre where travellers are able to obtain public transport information as well as purchasing tickets and obtaining information for coach travel and visitor activities.

At the same time as the new interchange opened, the predominant operator in the area, Warrington Borough Transport, relaunched its entire fleet of services as ‘Network Warrington’. This initiative included purchasing new low-floor vehicles, rebranding of all vehicles in the ‘Network Warrington’ style, restyled uniforms for drivers and a series of marketing campaigns including a penny fare into the town centre on the day the second phase of the shopping centre opened.

For the year from August 2006 when the interchange opened to July 2007, Warrington Borough Transport reported passenger growth across the network in the region of 13% compared with the previous year of operation, with other operators reporting 10% growth. Warrington Borough Transport is of the opinion that the improved driver facilities within the interchange have assisted staff retention which has a knock-on positive effect for passengers who are served by more experienced drivers.

Table 3.3 shows a 14.3% increase in total passengers from the period Aug ’03 – July ’04 to Aug ’06 – July ’07. This table highlights that:

- There was a decrease in total patronage during the temporary interchange, which then increased once the interchange was launched; and
- Concessionary passengers increased significantly after the launch of the concessionary fares policy.

Table 3.3 Percentage Change in Passengers from August ’03 – July ‘07

Period	Adult	Child	Concessionary	All Passengers minus Concessionary	Total
Aug '04 – July ‘05	2.4%	-3.7%	-0.4%	0.7%	0.5%
Aug '05 – July '06	-2.7%	-10.0%	29.5%	-5.0%	-0.2%
Aug '06 – July ‘07	-0.3%	-4.7%	131.4%	-4.7%	14.3%

Figure 3.5 highlights how concessionary travel has gone up approximately double since the introduction of the Free Concessionary Fares Policy, whilst adult patronage has generally stayed stable.

Figure 3.5 Proportional Change in Number of Tickets Between August 2003 and December 2007

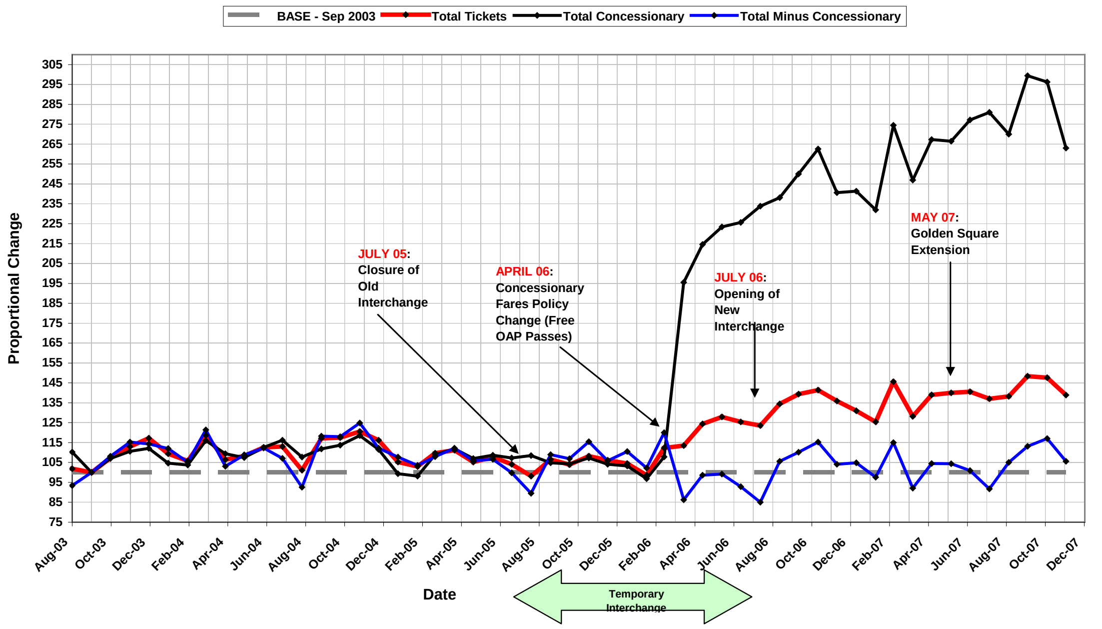
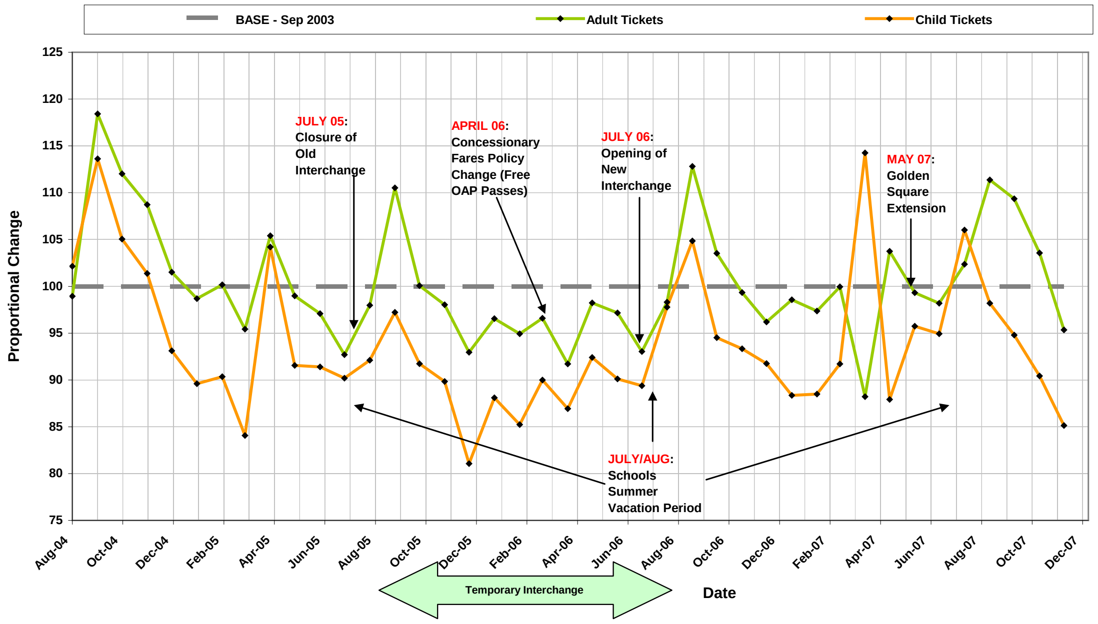


Figure 3.6 which removes the effects of seasonal variation, shows that during the time of the temporary interchange there was a continuous reduction in ticket sales for both adults and children, but this was reversed on completion of the new interchange.

Figure 3.6 De-Seasonalised Change in the Number of Tickets Between the Period of August 2003 and December 2007 – Adults Vs Child



This figure highlights and summarises the change in patronage growth at Warrington Interchange over the last 5 years, and shows that after removing the effects of seasonal variation, there is evidence of a decrease in patronage during the time of the temporary interchange. Since the launch of the new interchange and the re-branding there has been an increase in overall ticket numbers excluding concessionary ticket numbers. The most influential factor in changing patronage was the implementation of the free Concessionary Fares Policy on 1st April 2006 which saw a dramatic increase in concessionary fare paying passengers. The demographic data indicates that a much higher proportion of people use their car to go to work than the national average, and public transport use is significantly less than the national average.

There are a number of other local factors that could have influenced the increase in use of the interchange. Warrington Borough Transport, the main bus operator in Warrington has been very proactive in developing the Warrington Network brand. All the fleet is in the same livery. It has also expended a significant amount on new buses. In addition to this, the opening of the additional retail shopping centre would have attracted some people from other shopping centres e.g. Westbrook.

In summary, there was a dip in fare paying patronage during the operation of the temporary interchange which was reversed after the launch of the new interchange which tends to lend support to the hypothesis that the quality of the interchange has a noticeable positive affect on the level of patronage.

3.4 Cambridgeshire Citibus

The Citibus network was introduced in Cambridge in November 2001, and was refreshed in July 2004. It is operated by Stagecoach. The Citibus concept was introduced in Peterborough in April 2004. The key feature of the approach in each city was the simplification of the network to make it easier for the travelling public to understand. This involved removing references to services with numbers and letters such as ‘a’, ‘b’ and ‘x’ and replacing them with Citi1, Citi2, etc. In Peterborough in particular, Stagecoach avoided requests to deviate off route in order to preserve the high frequency, uncomplicated nature of the network.

Stagecoach Cambridgeshire launched a television advertising campaign to promote its Citibus networks. Since then, the notion of advertising on television has been taken a step further and the company has had a series of three television commercials designed for them which was aired at the end of December 2007. Stagecoach also deployed its companywide telemarketing initiative. The telemarketing approach involves telephoning householders living along the route of the service to ask whether or not they use the service. Those who do are thanked for doing so and asked their opinions of the service. Those who do not use the service are encouraged to do so by the provision of free travel tickets to be used within a specific period of time. The non-user group is contacted again a few weeks later to ask whether they used the tickets and their opinion of the service.

Real-Time Passenger Information has been introduced on the Citi 1, 4 and 7 in Cambridge and on the Citi 1 and 6 in Peterborough. The system is being rolled out gradually across the whole of both networks. The short journey distances which are characteristic of the Citibus services has meant that comfort measures such as leather seats are not considered appropriate or necessary for the Cambridge or Peterborough networks. The only ticketing initiatives which were trialled on the Citibus networks were reduced price Megarider tickets which were designed to encourage passengers to purchase day tickets rather than single or return tickets.

Where possible the City Council has incorporated its ‘Travel Choice’ marketing brand within the marketing materials for Citibus and other bus services. The City’s Sustainable Travel Town status has also assisted in developing links with the Citibus network, for example, the City Council funds and operates a series of ‘Local Link’ buses which connect with Stagecoach (and other) bus services.

Table 3.4 shows the patronage growth from 2001/02 revealing that there has been a steady increase in patronage on the Citi 3 service for all patronage.

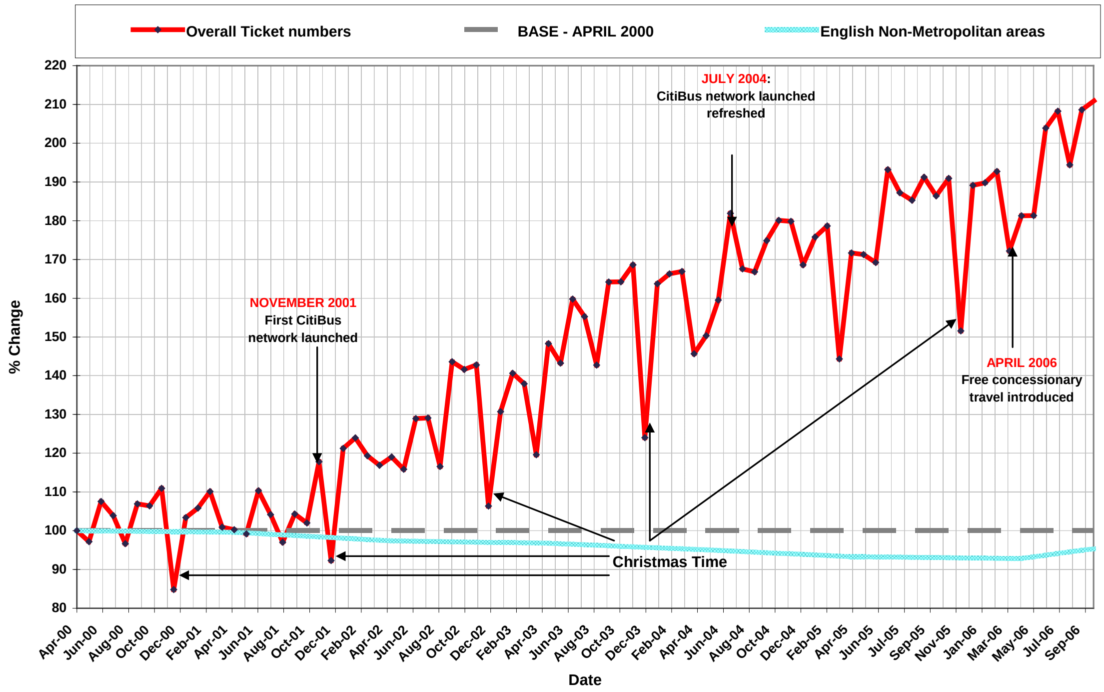
Table 3.4 Total Patronage Growth from 2001/02

Period	Total Patronage Growth
2002/03	5.6%
2003/04	25.3%
2004/05	50.8%
2005/06	64.8%

Figure 3.7 shows the growth in patronage from April 2000 up until October 2006. The total patronage data demonstrates:

- The seasonal variations, with a dip at Christmas each year; and
- The patronage was generally flat until the launch of the Citi network in November 2001, then there was a general upward trend in patronage.

Figure 3.7 Proportional Change in Passenger Numbers Between April 2001 and September 2007



The quantity of analysis has been detrimentally affected by the lack of detailed information from the operator, Stagecoach.

Figure 3.7 shows that since the launch of the Citi 3 service in November 2001 there has been a dramatic upward trend in patronage which is only beginning to level out. The growth in patronage began before the change in the Concessionary Fares Policy in 2006, thus demonstrating fare paying passengers have also increased. It therefore indicates that simplified branding, improved routing and less complex fares have achieved long term growth in patronage.

Analysis of demographic data demonstrates that:

- Cambridge is an affluent area with no Lower Super Output Areas (LSOA's) within the highest 20% of the IMD score;
- It has lower car ownership when compared with the national average; and
- Only 52% of journeys to work are made using public transport or car, with a high proportion of people cycling or walking to work.

It is possible that the culture towards soft modes and public transport in Cambridge has also contributed to a greater impact from these improvements. Cambridge may be an area where there is a greater elasticity towards improvements from alternatives to the car compared with the majority of the UK.

3.5 MORE – Wilts and Dorset

Launched in December 2004, the MORE network of services in Bournemouth replaced a number of bus services which operated to a co-ordinated timetable, but were not presented as a network. The aim of the MORE project was to simplify and rebrand the routes. There are two route groups within the MORE network, which are operated by Go Ahead:

- M1/M2 – Poole via Parkstone to Bournemouth Charminster and Castlepoint/Poole via Bournemouth to Christchurch; and
- Services M5 - M7 - operate between Poole and Canven Heath.

Buses run between Poole and Bournemouth up to every 5 minutes and run up to every 10 minutes between Bournemouth, Castle Point and Christchurch. Buses operate between 6am and midnight.

The fully air-conditioned vehicles operating on the services offer a range of seating types to meet the differing requirements of travellers, including a selection of single seats as well as the more usual pairs. All vehicles are low-floor and offer a designated space for buggies/ wheelchairs. The vehicles are fitted with CCTV with the footage being recorded and shown to passengers on a screen. Although fares on the MORE services are simple and inexpensive, they did not play a key role in the overall project.

A high profile marketing campaign was launched to promote the MORE services. The 'looks like a bus, works like a dream' was aimed at increasing bus use among existing passengers as well as encouraging modal shift from cars.

Table 3.5 shows that there was a dramatic increase in passengers from 2004. The MORE services were launched in December 2004 after a decrease in adult passengers between 2003 and 2004. After the launch there was a significant increase in patronage across all the different passenger groupings including children. This is slightly offset by the significant increase in bus mileage as the MORE network expanded.

Table 3.5 Percentage Changes in Passengers from 2003

Period	Adult	Child	Concessionary	All Passengers minus Concessionary	Total
2004	-6.7%	0.6%	0.2%	4.4%	3.7%
2005	33.8%	65.8%	23.9%	59.0%	52.4%
2006	56.3%	133.0%	140.7%	91.8%	101.1%
2007	57.0%	123.1%	237.7%	119.9%	142.2%

Figure 3.8 highlights the growth in concessionary fares:

- After the launch of the MORE network in December 2004 until the change in the Concessionary Fares Policy in April 2006, there was a 33% increase in concessionary travel; and
- After the introduction of the free Concessionary Fares Policy in April 2006 there was a 160% increase in over 60's concessions over the next 21 months.

Figure 3.8 Proportional Change in the Number of Tickets Between the Period of September 2002 and December 2007

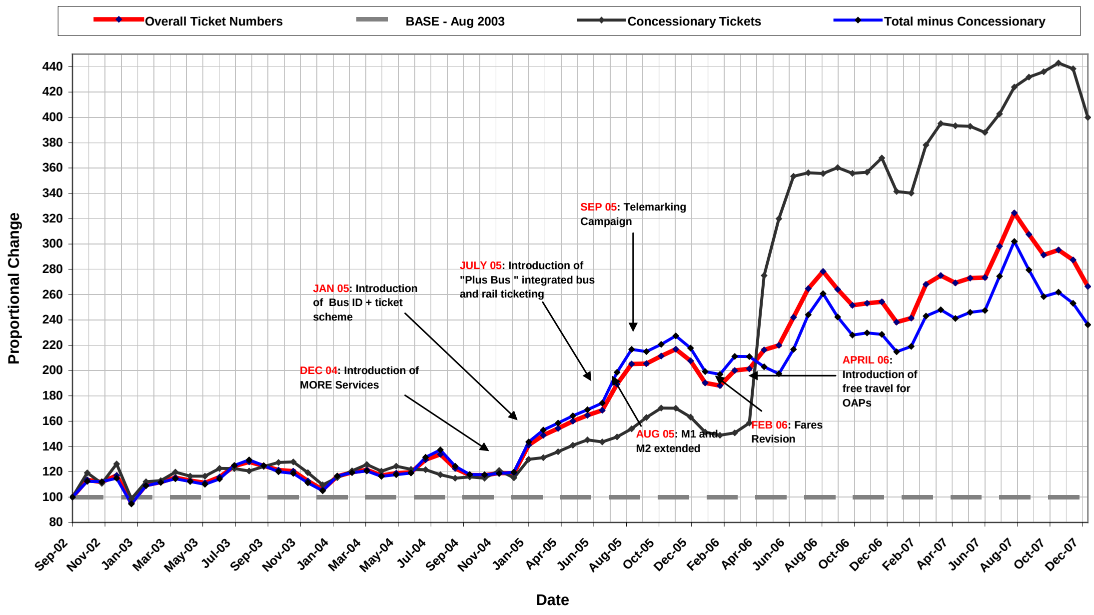
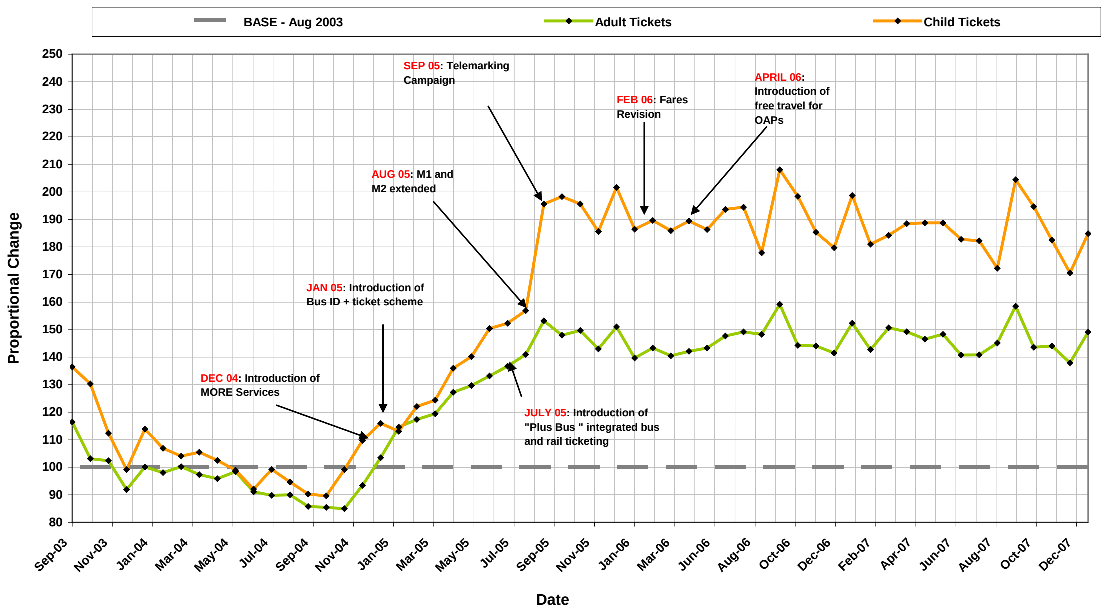


Figure 3.9 shows that for both adults and child passengers there were significant increases in patronage af ter t he l aunch of t he MO RE br anding. C hild passengers dou bled af ter t he introduction of the MORE branding, whilst adult tickets saw a steady increase of around 70%. It also highlights that there is a levelling off of growth in patronage for both adults and children.

Figure 3.9 De-seasonalised Change in the Number of Tickets Between the Period of September 2002 and December 2007



Figures 3.8 and 3.9 give the impression of significant increases of patronage which have occurred in some places by the implementation of soft measures, however once the route extension, and associated additional bus mileage, that occurred in August 2005 is taken into account the increase is less significant. The most influential factor in increasing concessionary patronage was the Free Concessionary Fares Policy on 1st April 2006. Analysis of demographic data for Bournemouth shows that senior citizens, as a proportion of the population, are 5% higher than the UK Average.

On balance the evidence shows that the introduction of the MORE branding has created a proportional increase in patronage greater than the increase in the bus mileage. There has been an increase in overall bus mileage, therefore more trips are expected to be made but the elasticity of the increase in trips to the increase in bus mileage is not expected to be greater than 1. There has been a 36% increase in mileage on the M1 and 65% on the M2. However adult fare paying passenger numbers have increased by significantly more than these figures.

3.6 Kent Fastrack

The Fastrack initiative is probably not typical of public transport schemes in Kent as it is predominantly a rural county. However, the major Thames Gateway development area has led to the development and implementation of Fastrack as the best and only way to address current and future traffic growth in the area. Given the influx of new homes and residents the only realistic option was to establish a mass transit system which would be able to achieve a high modal share of all motorised trips. Fastrack should be seen as a regeneration tool rather than as a public transport service. 50,000 new jobs and 25,000 new homes are being created in the Thames Gateway area: without Fastrack expectations are that there would be total “gridlock”. As explained below, part of the Fastrack network (Route B) runs through an established residential area.

There are two routes A and B; B was the first to open and is run by Arriva on a five year contract to Kent Thameside Delivery Board – 5.5. km of the route is segregated running. Route B is financed by the developer (ProLogis) within the area and again is run under contract by Arriva. Route B runs through an existing residential and commercial area where major new transport infrastructure and commercial/industrial opportunities are being created Route B will link into the Channel Tunnel rail service. Route A is running throughout major new residential and commercial development; the plan is that it will be regarded as the major travel mode for new residents within the area.

Measures adopted include hard measures such as new vehicles and a high frequency service. Many soft measures have been implemented including high quality roadside infrastructure, a simple ticketing and fares system, real time information systems and novel marketing campaigns and system branding.

Table 3.6 shows patronage change and highlights that there has been a 59% increase in adult fare paying passengers from September 2005 – March 2006 to September 2007 – March 2008. Total tickets along the whole corridor have increased by 97%, with these additional increases in patronage being due to:

- The free Concessionary Fares Policy in April 2006 which increased concessionary travel; and
- The overall increase in bus mileage throughout the corridor for services 480, 490 and Fastrack A/B, in part through network restructuring. (It was not possible to obtain data from the services that were removed including the 413, 141, 415, X80 and the 456. These services would have offset some of the increase in bus mileage from the Fastrack A/B.).

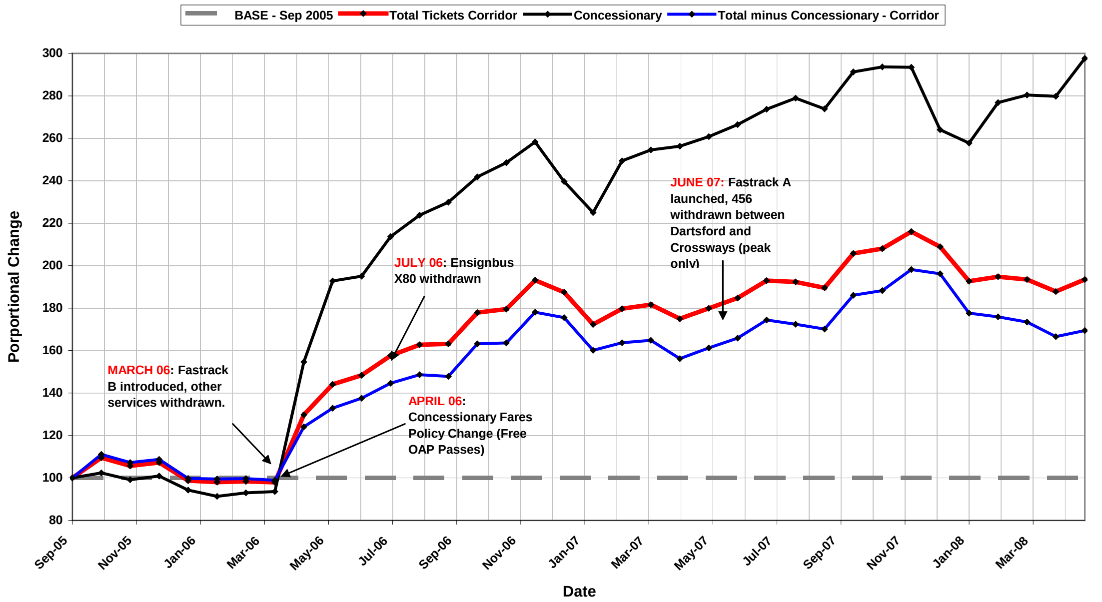
The total patronage in the corridor should increase over time as Fastrack A and B are running in some areas where housing and retail developments are still planned and under construction.

Table 3.6 Percentage Change in Patronage from September 2005 – March 2006

Period	Adult	Child	Concessionary	Other	Total minus Concessionary	Total Tickets Corridor
Sep 2006 - March 2007	44%	56%	151%	101%	60%	76%
Sep 2007 - March 2008	59%	77%	188%	119%	78%	97%

Figure 3.10 shows a significant increase in patronage after the launch of the Fastrack service, this is due to an improved service and the increase in service mileage. The introduction of the Fastrack was around the same time as the change in the Concessionary Fares Policy.

Figure 3.10 Proportional Change in Number of Tickets Between September 2006 and March 2008



There is an increase in total patronage along the whole corridor on the main services, 480, 490 and Fastrack A/B. This does not take into account the patronage which was originally on the cancelled minor services 413, 141, 415 and X80. Overall the patronage is in an upward trend.

The demographics of the Kent Fastrack 800m buffer is going to change significantly over the coming years with the new jobs and new homes. With only around 28,000 homes there currently now, this development is going to significantly impact on the socio demographic structure of the area, and introducing the Fastrack scheme before the development may influence the residents and workers mode of travel. More importantly it may increase the proportion of the workforce that travels to work by the bus.

In conclusion, there has been a significant increase in fare paying patronage and the introduction of the Fastrack scheme is creating more public transport trips along the corridor. There has been an increase in overall bus mileage but passenger growth has outstripped this. As such, it can be stated that there has been a net growth in passengers per operational mile. The Fastrack scheme is producing positive results with an increase in patronage along the whole corridor.

3.7 Hull Interchange

Bus patronage in Hull has managed to remain relatively stable despite the lack of buoyancy in the local economy. This success is attributed to the local knowledge of the area which resides within East Yorkshire Motor Services and the progressive service policies undertaken by Stagecoach who took over the previous municipal operator. The construction of a major new transport interchange – the ‘Paragon Interchange’ - which links together bus services with the national and local rail network has had a major impact on the perception of transport services within the city. The Paragon Interchange opened in September, 2007. The Interchange has 30 bus and 4 coach bays, with security staff and 24 hour CCTV. There are drop-off points for cars and taxis, a dedicated area for cyclists to leave their bikes and improved access for pedestrians.

Even though bus services still penetrate the city centre, which means that the transport interchange does not itself attract a higher proportion of passengers than the previous bus station, operators and the City Council alike feel that the perception of local transport services and their subsequent image has been significantly lifted by the creation of the transport interchange.

Table 3.7 shows a 21.6% increase in total passengers from the period April 2004 to March 2008. This table highlights that:

- There has been a year on year increase in total patronage since 2004; this could be due to Stagecoach introducing a flat fare structure; and
- Concessionary passengers increased significantly after the launch of the Concessionary Fares Policy, even though Hull had a very generous concessionary scheme prior to April 2006.

Table 3.7 Percentage Change in Passenger Data from April 2004 – March 2008

Period	Adult / Child	Concessionary	Total
2005 / 06	8.3%	22.0%	11.0%
2006/ 07	11.6%	42.2%	17.6%
2007 / 08	14.6%	50.2%	21.6%

Figure 3.11 shows that there has been a slight increase in adult and child tickets with an annual dip in patronage every year around Christmas time. In 2006 before the interchange is launched the proportional change dips to 101, whilst in 2007 it only dips to 103.

Figure 3.11 Proportional Change in the Number of Tickets Between the Period of April 2004 and March 2008

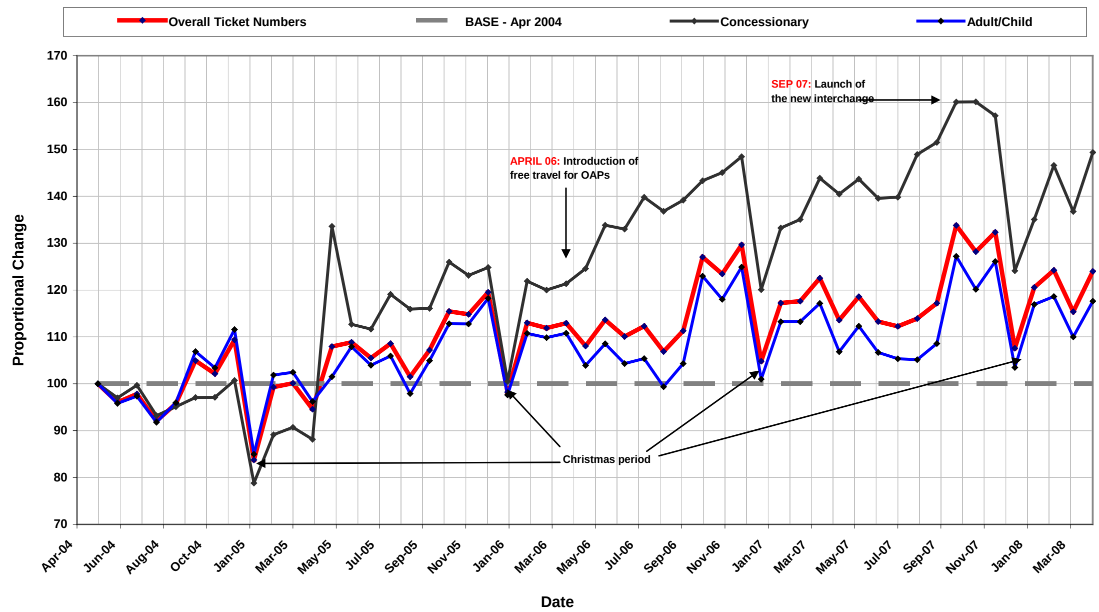


Figure 3.12 shows how the patronage of adults and children has changed once the seasonalised movement in patronage has been removed. This highlights that there has been a 16% increase when comparing 2004 with 2008.

Figure 3.12 De-seasonalised Change in the Number of Tickets Between the Period of April 2005 and April 2008 – Adults/Child

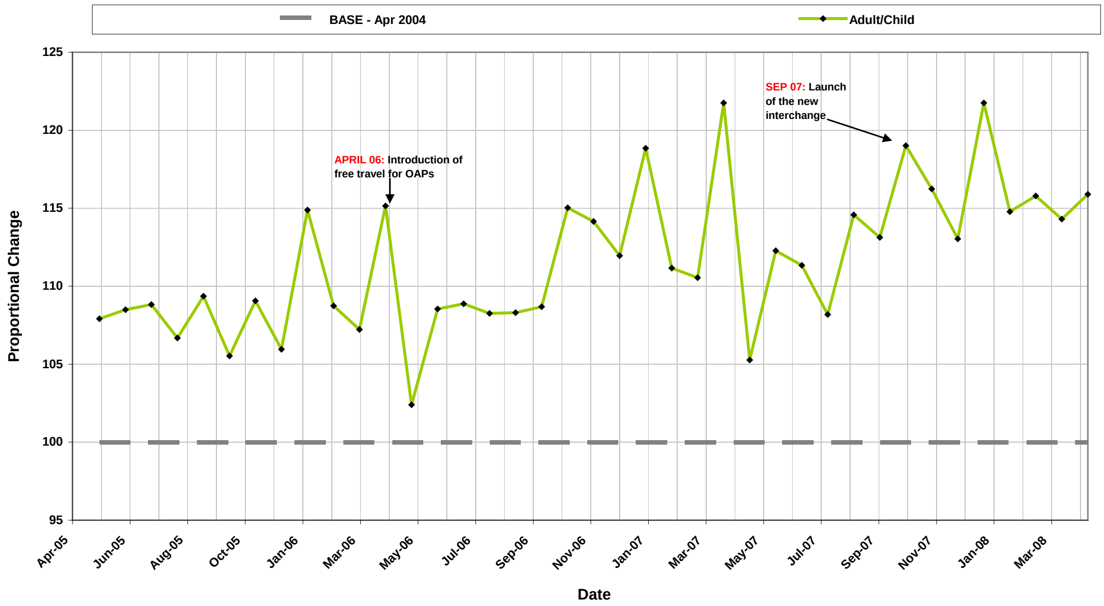


Figure 3.12 highlights the change in patronage growth over the last 4 years, and shows that after removing the effects of seasonal variation, there was an overall increase in the different passenger types. Not surprisingly, the change in Concessionary fares policy caused a significant increase in concessionary travel. If only the fare paying passengers are examined, then the data still presents a general upward trend. This could be due to a number of reasons:

- The depressed local economy and the rising cost of driving, especially the cost of fuel may have influenced the increase in bus patronage; and
- The success of the main operator, Stagecoach, with its simplification of its fares.

Most importantly it is too early to confirm if the introduction of the new Paragon Interchange has altered the perception of bus travel.

3.8 Nottingham Route 30

Nottingham City Transport (NCT), the arms-length municipal operator within the City, is running Route 30 to Wollaton using ethanol-powered vehicles. This initiative is designed to test the ability of soft measures, in this case environmental measures, to attract a new market to the bus service. The service has been carefully selected by NCT, as it is anticipated that residents within the Wollaton area will be particularly attracted by the new “Eco Buses”.

Three vehicles are required to operate the route; these have been funded with a grant from East Midlands Development Agency (emda) which also includes provision for fuel storage. The service runs on a 20 minute frequency. It is being marketed as “Eco Link” and started in early 2008. Revenue funding and capital funding through the LTP process is also being provided by Nottingham City. This is one of many initiatives by the City Council to encourage enhanced travel by bus and modal shift, as well as assisting in the reduction of carbon emissions. The timing of the implementation of Route 30 allowed the study team to use this case study as a further before and after analysis of the impacts of soft measures, with patronage growth being assessed throughout 2008.

Service 30 was the subject of a major Personalised Transport Planning Study (PTP) which involved the issue to 2130 residents in Wollaton of a personal public transport pack including a smartcard and individualised timetables – this encompassed all residents within 400m of the Service 30. The service 30 was selected as it had slightly declining patronage figures, there was no competition on the route, there was a reasonable demographics spread and finally, all buses along the route carried suitable smartcard readers. The trial led to a 5.5% increase in patronage (5% in revenue) against a previous trend of -1% according to an internal study carried out by Nottingham City Council.

Nottingham City Transport is widely acknowledged to be a high quality operator which received much praise and a Bus Operator of the Year Award for its GO2 network. This was introduced in September 2001 and demonstrated a major simplification of the existing network. Routes were colour-coded and interchange facilities provided within the city centre. The peak vehicle requirement was greatly reduced through the route simplifications which included the termination of services within the city centre. It is now estimated that the GO2 network is carrying significantly more passengers than the previous network with a major reduction in peak vehicle requirement.

Table 3.8 shows that there has in fact been a reduction in fare paying passengers between 2005 and 2007; any increase in overall patronage has been achieved by the introduction of the free concessionary fares policy in April 2006. Over the last three years there has been a 38% increase in concessionary travel and a 6.5% decrease in adult patronage.

Table 3.8 Patronage Change From 2005

	Adult	Concessionary	Child	Other	Total	Total minus Concessionary
2006	-8.82%	5.02%	-1.08%	-32.77%	-5.53%	-8.87%
2007	-4.12%	23.52%	19.25%	-18.93%	3.47%	-2.88%
2008	-6.50%	38.05%	97.40%	16.46%	10.04%	1.17%

Figure 3.13 demonstrates at no point in 2008 was the level of total tickets per 4 week period below the level of the base month April 2005. Total minus Concessionary is not showing a conclusive pattern after the launch of the Ecobus, and is still too early to make any conclusive decisions to determine if the Ecobus has been a success.

Figure 3.13 Proportional Change in the Number of Tickets Between April 2005 and September 2008 on the Eco Link

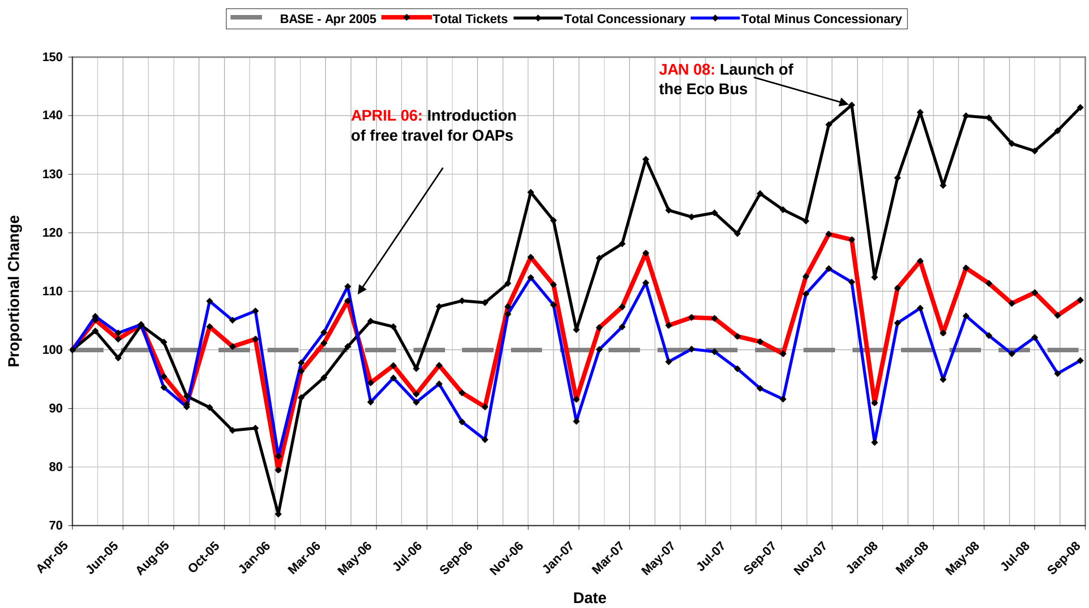


Figure 3.14 shows a significant increase in child patronage following the increased up-take of the Easyrider Child smart card by NCT in September 2007, combined with the start of the new school year. Average usage of the smart card between September 2007 and September 2008 was 191% higher than the average usage prior to September 2007. The effect of the school year can also be seen in the decline in the usage of the smart card during the August school holiday period. The figure also shows that there was no significant change in adult ticket numbers between April 2005 and September 2008.

Figure 3.14 De-seasonalised Change in the Number of Tickets Between the Period of April 2006 and September 2008 - Adults Vs Child on the Eco Link

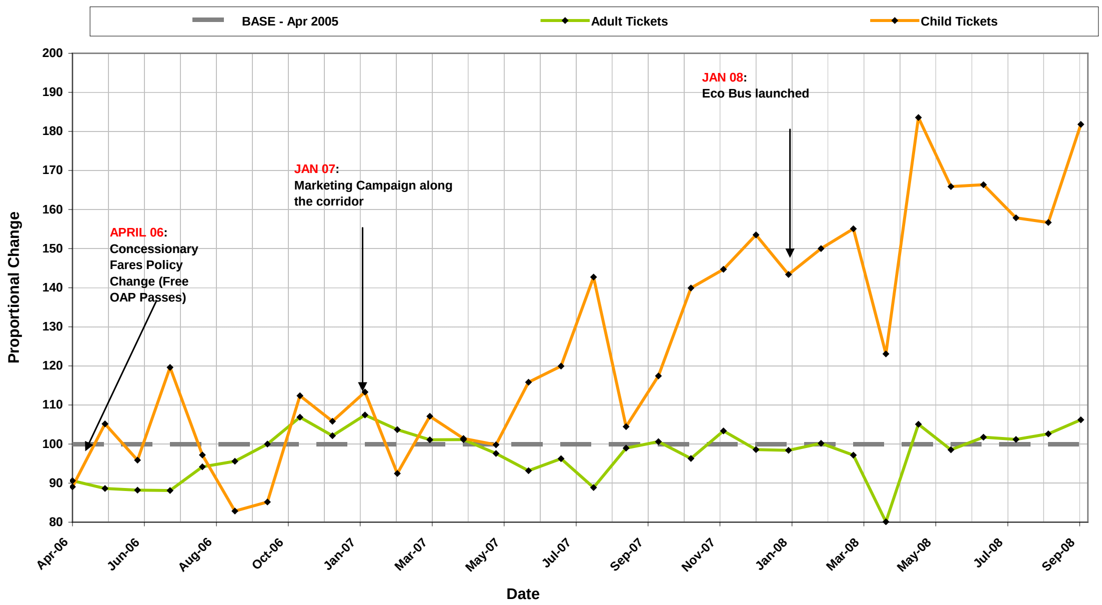


Figure 3.14 summarises the change in patronage growth over the last three years, and shows that there has been an increase in total patronage since 2005. Most of this increase has been due to the introduction of the free Concessionary Fares Policy in April 2006 rather than the introduction of the Ecobus scheme in January 2008. There was an increase in child patronage in 2007, following a marketing campaign beginning in January 2007 to promote greater bus usage. However, child patronage can be seen to increase from base levels immediately after September 2007, and again in September 2008. This suggests that the growth in child patronage may be due to the start of the school year rather than the marketing campaign. In order for this to be evaluated, further investigations need to be made into whether there was a change in 2007 regarding school bus provision. For example, if dedicated school buses were withdrawn and children began using Easyrider smart cards on public buses instead, then this would produce the observed trend. If this was the case then it is unlikely that the marketing campaign caused a real change in mode usage. Since the introduction of the Ecobus in January 2008, both adult and child patronage combined has undergone marginal net growth. However, this growth could be due to a number of different reasons other than the introduction of the Ecobus and it is not possible to determine the exact cause due to the relatively small patronage increase.

3.9 Go Ahead North East

Go Ahead North East has taken a radical approach to a rebranding of its network. Working from the premise that there is little interchange between the services operated on the Go Ahead North East network, the company under Peter Huntley (Managing Director), has been restructured into 30+ service groups – and each service group has developed a unique brand identity with which local service users can identify. Each individual service is led by a Unit Manager with dedicated service staff. The intention has been to develop a local brand which transport users will “cherish” – no one felt this way about the integrated Go Ahead North East company which existed before. Some of the services have been developed with the business community in mind – e.g. the Clipper which is an all day service to a Business Park. Others are very much more prosaic, e.g. Bargain Bus which operates in the Ashington area of Northumberland. Some identities such as the Red Kites and the Prince Bishops are rated as extremely high quality initiatives; others such as the Blaydon Racers and the Black Cats are rooted in the area’s sporting tradition; others are more whimsical, such as the Magic Roundabout and the Fab 56. The restructuring of the network has impacted upon aspects such as walk time/distance to stops and overall journey times; these aspects may also have had an impact on patronage levels.

The company has also attempted to be more responsive to community concerns and has adopted a series of in street Bus Surgeries to answer questions about services and to take on board suggestions form the travelling public. Local initiatives are encouraged from the business units which typically run 30 buses each. The rosters are far shorter now and drivers undergo training to NVQ Level 2. A "dynamic model" has been developed within the company – business units make a case for investment based upon their individual business plans. Route and fares simplification have also been important contributory soft factors within the restructuring. The internal culture has also changed within Go Ahead North East – the plan was to break down barriers between different categories of staff and to make sure that as far as possible a "one status" company would be in place with "everyone pulling in the same direction".

The Red Arrows services between Newcastle and Sunderland/Washington are regarded as the flagship of the fleet and appeal to the business community.

Figure 3.15 shows the growth in the Red Kites service since the launch in February 2007. Apart from the data error in October 2007 when the company closed one of the data depots and moved everything onto one system, there has been a slow increase in patronage. As the launch of the Red Kites was after the change in the Concessionary Fares Policy in April 2006 there is no significant difference between the concessionary patronage change and that for all tickets.

Figure 3.15 Proportional Change in the Number of Tickets Between the Period of September 2006 and March 2008 - Red Kites

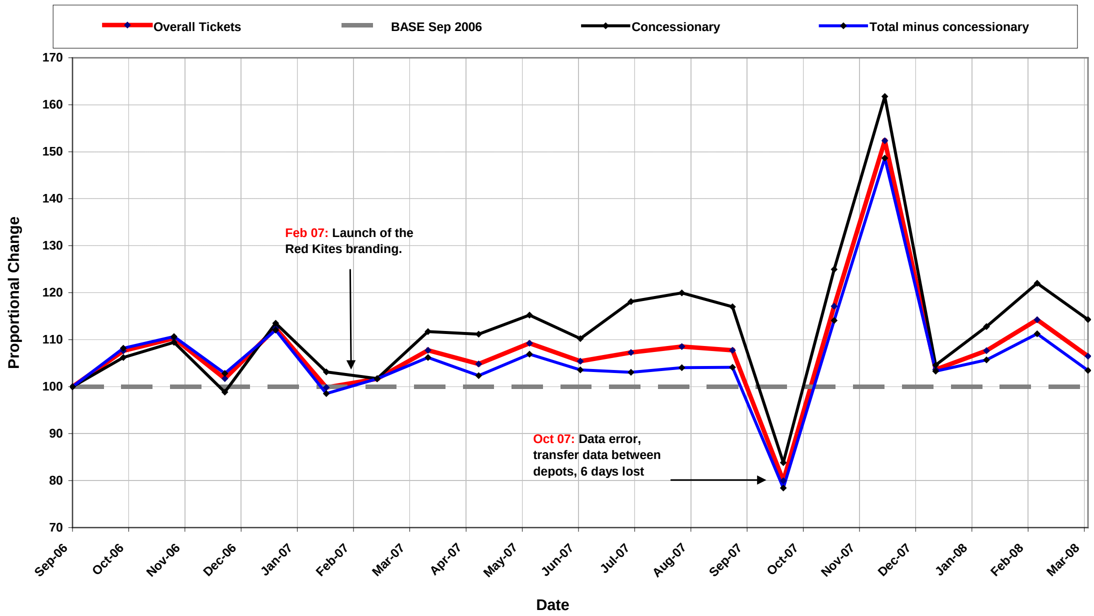
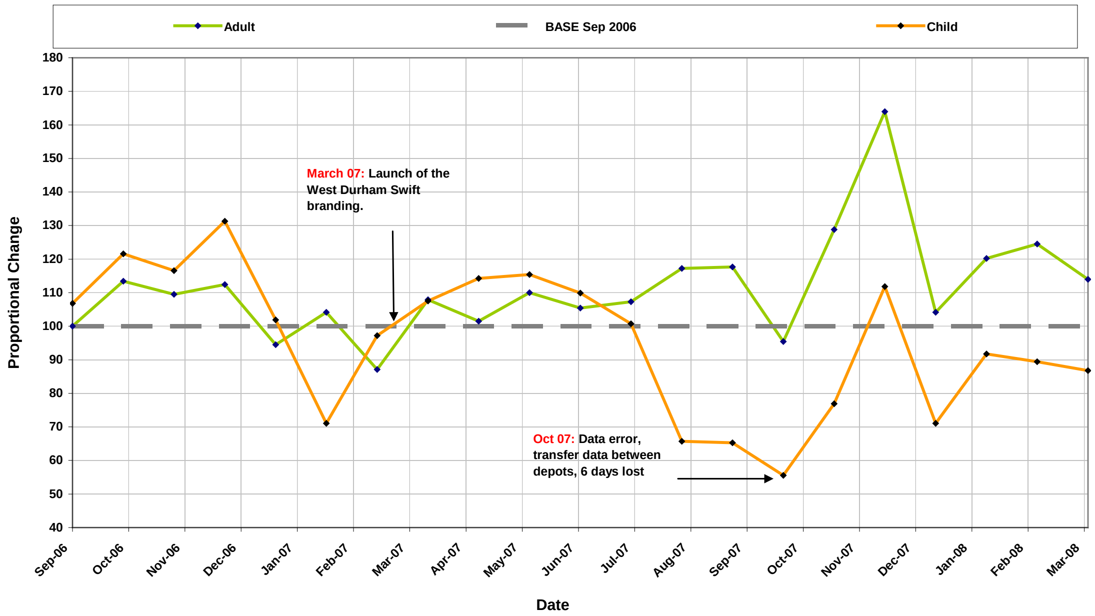


Figure 3.16 shows that child patronage again is decreasing, but this could be due to August/September being high months for child patronage; only with a few more years' patronage and some historic data will it be possible to determine the true picture. The adult patronage is very similar; there are limited movements throughout the year on both services except for the Christmas period and the data error in October 2007.

Figure 3.16 Proportional Change in the Number of Tickets Between the Period of September 2006 and March 2008 - West Durham Swift



This figure highlights the change in patronage growth over the last 18 months, and shows that the level of adult fare paying passengers has stayed steady since the re-branding, but more data is required to produce an analysis of de-seasonalised change in patronage.

Child patronage is showing a decrease over the last 6 months, in the Red Kites and West Durham Services. These two services were analysed as they are parallel services with the same origin and destination.

The Red Kites and West Durham Swift services links Consett to Newcastle. Consett is classed as a deprived area 45% of households along the Red Kites route do not have a car available, therefore if the residents want to work in Newcastle there is a greater reliance on an alternate mode of transport.

In summary, there is not enough data to show that the simplification of the network and fares has caused an increase in fare paying patronage, more historical data is needed to make that conclusion. The analysis from the household surveys may better reflect the overall impacts.

3.10 Blazefield Witch Way

Blazefield has adopted a quality concept on their X43 Witch Way service from Burnley to Manchester and their Service 36 from Harrogate to Leeds. Blazefield believe that soft measures can “make a good route better, but cannot turn a bad route into a good one”. Soft measures will only work if the basic concept/approach/service underlying them is right. They believe that the quality concept is only applicable to inter-urban routes and would not be applicable on local urban services. The concept has been to provide a simple, safe, environment with quality seating and a feeling of “one’s own” space in order to encourage more travel by existing passengers, as well as inducing a modal shift from those who previously would not have considered bus travel. Marketing has emphasised the quality concept and has removed the bus image from publicity materials. Blazefield say “why use a bus to sell bus travel?” Since the quality concept was applied the routes have seen a 16% increase in patronage over comparable areas of route, both inter-urban and Manchester city centre sections, according to Routes to Revenue Growth Report produced by the Ten Percent Club.

There has been no real fares simplification and drivers are not dedicated to the route – all Blazefield drivers undergo equally high level of training – Blazefield feel it is wrong to offer one level of driver on some routes, and a higher quality of driver on others; the basic product should be high quality in their opinion.

Add-ons include real time information (on the route 36) and bus stop upgrades in partnership with the various local authorities. Blazefield publicity concentrated on the themes that:

- Business class is standard;
- Reflect the historical association of the brand with the locality;
- Emphasise prestige destination reachable through interchange;
- Provide information for “new bus users”;
- Provide descriptions of vehicle interior and comfort;
- Emphasise the benefits of bus use over car; and
- Emphasise car parking costs in Manchester.

There was insufficient data to undertake a complete year on year analysis however there was a sixteen week period in each year where all the data was available. **Table 3.9** shows this fixed 16 week period in 2006 and 2007.

Table 3.9 Percentage Change in Passenger from April to August for 2005, 2006 and 2007

Period	Adult	Child	Concessionary	All Passengers minus Concessionary	Total
April 2006 - Aug 2006	0.66%	-34.69%	39.59%	-9.68%	-2.07%
April 2007 - Aug 2007	0.84%	-39.95%	51.71%	-8.74%	0.60%

Figure 3.17 shows the growth in concessionary fares as a result of the new Concessionary Fares Policy introduced in April 2006. This figure highlights how concessionary travel has risen by around 70% since the introduction of the Free Concessionary Fares Policy. When free concessionary fares were introduced there seems to be a sudden dip in all three of the ticket types; this is likely to be a data error than an actual dip in patronage because it recovered to its previous levels in the following month.

Figure 3.17 Proportional Change in Passenger Numbers between March 2005 and August 2007

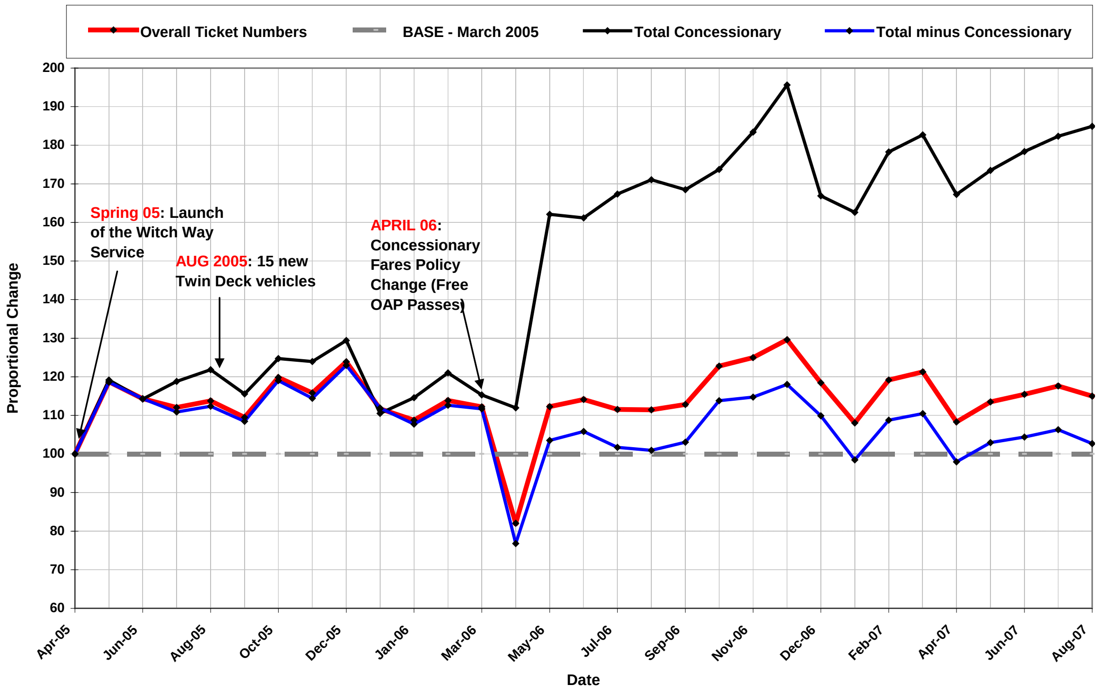


Figure 3.18 shows a significant dip in the number of child and adult passengers around the time of the concessionary fares policy change. The number of adult passengers has since recovered and grown above the March 2005 levels, whereas the number of child passengers has continued to decline, albeit at a slower rate than the sudden dip in March 2006. This graph also emphasises that there was a period of increased and sustained patronage growth in adult tickets.

Figure 3.18 De-seasonalised Change in Passenger Numbers Between March 2005 and August 2007

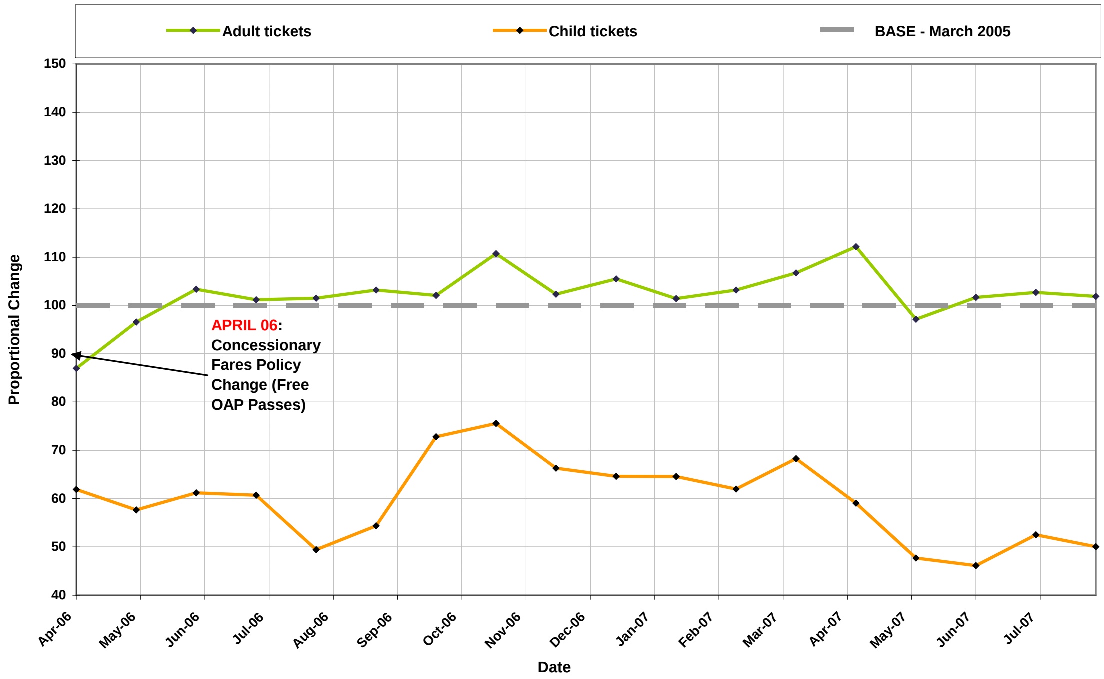


Figure 3.18 summarises the change in patronage growth since the launch of the Witch Way service in the Spring 2005. It highlights that the service was re-branded at the same time as the reduction in bus mileage of 8%. Therefore the performance of this service should be measured against a reduced operational size.

Data was unable to be obtained for the period before the launch of the Witch Way service, which means it is not possible to determine the level of child patronage before the service, but based on the data available there has been a dramatic decline in child patronage from the launch of the service. There is no evidence of other operational changes in the area that may have explained the decline in child patronage levels, e.g. improved school bus system. However, as the service operates across a number of Local Authorities it is difficult to accept without detailed evidence that the action of one Local Authority alone would cause this level of reduction. It is possible that the high standard of features on the bus have a deterrent affect for this passenger group who may feel intimidated by a premium type operation. Adult patronage has remained steady since the launch of the service with no significant change over the two and half years.

Fare paying passengers have reduced by 9% but this is due to the aforementioned fall in low yield passengers, children.

The change in the Concessionary Fares Policy that was introduced in April 2006 had the most influencing factor in changing patronage, causing a 52% increase in concessionary travel.

Demographic analysis highlights that the key origins of the trips, Burnley and Nelson, are in the highest 10% band of the IMD data. It also shows that the proportion of households with no car or van available is 10% above the national average.

In summary, the branding of the X43, Witch Way, service does not seem to have caused any change in the level of the fare paying passengers travelling on the service over the last 3 years. It could be said that it has been effective in retaining adult non concessionary passengers on a long distance route, where the car alternative can be quite attractive. Much of the route is outside of the urban network where car tends to have a much greater advantage over fixed route bus services. Car drivers are able to use more of the motorway network and gain a speed advantage, which is not always the case in urban areas.

3.11 Conclusions

The case study analysis has provided insight into the relative impact of soft measures especially to fare paying groups. On this basis the case studies have been allocated as follows into 3 groups:

Case study	Group
1. Cambridge 2. Poole 3. Dartford 4. Leeds	Strong Evidence of Success
5. Warwick 6. Warrington 7. Hull 8. Burnley	Some Evidence of Success
9. Nottingham 10. Tyne and Wear	Limited Information

It is accepted that in many case the schemes were introduced to reduce decline in passenger numbers and hence no growth can, in these cases, be classified as a success.

Cambridge Citibus 3 has seen the largest and sustained growth in patronage since its launch in November 2001 and is still continuing to grow. This was part of a change of the whole network (i.e. not just Citibus 3), creating a simplified network structure and branding, removing route deviations to preserve the high frequency, and rename the services to Citi1, Citi2 etc. Interestingly is that Cambridge is an affluent area, highlighting that a bus as a mode of transport can become more attractive, even to a segment of the population who could afford other options. It should be noted that hard factors may also have contributed to the success in Cambridge e.g. peak frequency of 10 minutes.

The other case studies which have seen a significant increase in fare paying passengers are Poole, Dartford and Leeds. Even after taking into account the increase in the length of the network in all 3 cases there has still been an increase in fare paying passengers. With all these schemes, there has not just been one soft measure introduced, but a package of measures. A common theme between the schemes is route simplification, route branding and RTI. Generally if route simplification and route branding has been introduced, it is easier to introduce the RTPI and route information in a more simplified manner.

The interchanges in Hull and Warrington have seen an increase in patronage, but it is harder to distinguish between real growth and growth generated from the change in the Concessionary Fares Policy. The MD of Warrington Borough Transport believes that they saw a decrease in patronage during the closure of the old interchange and the opening of the new, highlighting that Interchanges make a difference. In the case of Hull the growth for fare paying passengers has been marginal.

Nottingham Route 30 and Go Ahead North East have limited information after the soft measures were introduced to make a calculated assumption about their impacts.

The evidence indicates that many of the soft measures in Table 6.3, the unpacking SP values, are not as highly rated as the soft measures indicated by the operators. The operators and promoters place greater importance on their relative success on route simplification and network branding as they are able to provided more understandable information to the user.

In most of the case study areas there is evidence that hard factors played a significant part in the overall success. The newly built infrastructure has a significant role at the interchanges and the frequency of service has played a role for schemes such as those in Warwick and Cambridge.

AECOM

4 Case Studies: Qualitative Research

4 Case Studies: Qualitative Research

4.0 Introduction

Although the research conducted using depth interviews was qualitative, there were a number of exercises carried out as part of the interview, which were of a quantitative nature. However it must be born in mind that the sample sizes were low, typically 4-5 interviews per area, so this chapter is not meant to be a report of a rigorous quantitative data analysis exercise. However this analysis does provide useful insights which are backed up by the qualitative analysis. The results of the quantitative analysis are outlined in Section 4.2. The qualitative analysis is contained in 4.3 and the conclusions are contained in Section 4.4.

4.1 Quantitative Analysis

The first exercise asked respondents to say which factors were important in their decision to use the bus and then they were asked to rank these in order of importance. These results are shown in Section 4.2.1.

The second exercise took the form of a game playing exercise. Respondents were shown a board where their journey by bus was described, They were asked first to identify what their current service provision was like using the board. They were then asked what improvements they would like to see compared with their current situation. Finally they were asked what would be the worst things that could happen to the service, again using the board. These results are shown in Section 4.2.2.

4.1.1 Importance of Hard and Soft Factors

Respondents were presented with a mixture of hard and soft factors that make up a typical bus journey and these included:

- Information Provision - Planning (Soft);
- Marketing/Branding (Soft);
- Walk Time to Bus Stop (Hard);
- Safety walking to Bus Stop (Soft);
- Waiting Time at Bus Stop (Hard);
- Bus Stop/Shelter Features (Soft);
- Information Provision at Bus Stop (Soft);
- Reliability of Bus (Hard);
- Safety at Bus Stop (Soft);
- Frequency of Bus Service (Hard);
- In Vehicle Time (Hard);
- Bus Type (low floor v non low floor) (Soft);
- Driver Attitude (Soft);
- Seat Availability (Soft);
- Comfort (Soft);
- Cleanliness (Soft);
- Fare Paid (Hard);
- Ticket Type (Soft);
- Walk Time from Bus Stop (Hard); and
- Safety from Bus Stop (Soft).

Respondents were asked whether each factor was important to them and then asked to rank each factor in order of importance.

For each respondent, the factors were then weighted, based on the relevant ranking provided by each respondent to give a clearer picture of which factors were considered more important than others. Using only those ranked in the top 5 (where 1 was the most important) the following scores were allocated:

- 10 = Rank 1 (Most Important);
- 8 = Rank 2;
- 6 = Rank 3;
- 4 = Rank 4;
- 2 = Rank 5; and
- 1 = Considered important but not in the top 5.

Table 4.1 below shows the sum and mean score for each factor.

Table 4.1 Important Factors (Weighted by Rank)

Rank		Factor Type	Sum	Mean
1	Reliability of Bus	H	276	6
2	Frequency of Bus Service	H	164	3
3	Fare Paid	H	131	3
4	Safety at Bus Stop	S	110	2
5	Walk Time to Bus Stop	H	86	2
6	Safety Walking to Bus Stop	S	78	2
7	Seat Availability	S	77	2
8	Comfort	S	77	2
9	Waiting Time at Bus Stop	H	73	1
10	Information Provision - Planning	S	71	1
11	Bus Type (low floor v non low floor)	S	68	1
12	Driver Attitude	S	68	1
13	Cleanliness	S	61	1
14	Bus Stop/Shelter Features	S	58	1
15	Information Provision at Bus Stop	S	58	1
16	Walk Time from Bus Stop	H	36	1
17	In Vehicle Time	H	35	1
18	Safety from Bus Stop	S	34	1
19	Ticket Type	S	23	0
20	Marketing/Branding	S	10	0

Reliability and frequency (both hard factors) were considered as the most important factors, followed by fare also a hard factor. Fourth was safety at the bus stop a soft factor and fifth was walking time to stop (a hard factor). Then came a number of soft factors: Safety travelling to the bus stop (6th), seat availability (7th), comfort (8th) and information provided before making a journey (10th).

Table 4.2 shows how the different factors were scored by different market segments. This shows some interesting differences.

Table 4.2 Important Factors (Ranked) by Segment

	Factor Type	I use bus at least twice a week	I use bus 2-4 times a month (weekly/fortnightly)	Non User	Regular trip to or from work	Shopping	Personal business	Travel alone	Travel with small children	Travel with children	Travel with other adults	Health Issue	No Health Issues	Peak	Day time - off-peak	Employed	Unemployed	Retired	Homemaker	18-24	25-34	65+	Male	Female	Car Available	No Car Available
Information Provision - Planning	S			3	4			5	3							5	5						5			
Marketing/Branding	S																									
Walk Time to Bus Stop	H	5								3	1		5		5	4								4	5	
Safety to Bus Stop	S	5					1		4					5				5				4		5		
Waiting Time at Bus Stop	H		5			5				5							5		3		3					
Bus Stop/Shelter Features	S			2	5				2		5								4							
Information Provision at Bus Stop	S								4			4					3									
Reliability of Bus	H	1	1	1	1	1		1	1	1	3	1	1	1	1	5	2	1		1	1	1	1	1	1	1
Safety at Bus Stop	S	4	4			3	5					2	4	4	4			3	2		5	3		3	4	3
Frequency of Bus Service	H	2	2	4	3	2		2	4	2	2		2	3	2	2	4	2		5	2	2	3	2	2	4
In Vehicle Time	H																									
Bus Type (low floor v non low floor)	S								1			3							1	3						2
Driver Attitude	S						4															5	4			
Seat Availability	S		5				3		5		4	3								4						5
Comfort	S					4		4										4								
Cleanliness	S																		5							
Fare Paid	H	3	3	4	2		2	3	3	4		5	3	2		3	1			2	4		2		3	
Ticket Type	S														3											
Walk Time from Bus Stop	H																									
Safety from Bus Stop	S																									

Looking at the overall importance scores the top 5 factors are:

- Reliability;
- Frequency;
- Fare Paid;
- Safety at Bus Stop; and
- Walk Time to Bus Stop.

All are hard factors except Safety at Bus Stop.

There seems to be a close relationship between reliability, service frequency and waiting time. Travellers do not want to wait long for their bus. If the service is frequent reliability becomes less of an issue because people do not actually plan using a timetable – they generally turn up and go. Evidence for this is contained in Section 4.2 on qualitative analysis.

Looking at **Table 4.2** there are some interesting differences by segment, especially for the softer factors, although it must be emphasized that these are based on small sample sizes:

Information Provision Journey Planning - Becomes Important For
- Non users; and
- People travelling with small children.

Bus Stop Shelter Facilities Becomes Important For
- Non users;
- People travelling with small children;
- People travelling with other adults; and
- Homemaker (these are usually looking after small children).

Information Provision at Bus Stops Becomes Important For
- People travelling with small children;
- People with health issues; and
- Unemployed.

Bus Type (Low Floor) Becomes Important For
- People travelling with small children;
- People with health issues;
- 18-24 (again these are more likely to have young children);
- Home maker (these are usually looking after young children); and
- Non car available people.

Driver Attitude Becomes Important For
- 65+.

Seat Availability Becomes Important For
- People travelling with small children;
- People travelling with other adults; and
- People with health issues.

Comfort Becomes Important For
- Retired people; and
- Shoppers.

Cleanliness Becomes Important For
- Home makers (likely to be a proxy for travelling with small children).

4.1.2 Improvements and Detractors

As part of the discussion a game planning exercise was used to explore how people perceive their current bus service and to explore how hard and soft factors interact.

Respondents were presented with a list of factors (both hard and soft) and asked to identify their current service provision. For many of the factors 5 levels were presented representing a scale of 1-5 where 1 was the best case scenario and 5 was the worst scenario.

For example for Reliability of the Bus, the following 5 levels were presented on a scale of 1-5.

1. Totally Reliable, Always Sticks to Timetable.
2. Good, but Occasionally a Little Early or Late.
3. Quite Good, You Can Trust the Timetable.
4. Poor, Sometimes Lets Me Down.
5. Very Erratic, Cannot Trust Timetable.

Other factors such as walk time, frequency (how often the bus comes), travel time and fare paid simply required the respondent to provide a time (in minutes) or cost (in pence).

Table 4.3 below shows the mean scores provided by respondents for each of the presented factors. The scores from the Sunderland area (pilot area) were omitted from this analysis as the gaming approach changed following the feedback from the pilot. The results from Sunderland are therefore not comparable to other areas.

Table 4.3 Current Service Provision

	Factor Type	Mean	Unit
Information Provision - Planning	S	3	Scale 1 – 5
Marketing/Branding	S	3	Scale 1 – 5
Walk Time to Bus Stop	H	1	Scale 1 – 5
Bus Stop/Shelter Features	S	3	Scale 1 – 5
Reliability of Bus	H	2	Scale 1 – 5
Safety at Bus Stop	S	2	Scale 1 – 5
Frequency of Bus Service	H	2	Scale 1 – 5
In Vehicle Time	H	26	Minutes
Seat Availability	S	2	Scale 1 – 5
Comfort	S	2	Scale 1 – 5
Cleanliness	S	2	Scale 1 – 5
Fare Paid	H	129	Pence

Of those factors measured on a five point scale, respondents considered the proximity of the bus stop (1) to be the closest to the presented 'best case scenario' (1).

Seat availability (2); bus reliability (2); safety at the bus stop (2); frequency (2); and comfort and cleanliness (2) also scored highly. Marketing/branding (3); information provision (planning) (3) and the features of the bus stop/shelter were those factors deemed closest to the presented "worst case scenario" (5). However these factors were actually closer to the middle value (3).

Table 4.4 below shows the mean scores for the provision of each factor per area.

The Quality Score gives an indication of how well the local services are perceived for all the attributes that were recorded on a 1 to 5 scale (i.e. excluding in vehicle time and fare paid). Given there are 10 attributes measured, if all the attributes scored the best level (1) this would give a score of 10. However if they all scored at the worse level (5) the score would be 50. If they all scored 3 the mid point the score would be 30.

This shows that all the areas score better than the mid-point since the scores range from 20 to 27.

Table 4.4 Current Service Provision per Area

	Factor Type	Unit	Warwick	York	Warrington	Cambridge	Poole	Dartford, Kent	Hull	Nottingham	Burnley, Lancashire
Information Provision - Planning	S	Scale 1 – 5	4	3	3	3	3	5	3	4	3
Marketing/ Branding	S	Scale 1 – 5	2	4	5	4	3	4	5	3	2
Walk Time to Bus Stop	H	Scale 1 – 5	2	1	1	1	1	2	1	1	3
Bus Stop/Shelter Features	S	Scale 1 – 5	4	3	4	4	2	3	2	4	3
Reliability of Bus	H	Scale 1 – 5	2	2	3	3	2	2	3	2	2
Safety at Bus Stop	S	Scale 1 – 5	1	2	2	3	2	2	3	3	2
Frequency of Bus Service	H	Scale 1 – 5	1	1	2	1	1	1	2	2	2
Seat Availability	S	Scale 1 – 5	2	2	2	2	2	2	1	2	2
Comfort	S	Scale 1 – 5	2	3	2	3	3	3	2	3	2
Cleanliness	S	Scale 1 – 5	3	2	2	3	2	3	3	2	2
Total Score			**20**	**24**	**24**	**27**	**22**	**25**	**24**	**26**	**22**

Table 4.5 Reported Bus IVT and Fares by Area

		Median	Minimum	Maximum
Warrington	IVT	15.0	10.0	20.0
	Fare Paid	75.0	0.0	150.0
Warwick	IVT	17.5	15.0	20.0
	Fare Paid	125.0	0.0	250.0
Dartford	IVT	15.0	5.0	20.0
	Fare Paid	150.0	0.0	150.0
Nottingham	IVT	25.0	5.0	30.0
	Fare Paid	0.0	0.0	150.0
York	IVT	15.0	15.0	20.0
	Fare Paid	125.0	0.0	150.0
Hull	IVT	15.0	15.0	20.0
	Fare Paid	125.0	100.0	125.0
Cambridge	IVT	20.0	20.0	25.0
	Fare Paid	150.0	0.0	150.0
Burnley	IVT	60.0	30.0	80.0
	Fare Paid	250.0	3.6	600.0
Poole	IVT	30.0	25.0	55.0
	Fare Paid	175.0	100.0	175.0
Total	IVT	20.0	5.0	80.0
	Fare Paid	150.0	0.0	600.0

Table 4.5 shows the In Vehicle Time and Fare ranges reported for each area. This shows that the mean journey times were around 20 minutes, with the exceptions of Poole and Burnley. The fare paid was around £1.50.

Improvements

Respondents were then asked to consider those factors where there was room for improvement (where the best case scenario (1) had not been selected) and identify the factor that would be the best improvement to them across all factors, and then the second and third best improvements etc. These are shown in **Table 4.6**.

Table 4.6 Respondents Stated Top Improvements

	Top Improvement	
	N	**%**
Information Provision - Planning (Soft)	0	0
Marketing/Branding (Soft)	0	0
Walk Time to Bus Stop (Hard)	1	3
Bus Stop/Shelter Features (Soft)	8	24
Reliability of Bus (Hard)	10	30
Safety at Bus Stop (Soft)	6	18
Frequency of Bus Service (Hard)	1	3
In Vehicle Time (Hard)	2	6
Seat Availability (Soft)	0	0
Comfort (Soft)	0	0
Cleanliness (Soft)	0	0
Fare Paid (Hard)	5	15
Total	**33**	**100**

Clearly the extent to which people think something can be improved depends on how well it currently performs.

Despite reliability being considered as good (mean score of 2.1 and 2.2 respectively) respondents considered this factor as the most important area for improvement. For example 30% of respondents considered reliability to be the first factor they would improve. Bus stop/shelter features (24%) was the second most important improvement most respondents would like to see implemented followed by safety at the bus stop (18%). The soft factors featured prominently during this exercise (2 out of the top 3 improvements were soft factors).

Detractors

Again the extent to which people think that something can worsen depends on how well it currently performs. These are factors that may stop people using the bus.

Respondents then identified the factors that would be the worst thing that could happen to them across all factors (detractors), and then the second and third detractor etc and the results are shown in **Table 4.7**.

Table 4.7 Respondents Stated Top Detractors

	Top Detractor	
	N	**%**
Information Provision - Planning (Soft)	0	0
Marketing/Branding (Soft)	0	0
Walk Time to Bus Stop (Hard)	2	6
Bus Stop/Shelter Features (Soft)	1	3
Reliability of Bus (Hard)	12	36
Safety at Bus Stop (Soft)	8	24
Frequency of Bus Service (Hard)	4	12
In Vehicle Time (Hard)	0	0
Seat Availability (Soft)	2	6
Comfort (Soft)	0	0
Cleanliness (Soft)	1	3
Fare Paid (Hard)	3	9
Total	**33**	**100**

Over a third of respondents (36%) stated that a decrease in the current level of reliability would be the worst thing that could happen based on the factors and levels presented. Safety at the bus stop (24%) and frequency of the bus service (12%) were also repeatedly mentioned by respondents.

4.1.3 *Key Findings*

Hard factors seem to dominate but soft factors are important for key segments. Reliability and frequency were the most important service attributes followed by fare, then safety at bus stop (a soft factor) and walk time to bus. However other factors like low floor buses and bus shelter facilities become important for segments like people travelling with small children, people with health issues and non users. Non users also find information provision important. Reliability bus stop features and safety at bus stops were the three things that people would like to see improved. Reliability, safety at bus stops and frequency were the three things that people would not want to see worsen. Worsening these attributes are most likely to cause people to stop using the bus.

4.2 Qualitative Analysis

The purpose of this section is to report the key findings from the qualitative analysis of the depth interviews. More detail is contained in the Qualitative Research Working paper.

Given the sample sizes are quite small – typically 4-5 interviews per area the analysis is presented on a thematic basis across all case study areas. However where particular issues have arisen that relates to a specific case study area these have been highlighted.

The complexities of what is being explored is actually summarised well by one of the respondents, in the context of thinking about hard and soft factors:

'different people have different priorities, so to some people the cost would outweigh any other factor, whereas somebody with a pushchair would want a low floor to get on and off but I suppose it depends, doesn't it, really.' - female - car available - hull - rti & interchange - student - 18-24 - C1/C2

It does indeed depend. Some people value hard factors more highly than soft factors and some may value softer factors more highly than hard factors it depends on the person involved and the context.

It must be born in mind that in all of the areas considered, bus services have experienced improvements. This potentially applies to the bus industry in general as investment has increased and buses are generally better than they used to be as recognized by one of the respondents.

'when I was younger, we used to go on the buses a lot, I think the bus service has improved immensely, when we had the old bus station and Park Lane bus station, the buses were always a mess, they were filthy, they smelt rotten, there was vandalism, the seats were ripped, but when you get on them now, it's a very clean service, I don't think we've had any problems with the state of the buses lately.' - male - no car available - Branding in Sunderland – employed - 25-retirement age - C1/C2

Table 4.4 and Table 4.5 to a lesser degree, shows that the bus services under consideration are generally perceived to be performing relatively well by respondents.

There seems to be a relationship between the importance of a service feature and its performance, so if a particular service feature is poor this may become important to travellers because they see a need for it to be improved. If it is improved its relative importance may decline. So if the service is performing well particular service attributes may not be perceived as being important. This may explain why in vehicle time did not score highly in the quantitative analysis. This summed up well by:

'Frequency of bus service, that's of no concern to me because it's good.' - male - no car available - citi3 Cambridge - unemployed - 25-retirement age - A/B.

'Well, the hard factors are the fact that the walk time is very short, the wait time is very short and the travel time's short and the fare is reasonable. So, it's all positives for me, but perhaps if I lived further away from a bus stop, I wouldn't be thinking of that.' - female - car available - fastrak Dartford - employed - 25-retirement age - C1/C2

It may also explain why safety was not the most important factor in the quantitative analysis. Feeling unsafe, either getting to/from the bus stop or while waiting at the bus stop, is a key factor that would stop people using the bus. Given most people travel during the day they do not perceive themselves as being unsafe. In Table 4.4 perceived safety at the bus stop was scored either as 1, 2 or 3 i.e. people perceive the waiting environment as safe. However it was suggested that if their perceived safety dropped this would become very important to them and they would stop using the bus. When asked to rank safety in terms of importance:

'It's the safety one I struggled to place because at the moment I don't feel it's an issue, but if it was then it may be number one.' - female - car available - York ftr - employed - 25-retirement age - A/B

The different factors are explored under the following headings:

- Journey Planning
- To The Bus Stop
  - General
  - Safety
- At The Bus Stop
  - Shelters
  - Real Time Information
  - Waiting – Service Frequency
  - Waiting - Reliability
- On Bus Experience
  - Bus Type
  - Low Floor
  - Seats/Comfort
  - Cleanliness
  - Drivers/Staff
  - CCTV
- Fare/Ticketing
  - Fare
  - Ticket Type
- Network Stability
- Operator Awareness
- Branding

- Convenience
- Hard v Soft Factors
- Contexts
  - Children
  - Weather
  - At Night

The results of the game playing exercise are not contained in this report as they were primarily designed t o ai d t he d evelopment of t he S P exercise; however det ails ar e c ontained in t he Qualitative Research Working Paper.

Journey Planning

The am ount of j ourney p lanning and i ts t ype depends on t he t ype of t raveller, (especially whether they have access to the internet and texting for example, which are particularly attractive for younger travellers),

'I've definitely used the text service, not many times, but I have definitely used that and that was helpful. ' - male - no car available - citi3 Cambridge - unemployed - 18-24 - C1/C2

The type of service that is provided (for high frequency services the need to look at timetables is reduced since people tend to turn up and go).

'If they weren't as regular, then I probably would make a point of getting timetables, but because they're every ten minutes, it's just a case of when we're ready we go, there's no real planning involved.' - female - car available - York ftr - employed - 25-retirement age - A/B

Some peop le ex perience di fficulty un derstanding timetables. J ourney p lanning becomes particularly important when people are making unfamiliar journeys and when there are changes to the network.

'journey planning, it doesn't take much, going into Nottingham, no problem, because we know exactly what time the buses leave, five past, twenty five, forty five. If we want to go somewhere else, which means going into Nottingham and out again, the NCT do issue a journey planner, we've got a string of timetables in the drawer there and the journey planner, you can see what time other buses go. ' - male - car available - Nottingham 30 marketing - retired - retirement age - A/B

Journey To Bus Stop

Proximity to the bus network is a key factor because it reduces the amount of time taken to get to the bus stop.

'it only takes me four or five minutes to get to the bus stop. So that's the main reason for choosing that particular bus. ' - female - car available - Nottingham 30 marketing - retired - retirement age - C1/C2

The extent to which this is a barrier is linked to people's mobility, the local terrain and whether the local environment is perceived to be safe. This particularly an issue when travelling at night.

'I wouldn't use a bus of a night, it's nothing to do with the bus, but it's just walking from there to here' - female - car available - York ftr - retired - retirement age - C1/C2

Personal Safety

Feeling personally safe is a key issue and is influential in whether someone makes a journey or not. Safety i s s omething r aised in r elation t ravelling at night. Safety i s a lso do wn t o the individual's mindset. Some people tend to be more timid than others and there does not seem to be an easy explanation for this.

Most people travel during the day when they do not perceive safety to be an issue.

'Well, safety for me is important, I've never felt at risk, but I do hear people say that they're concerned about the safety, but then I don't travel at the times when it could be more risky.' - male - car available - Warrington - rti & interchange - retired - retirement age – unspec

If it was an issue it would be a deal breaker and may stop people travelling, when asked about how important safety is:

'I think it's the safety one I struggled actually, to place that, because at this moment in time I don't feel it's an issue, but if it was an issue, then maybe it may be number one.' - female - car available - York ftr - employed - 25-retirement age - A/B

Travelling with other people and introducing measure such as CCTV can help reduce safety concerns.

At The Bus Stop
Waiting at the bus stop is influenced by the waiting environment – particularly whether there is a shelter which is particularly important when it is wet.

'No, I think a bus shelter matters, because if it's raining, you're going to get wet, and it's going to put you off using ' - female - car available - fastrak Dartford - employed - 25-retirement age - C1/C2

Seating can be important especially for the elderly and those with young children, although sloping seats are not universally popular (Dartford).

I understand why they've probably got slopey seats, but proper seats or just a normal small bench would be better, it's not very practical and the elderly moan about it all the time, because it's not good for their knees, 'too much pressure on my knees,' I hear that all the time.' - female - car available - fastrak Dartford - employed - 25-retirement age - C1/C2

Lighting can also be important.

'I wouldn't like standing at a bus stop waiting when it wasn't well lit, if I was on my own. If I was with somebody it wouldn't bother me, but to stand on my own in a bus stop that wasn't well lit, I wouldn't like that.' - female - no car available -York ftr - student - 18-24 - C1/C2

Vandalism of the shelter is an issue which emphasizes safety concerns.

'I have noticed that they have built a lot more bus shelters recently in Nottingham, which I think is good, but then again you do get vandalism as well, broken glass all over the place sometimes. ' - female - car available - Nottingham 30 marketing - employed - 25-retirement age - C1/C2

Real Time Information
The provision of information at the stop is also important. Real Time Information is popular where it has been introduced.

'so if you know it's going to be ten minutes, you know you've got ten minutes to wait and if it's two minutes, then you're looking for it to come round the corner' - male - car available - fastrak Dartford - retired - retirement age - C1/C2

Providing real time information reduces the impact of a late running bus because the traveller can plan and let people know that they are going to be late.

'At least I could phone work and say look the bus is ten minutes late so I'm going to be ten minutes late. There's always somebody there who can cover for ten minutes. But when there's nothing you just stand waiting, then it gets to half time and you might as well get a taxi. So you run down, get a taxi and it costs £10, so you begrudge them that,' - male - no car available - Branding in Sunderland - employed - 25-retirement age - C1/C2

There are concerns about vandalism of the screens.

'there's electronic signs saying how long you've got to wait, I think that is good. I don't know if that would work round here they may just get smashed up' - male - no car available - citi3 Cambridge - unemployed - 18-24 - C1/C2

Service Frequency
Frequency is a very important factor in influencing people to use buses and is cited as the major reason by many people. Clearly frequency, waiting time and reliability are closely related. The higher the frequency of the service the less important reliability becomes.

'The only reason that we choose to use the bus as often as we do is because it is such a good service. I think I probably would be more tempted, if it didn't run as regularly' - female - car available - York ftr - employed - 25-retirement age - A/B

Poor frequency was a reason cited for not using a particular bus. When asked about awareness of other operators:

'Only the Whippet, but I don't use it, because it's so infrequent.' - female - car available - citi3 Cambridge - retired - retirement age - C1/C2

Reliability

Reliability is closely linked with service frequency and is important. However where the service frequency is high (every 10 minutes), people generally do not refer to a timetable – they just turn up and go, so reliability frequency and waiting time are closely related.

'I've heard of buses being late, but I've not come across it myself.' - female - car available - Wilts & Dorset M1 & M2 Poole - employed - 25-retirement age - C1/C2

There is a general recognition that reliability is getting better.

'Reliability is a big thing, they are a lot more reliable now.' - female - no car available - york ftr - student - 18-24 - C1/C2

Sometimes it is not the bus operators fault. When asked about the most important factor influencing choice of bus:

'Reliability, but then it's not their fault, is it, it's the traffic situation.' - female - car available - citi3 Cambridge - retired - retirement age - C1/C2

Where the service frequency becomes less reliability certainly becomes a major issue**.**

'They're infrequent. You've got to wait another forty minutes, it's like that cliché, when one comes they all come at once.' - male - car available - Hull - rti & interchange - employed - 25-retirement age - A/B

New Interchanges

The expectation that new interchanges lead to an improved waiting environment; this is not universally the case. Although the feedback on the Warrington, Burnley and Sunderland was generally positive, Hull interchange was the source of criticism on a number of grounds namely location (not as well located as before).

'I tend to get off before I get to the station, I must be honest.' - female - car available - Hull - rti & interchange - homemaker - 25-retirement age – DK

There are also issues of safety (buses reverse out now).

'Well, my son in law next door, he's a bus driver and he drives a Stagecoach and he says it's a death trap the passengers get off and then they've got to reverse out and go round wherever they go to ' - male - car available - Hull - rti & interchange - retired - retirement age – DK

There are also issues about the passenger queuing system with people complaining about queue jumping.

On Bus Experience

Not surprisingly people like new buses. They like well lit destination displays which make it easier to see where the bus is going especially at night. There is a general expectation that new buses will be clean quiet and more comfortable, although depending on the type of seats used some people find new seats less comfortable; although most perceive them to be more comfortable. There is a general preference for single deck buses. Low floor buses are universally approved of.

Low floor buses are useful for travellers with pushchairs, buggies or wheelchairs to be able to get onto the bus without folding them down. This may sometimes require the driver to produce a ramp. An increasing issue especially on routes with high numbers of people with buggies is the capacity, as most buses only have space for one or two buggies/wheelchairs. If the capacity is exceeded either the traveller has to fold down the buggy or they wait for the next bus. This soft factor is a real deal breaker for these market segments. Low Floor buses are thought to be a good thing even by those who do not need them.

'it's such a big advantage with people with pushchairs, I mean they can push the children on in a pushchair, whereas before you'd got to take the child out, fold the pushchair up, lift it on. I've

done that, been there, done that.' - female - car available - 66 bus in Warwick/Leamington - retired - retirement age - C1/C2

'I don't have pushchairs, but they allow about four pushchairs on a bus, whereas in my day we had to fold your pushchair and put it in the luggage compartment nowadays they just hop on. That's very good, where the step comes down, where it tilts, so you've got no high step to get onto it, when you're getting on and off the bus, which is quite a good idea and also anybody disabled with a wheelchair, a ramp comes out, it's very good how it's all done' - female - car available - York ftr - retired - retirement age - C1/C2

But sometimes there is not space on the bus which means the person has to wait for the next one.

'Well, like a lot of people on the bus I can't get on with the buggy.' - female - no car available - fastrak Dartford - homemaker - 18-24 - D/E

Seating/Comfort
Seat comfort and cleanliness are closely related. Where new buses have been introduced travellers generally perceive improved comfort.

'it's a lot more comfortable, because you haven't got those, metal frame seats with very thin coverings on, they're nice comfortable seats to sit in now' - male - no car available - Wilts & Dorset M1 & M2 Poole - retired - retirement age - unspec

'it's comfortable, they have armchairs on the bus as opposed to the hard seats. ' - female - car available - Witch way - Burnley - employed - 25-retirement age - C1/C2

But some people think the newer buses are less comfortable.

'some of the buses the seats are hard, they seem to be more modern buses, the older buses you had softer seats. They seem to be narrower seats. They're a bit more comfortable and a bit more space on the older buses, not on the new ones, maybe they're trying to squeeze more in,' - male - car available - Nottingham 30 marketing - retired - retirement age - A/B

Some preferred alternative seating configurations

'They're not all double seaters, they do have some single seats which is great when you're travelling on your own, because sometimes you don't particularly want to be sitting with anybody. They have a couple of single seats on one side that aren't reserved for disabled or elderly, so I like that. It's strange, but I like that.' - female - car available - Wilts & Dorset M1 & M2 Poole - employed - 25-retirement age - A/B

Cleanliness
Travellers are positive about bus cleanliness.

'They're always clean,' - female - car available - Witch way - Burnley - employed - 25-retirement age - C1/C2

'They're usually quite clean, you can see out of the windows, which days gone by, you haven't always been able to see out of bus windows, have you ' - female - car available - Hull - rti & interchange - student - 18-24 - C1/C2

'They're clean, they're nice and bright, you know, it's a yellow bus, but inside the seats are comfortable,' - female - car available - Nottingham 30 marketing - retired - retirement age - C1/C2

However this may not necessarily be important for travel choices.

'You know if two buses come along and they said that's going to cost you £1, that's going to cost you £1.05, because it's cleaner, I'd get on the £1 one.' - female - car available - fastrak Dartford - employed - 25-retirement age - C1/C2

Driver Attitude
Drivers/staff can create a positive travelling environment by the way they deal with customers and also how they interact with passengers with special needs especially those with buggies/pushchairs and wheel chairs. People generally perceived this positively.

'Driver attitude that is important to me, but it is mostly good' - male - no car available - citi3 Cambridge - unemployed - 25-retirement age - A/B

'They're very pleasant, they go out of their way to be, sort of like good morning, whereas on the ordinary buses that wasn't there, but it is on the FTR.' - female - car available - York ftr - retired - retirement age - C1/C2

Although there were individualised exceptions particularly in relation to people with prams/buggies.

.*'Yes, sometimes you have trouble to get on the bus with the buggy, they start being a bit moody.' - female - no car available - fastrak Dartford - homemaker - 18-24 - D/E*

Driving performance also has impact on the comfort and safety of passengers.

'They go very fast and they stop really fast and they don't take into account the fact that some of the older, more infirm people or people who don't have time or press a button, they'll get up to get off and then all of a sudden the bus will decelerate and they'll be falling all over the place.' - male - no car available - citi3 Cambridge - unemployed - 25-retirement age - A/B

Conductors have been re-introduced on the FTR in York which has been well received.

'Gone back to the old days of having a conductor, which isn't a bad thing because there's somebody there, to see everything, if anything's wrong or to help people, they're very helpful" - female - car available - York ftr - retired - retirement age - C1/C2

CCTV

CCTV is viewed positively by travellers.

This can be on the bus.

'I have noticed the CCTV, which does give me some sense of security and I think if there was an incident then they'd be able to see what was going on.' - female - car available - Nottingham 30 marketing - employed - 25-retirement age - C1/C2

Or in the local area

'CCTV that's quite important as well, because I know on one of my bus routes there's quite an unsavoury area with a lot of unsavoury characters getting on it, who you wouldn't like to meet in a dark alley and sometimes they can be as rowdy as hell.' - male - no car available - York ftr - employed - 18-24 – unspec

Fare and Ticketing

The fare paid is another key hard factor, although it is a major factor for some.

'Definitely, if the buses were cheaper, I would use them more' - male - car available - Hull - rti & interchange - employed - 25-retirement age - A/B

It is not such an issue for others. Many travellers with a car available compared the cost of using the bus with using their car; because these may be less frequent bus users, they generally buy single or return tickets and in many of these places parking cost is quite expensive so the bus may be relatively attractive in terms of cost.

'Some people might argue that £1.15 for a ten minute journey is quite excessive, but it depends on what context you put it in.' - female - car available - Hull - rti & interchange - student - 18-24 - C1/C2

Many regular travellers just buy single or return tickets because of the simplicity. Other people do not buy season tickets because of the cost.

'I've never been able to afford one or a monthly one or anything like that.' - female - no car available - 66 bus in Warwick/Leamington - student - 18-24 - C1/C2

Some do not understand the types of season tickets that are available.

'No, I don't know how to get them, (other types of ticket)' - female - no car available - fastrak Dartford - homemaker - 18-24 - D/E

And this is particularly the situation where there have been changes to the network/ticketing system for example Sunderland.

'Well, it used to be a £3 day pass, so you could just get on any bus and now you've got to go through colour zones and stuff.' - female - car available - Branding in Sunderland - homemaker - 25-retirement age - C1/C2

Day Tickets

Day tickets are very popular when they are cheap.

'I mean it is a very good deal, if you get a £3 day rider, that means you can travel anywhere around Cambridge' - male - no car available - citi3 Cambridge - unemployed - 25-retirement age - A/B

Season Tickets

The advantages of season tickets were identified by some. It saves money and there is no need for change for the bus fare:

'It's just easier and convenient, because it only saves me about £2-3 a week, but it's knowing that I don't have to make sure that I've got money on me, because it's like bosh, I'm in, I can sit down and I don't have to worry about if an inspector comes on and finding my ticket.' - female - no car available - unspec - employed - 25-retirement age - C1/C2

An added advantage is that even if the holder runs out of money they can still get the bus home.

'you've got that pass and if you ran out of money you've already got your pass' - female - no car available - York ftr - student - 18-24 - C1/C2

Flat Fare

Flat fares can be popular because everyone pays the same and it is easier to understand.

'I'm in favour of a flat fare. just for the speed and the convenience of it and I think it takes the unfairness out of paying more for part of a journey.' - male - car available - Warrington - rti & interchange - retired - retirement age – unspec

Smart Cards

Although smart cards do not currently exist in any of the case study areas, some had experienced Oyster cards in London. The idea was well received on the grounds of its speed and convenience. The issue of forgetting to top it up was raised as a possible problem.

'The electronic smart cards, because it would just make it so much quicker.' - female - no car available - York ftr - student - 18-24 - C1/C2

Network Stability

Although changing the network can potentially provide an improved bus service to travellers, it does have drawbacks particularly if the changes are not well communicated. This was a particular issue in Sunderland when there was change in the ticket zoning. Changing service numbers and routes can be confusing for people.

'Yes, and now they've changed it to M1, M2 and you just don't know which way they're going now, because some of the routes have got longer, so you don't know.' - female - car available - Branding in Sunderland - homemaker - 25-retirement age - C1/C2

Operator Awareness

Travellers were generally aware of the operator that operated their service particularly if it was one of the big operators: First, Stagecoach or Arriva. Where a service was heavily branded, for example Fastrak, fewer people were aware of the operator, which in this case was Arriva. One particular person rated Fastrak very highly but hated Arriva.

'I prefer the Fastrak. I think the Arriva is the worst service I've ever known in my life, since I've been born.' - male - no car available - fastrak Dartford - unemployed - 18-24 - D/E

However most people did know that First operated FTR in York so this awareness is down to local factors.

Most people did not have a preference for a particular operator.

'I know who operates it, but it doesn't matter.' - female - car available - Witch way - Burnley - employed - 25-retirement age - C1/C2

'As long as it's going where I want to go I couldn't care less who was operating it.' - female - car available - York ftr - employed - 25-retirement age - A/B

'I don't think it matters who operates it, as long as they get a good service.' - male - car available - fastrak Dartford - retired - retirement age - C1/C2

Branding

Branding includes buses being painted in a particular way on different routes often with catchy names e.g. Black Cats. It would also include marketing initiatives.

Most people did not think branding mattered very much.

''I'm not so sure I'd ever be that affected by the type of branding and things like that, whether it was a purple bus or a green bus, as long as it got me from A to B, I don't think that would be a big issue?' - female - car available - York ftr - employed - 25-retirement age - A/B

It was something that some people found helpful especially identifying buses at a distance. This was also felt helpful for people with poor eyesight who may not be able to read bus numbers very clearly and tourists who might have difficulty identifying the correct bus.

'one of the main factors that changes is the branding, with the Trumpington, I always know that I'm looking for a blue bus, a blue double decker bus that says Trumpington on it in big letters the other two Park and Rides are green and red, so you know straightway which one's which' - male - no car available - citi3 Cambridge - unemployed - 18-24 - C1/C2

However inappropriate branding may backfire as in the case of a Newcastle United fan refusing to use the Black Cat service (named after local rivals Sunderland).

'No, even though I don't follow the Black Cats, I'm a Newcastle supporter. I keep off them.' - female - no car available - Branding in Sunderland - retired - retirement age - C1/C2

Convenience

One surprising finding was that a significant number of car available travellers were using the bus because it was more convenient than using car.

To be quite honest with you, it's easier and cheaper for me to get the bus than it is to drive, I'd rather be on the bus, I think it's safer and I find it less stressful, 18-24, car available, male, Warrington - rti & interchange, A/B, employed

Issues of parking both the cost and lack of spaces plus congestion are making using car less attractive.

'Well, car in town is very inconvenient, the traffic, the weight of traffic, the cost of parking. It's cheaper and much easier to get on the bus.' - male - car available - Warrington - rti & interchange - retired - retirement age – unspec

'there's people saying it's too expensive, but when you look at it compared to other things, like parking your car in the city centre, it's so much cheaper just to get a bus, like my mum and dad have both got cars, my sister's got a car, everyone's got a car, but if they're going into town they leave the car at home and they get a bus, because it's a lot cheaper.' - female - no car available - York ftr - student - 18-24 - C1/C2

'it would probably cost me more to use the car, I couldn't guarantee that I'd get parked up where I wanted to anyway, so it's more convenient, because we've got such a good service here, just to hop on the bus.' - female - car available - York ftr - employed - 25-retirement age - A/B

However although these factors may have forced car users to consider using the bus, it was admitted that if these problems were solved they would return to using their car.

For example the reason why the following person was using the bus was that she could not get parked at Blue Water Shopping Centre

Q. So the main reason you use it really is because it's negative things about the car, you want to go to the shopping centre and you can't really use the car conveniently?

Yes, if Fast Track probably wasn't as efficient as it was and I had to wait a long time for the bus, because I've never had it, so the actual experience of Fast Track has always been really good, but if it wasn't, then I would probably ditch the bus and go back to the car and just put up with the parking.

Q. What would be the best thing that could happen to you?

Nobody else drives to Bluewater.

25-retirement age, car available, female, fastrak Dartford, C1/C2, employed

If no one else drove to Bluewater she would be able to park and would then go back to using her car.

Contexts

It became evident from the interviews that different contexts can influence the importance of different hard and soft factors.

These were:

Travelling with Children

Travelling with children makes softer factors more important.

'The low floor, that wouldn't really bother me if it was just me on my own, the walking time to and from the bus stop, it wouldn't really bother me the reliability of a bus service is such, that wouldn't really bother me, unless I had somewhere to go, but if I've got the baby, then I know I've got to be somewhere, Obviously seating availability, that wouldn't bother me either if I didn't have the baby, because I'd sit or stand. But I need somewhere to put him and also like the cleanness of it' - male - no car available - 66 bus in Warwick/Leamington - employed - 18-24 - D/E

'So I suppose when you've got a baby it's different, isn't it, your attitude changes to everything. ' - male - no car available - 66 bus in Warwick/Leamington - employed - 18-24 - D/E

'Before I had the bairn, it didn't really bother us, I just used to get on any bus. So, would it be fair to say that because your situation's changed, now that you've got a child, then you have to think about the child. Yes, obviously things change.' - female - car available - Branding in Sunderland - homemaker - 25-retirement age - C1/C2

Weather

Weather seems to have potentially a positive and negative impact on bus patronage and traveller expectations.

Rain may encourage those who would walk to use bus;

'It's mainly the weather, if it's nice and I'm on my own, then I'll walk, but if it's crabby weather, I'd rather jump on that than get wet through. ' - female - no car available - Nottingham 30 marketing - homemaker - 25-retirement age – DK

Or encourage bus users to use car or taxi.

'when it was really bad weather, I might decide not to use the bus and might say to my husband oh come on, drop us in' - female - car available - York ftr - employed - 25-retirement age - A/B

Clearly shelters are more important when the weather is wet.

Travelling at Night

Many do not use the bus at night. This is largely down to feeling unsafe in their local area. Travelling with other people can mitigate against this. Car available travellers are more likely to use their car at night.

That stop it's a bit dodgy around that area, maybe to the point where you wouldn't use that bus stop at night time, you wouldn't even think about it.' - male - no car available - York ftr - employed - 18-24 – unspec

'I wouldn't be very happy about it, particularly on my own, I suppose if you were with other people it's not so bad, but I'd be wary of using it at night.' - female - car available - fastrak Dartford - retired - retirement age - A/B

'Well, I wouldn't catch a bus at night, I went out last night, well, I'd go in my car, I wouldn't go and wait for a bus at night.' - female - car available - 66 bus in Warwick/Leamington - retired - retirement age - C1/C2

Discussion Of Hard And Soft Factors

As part of the interview respondents were asked what they thought about concept of hard and soft factors.

The issues are well summarized by the following quote when asked what hard and soft factors are important in their decision to use the bus:

'Different people have different priorities so to some people the cost would outweigh any other factor, whereas somebody might, somebody with a pushchair would want a low floor to get on and easy access to get on and off, but I suppose it depends, doesn't it, really.' - female - car available - Hull - rti & interchange - student - 18-24 - C1/C2

The Interaction between hard and soft factors depends on type of traveller and circumstances. Hard factors would seem to dominate but there are situations where soft factors become important e.g. low floor buses for people with pushchairs, or shelters when it is wet.

Some people feel hard factors are more important:

'My idea of a public bus service has always been the same, a good fast, frequent, efficient service, if it's inconvenient, this is the main thing, you know'- male - car available - fastrak Dartford - retired - retirement age - C1/C2

'The only important factors to me really are travel time, the frequency of getting in and out when I want to and of course the cost.' - male - car available - Warrington - rti & interchange - retired - retirement age – unspec

'Comfort's not really that important, it's a bus that gets you where you want to go. ' - female - no car available - Nottingham 30 marketing - homemaker - 25-retirement age – DK

Others emphasised that soft factors could be more important.

'It's always the little things, I think the soft factors, It's always the little things that tend to niggle at people and gripe people, you know' - male - no car available - York ftr - employed - 18-24 – unspec

However others acknowledged that both hard and soft factors are important.

'I would say they're both as important to me, I want to be able to know that I'm safe on a bus, which is the security factor, but then I don't want to be walking miles to get the nearest bus and I don't want to pay a fortune for the bus, but I want to be comfortable, I want to make sure that there's access for wheelchairs. So, I think to me personally, they're both as important as each other.' - female - no car available - unspec - employed - 25-retirement age - C1/C2

Both hard and soft factors are important it depends on the circumstances and the type of traveller involved.

4.3 Summary and Conclusions

The interactions between hard and soft factors depend on the type of traveller and the circumstances under which they are travelling.

When asked to prioritise a series of hard and soft factors when considering making a journey by bus, overall hard factors such as reliability and frequency come out very strongly and to a lesser degree distance to stop and fare, which are all hard factors. Safety at the bus stop came out as the top soft factor. Hard factors seem to dominate which is not unexpected, however there are situations where soft factors become important. However some market segments have different priorities. For travellers with small children having a low floor bus becomes critical. This is also important to people with health issues, which is not surprising. However frequency and reliability remain important for most segments.

The areas covered in the research generally have high frequency (every 10 minutes or better) and generally reliable bus services.

There seems to be a relationship between the importance of a service feature and its performance. If a particular feature is performing poorly travellers may give this a high importance score since they see a need for it to be improved. If it is improved its relative importance may decline. So if the service is performing well particular service attributes may not be perceived as being important.

Safety is an interesting example of this. From the research feeling unsafe, either getting to/from the bus stop or while waiting at the bus stop, is a key factor that could stop people using the bus. Given most people travel at times when they feel safe, safety in itself may not be rated as being so important to them (otherwise it would have been ranked top in the quantitative exercise). However if their perceived safety dropped this would become very important to them and they might stop using the bus. Clearly other factors for example lighting, CCTV the presence of other passengers can help promote a safe waiting environment, however there were a high number of people who would not use the bus at night because of safety concerns (this is particularly the case for car available people and elderly people). Safety is an issue that would dominate everything else if people felt unsafe however people do not travel at times when they feel unsafe.

It was found, surprisingly, that many car available travellers perceive the bus to be more convenient than car in particular situations especially where congestion is particularly bad or where parking is difficult/expensive. Where driving becomes difficult this becomes a trigger for drivers to consider the bus alternative. There seems to be a close relationship between reliability service frequency, and waiting time. It seems a key requirement of the bus service is that travellers should not have to wait long. Where the service is high frequency travellers do not use a timetable so reliability becomes less important. Where the bus service is high frequency, it becomes an option car available people to try. However if these car issues were solved it is possible that some of the people who previously used car would use their car irrespective of how good the bus service is. Bad things about car rather than good things about bus seem to be the main driver.

However a high quality bus service in terms of high frequency and reliability is a pre-requisite for patronage growth particularly among those segments who might not usually use the bus. Once these hard factors are of a satisfactory quality softer factors then become important in enhancing the quality of the bus journey.

A bus which is modern clean and comfortable provides an enhanced bus experience. If the bus was dirty and uncomfortable it is possible that some people would not use it even if it was high frequency/reliable. However it seems that a comfortable and clean bus would not compensate for a bus service which is infrequent and unreliable.

However there are contexts that are important.

Travelling with children seems to have an overriding impact on determining what features become important. It seems to heighten the importance of all the soft factors e.g. cleanliness, comfort, safety. When travelling with a pushchair (and with a wheelchair for elderly people) the low floor issue becomes critical. However being able to access the low floor bus is one factor - having enough space on the bus to park the wheelchair/pushchair is another.

The weather can also have a major impact on people's perception of what aspects of the bus service is important. Shelters clearly become more important when it is wet. Rain seems to impact on bus demand in a number of ways. Firstly it may encourage people who would walk to use the bus. Secondly it encourages people who might use the bus to use car or taxi.

Travelling at night is another key context in which priorities change. Safety issues become far more important and less people make bus journeys. Car Available people are far more likely to use their cars at night.

So in summary, it seems that soft factors can enhance the bus journey experience however this mainly comes into play when certain hard factors particularly frequency and reliability have reached particular acceptable thresholds. The exceptions are travelling with children in which case low floor buses are essential, and safety. If ever safety became an issue it would override everything else.

- Threshold effects exist for non-bus users which have to be overcome before bus is considered a viable option, for example, a high frequency (10 m in head ways) reliable service. Only after that do soft factors come into play.
- Safety appears to override everything.
- Ease of boarding is a key issue for certain people. However, it is not just boarding but whether there is enough space to store an unfolded pushchair.
- There is an expectation that new buses will be comfortable and clean.
- Car drivers are sensitive to problems related to the car, i.e. congestion, cost of parking and availability of parking. Increases in these are likely to push people to the bus more than soft factors.

These conclusions informed the further quantitative research undertaken in Phase 2 of the study.

5 Quantitative Research Phase

5 Quantitative Research Phase

5.0 Introduction

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.

In order to cover these objectives five distinct aspects of primary data collection were used. These were:

- A series of SP exercises to deal with the relevant issues in valuing 'softer' qualitative factors and to determine their impact on modal choice;
- Collection of RP 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; 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.

The data collection approach involved two distinct but related surveys:

- Pencil and Paper Survey – this covered non SP aspects of the survey; and
- Computer Aided Personal Interviewing (CAPI) – this covered the same issues as the Pencil and paper survey plus the Stated Preference Survey.

The target number of interviews in each of the 10 survey areas was 225 SP and 250 Pencil and paper, making a total of 475 interviews in each area or 4750 in total.

5.1 Questionnaire Design

The questionnaires were designed by ITS Leeds.

The pencil and paper survey contained the following information. The same basic questionnaire was used for all areas. It covered the following topics:

- Part 1 Local Bus Services – usage, perception of , travel diary of bus usage over last week, ticket used, perceptions of service improvements – awareness, importance and impact on behaviour
- Local marketing and branding initiatives – awareness and impact on behaviour
- Part 2 Employment Information – information about journey to work – mode used
- Part 3 Socio Demographic Information – age, gender, income, car ownership, household type.

The CAPI questionnaires were computer based and so were customised to each area.

The CAPI questionnaire contained both non SP questions (very similar to the Pencil and Paper questionnaire) and questions relating to the SP experiments including the experiments themselves.

There were 5 types of SP experiment in total and these were as follows:

- **Route Choice SP**. This SP experiment was presented to a selection of the overall sample that had a choice between a high quality bus on one corridor and a lower quality bus on another. The experiment offered a choice between buses on two routes. These would differ in terms of journey time, fare, frequency, access and egress time and bus quality.
- **Demand Effects SP** (Bus Users) (Mode Choice SP or Main SP): This SP experiment was presented to bus users (with and without a car available). The SP experiment offered combinations of journey time, fare, frequency, reliability and bus quality which was specified as a whole package or 'half package'. The respondent was asked whether they would continue to use the bus.
- **Demand Effects SP** (Car Users) (Mode Choice SP or Main SP): This SP experiment was presented to car users where the respondent was offered a choice between car, presented in terms of costs, journey time and parking availability, and bus presented as described above.
- **Unpacking SP** (Bus Attributes SP): Bus improvements that have been offered in practice were presented as either present or not in varying combinations and respondents were asked to choose between the package of bus improvements and a saving on their journey time.
- **Information SP** (4th SP): Respondents were asked to choose between a varying package of information systems (such as real time information, audio announcements, SMS messages and web based real time information) and a saving on their journey time.

A further SP experiment, the so called '5th SP' (Fare Simplification) was conducted by ITS Leeds but outside of the scope of the PAPI and CAPI surveys described in this chapter.

Each respondent received 2 SP games, depending on the area, main mode of transport and whether they had a choice of using a quality and/or non quality bus. The SP experiments were bundled into 6 questionnaire designs. **Table 5.1** below illustrates which SP experiments were presented in each of the 6 designs, alongside the selection criteria for each questionnaire design.

Table 5.1 SP Experiments

Design	Selection Criteria	SP Experiment				
		Route Choice	Demand Effects/ Mode Choice (Bus)	Demand Effects/ Mode Choice (Car)	Info Provision	Unpacking/ Bus Attributes
1	Quality bus users who have a choice of using a non-quality bus (at a different bus stop)	✓	✓			
2A	Non quality bus users who have a choice of using a quality bus (at a different bus stop)	✓				✓
2B	Non quality bus users who have a choice of using a quality bus (at a different bus stop)	✓			✓	
3A	Quality bus users who have no choice but to use the quality bus and have a car available or not		✓			✓
3B	Quality bus users who have no choice but to use the quality bus and have a car available or not		✓		✓	
4	Car users who could use a non-quality bus but not a quality bus			✓		✓

Due to the individual characteristics of each case study area, particular questionnaire designs (and therefore particular SP experiments) were therefore used for each area and this can be seen in **Table 5.2.**

Table 5.2 Questionnaire Design

Case Study Area	Questionnaire Design					
	1	2A	2B	3A	3B	4
Area 1 - Poole				✓	✓	✓
Area 2 - Hull				✓	✓	✓
Area 3 - Tyne & Wear				✓	✓	✓
Area 4 - Dartford	✓	✓	✓			
Area 5 - Cambridge				✓	✓	✓
Area 6 - Leeds	✓	✓	✓			
Area 7 - Warrington				✓	✓	✓
Area 8 - Burnley				✓	✓	✓
Area 9 - Warwick	✓	✓	✓			
Area 10 - Nottingham				✓	✓	✓

5.2 Sampling

Maps showing the routes of interest were produced for each area. These maps are contained in **Appendix C**. A buffer area of 500 metres either side of the routes of interest was drawn and a number of sampling points selected within the buffer areas. Quotas were set for age, gender and working status (whether working or not) which were derived from a detailed analysis of the census data for each buffer area. Quotas were also specified for time of interview. A quota sampling approach was used and households were selected using random walk approach. A requirement of the pencil and paper survey was that the respondent must have made a bus journey. A further requirement of the CAPI survey was that the person was employed and was making a commuting journey by bus. This commuting journey became the trip of interest for the survey.

5.2.1 Pilot Survey

Pencil and Paper

The pilot survey was carried out in the Warwick area at the beginning of February 2008. 50 interviews were carried out. Following this feedback some amendments were made to the ordering of the questionnaire and wording of some of the questions.

CAPI

The first area Warwick/Leamington was also used as a pilot survey for the CAPI survey. This survey took place during June 2008 and the results were reviewed to ensure there were no problems. Following this review a number of amendments were made to the CAPI program.

5.2.2 Main Survey

Pencil and Paper

The client was concerned that using a quota approach might lead to sampling bias and requested that the first survey area be analysed to check the sampling approach was providing unbiased results. Consequently after the first area was completed the fieldwork stopped and the results were reviewed. These results were discussed at a Progress Meeting. It was agreed that no bias was evident from the results and the fieldwork in the other nine areas commenced late April 2008. The full survey was completed by the beginning of July 2008.

CAPI

Following the pilot the main survey started in July 2008 in a number of areas, particularly Warwick/ Leamington Spa and Leeds interviewers found it difficult using the household survey approach to find commuters using the bus making trips within the survey area. To achieve the hit rate in these areas the fieldwork company boosted the sample using a hall test method where people were recruited on street and asked to do the interview at a local convenient venue e.g. hotel. The survey was completed on 28th September 2008. This data was passed on to ITS Leeds for analysis.

5.3 Survey Results

This section focuses on the key results that relate to the impact of Softer Factors on perceptions and bus usage.

As part of the Non Capi survey respondents were asked whether they had noticed any of the improvements, namely Bus Improvements and Marketing Initiatives.

Bus Improvements

Information

- 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.

On bus

- CCTV.
- Air Conditioning.
- Leather seats.

Waiting environment

- Modern bus stops.
- Modern bus stations.
- New bus vehicles.
- Low floor bus vehicles.
- Environmentally friendly bus vehicles.

Other Bus 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

Marketing Initiatives

- Promotional materials through your front door letter box
- Adverts on radio/television
- Different coloured buses for different routes
- Posters/bill boards on streets and in public places
- Personal Tele-marketing
- Offering Information on Services
- Discounted tickets for trial periods
- Newspaper Advertising

They were then asked what impact these changes had made.

They were then asked whether any of these improvements had led them to making more bus trips. The tables in the following sub sections show:

- % noticing impact by area
- % saying improvement had made a major impact
- % saying they had made more bus trips

5.3.1 Bus Improvements

Awareness

The tables in **Appendix D** show the awareness of the Bus Improvements.

The tables in the Appendix show the overall awareness of bus improvements was 22% - this was highest in Dartford and Warwick (34% and 45% respectively). The tables also show that the overall proportion of those who were aware saying the initiatives had made a major impact was 37%. Of those aware 9% said the initiatives had caused them to make more trips. In terms of overall impact 9% of the 22% of respondents who were aware of the improvements had increased the number of bus trips made. (This represents 2% of respondents).

A summary table showing the mean scores by feature type and area is shown at the end of this section. These are overall awareness scores for both bus users and non bus users.

Looking at detailed tables gives a better guide to what is important by area because some areas only score highly on one or two features which may not be reflected in a high overall average score.

Below the key features where each area scores substantially higher than the mean, have been highlighted.

Bus Information Improvements:
Warwick has an overall awareness score of 32% scores highly on:

- Audio announcements on the bus about the next stop
- Real time bus information displayed inside the bus on a screen
- Real time bus information via text messages
- Real time bus information displayed on a web page

Dartford has an overall awareness score of 36% scores highly on:

- 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 text messages

Leeds has an overall awareness score of 36% scores highly on:

- Audio announcements on the bus about the next stop
- Real time bus information displayed inside the bus on a screen

Poole has an overall awareness score of 24% scores highly on:

- Real time bus information displayed inside the bus on a screen
- Real time bus information displayed at the stop on a screen

These are the top four scoring areas in terms of Bus Information Improvements.

Bus Interior Improvements:
Warwick has an overall awareness score of 53% and scores highly on all three features:

- CCTV
- Air Conditioning
- Leather seats

Dartford has an overall awareness score of 38% and scores highly on:

- CCTV
- Air Conditioning

Leeds has an overall awareness score of 28% and scores highly on:

- Air Conditioning

Nottingham has an overall awareness score of 26% and scores highly on:

- CCTV

Burnley has an overall awareness score of 23% and scores highly on

- Leather Seats

It is reassuring that the two areas which feature Leather seats Warwick and Burnley both score highly on this feature.

Bus Exterior/Bus Waiting Environment:
Warwick has an overall awareness score of 60% and scores highly on:

- Modern bus stops
- New bus vehicles
- Low floor bus vehicles
- Environmentally friendly bus vehicles

Dartford has an overall awareness score of 43% and scores highly on

- Modern bus stops
- Modern bus stations
- New bus vehicles

The key feature of the Nottingham scheme is a gas powered bus; Nottingham has an overall awareness score of 37% and scores highly on:

- Modern bus stops
- Environmentally friendly bus vehicles

Burnley has a relatively new bus station; Burnley has an overall awareness score of 31% and scores highly on:

- Modern bus stations
- New bus vehicles

The key feature of the Warrington scheme is a new bus station. Warrington has an overall awareness score of 26% and scores highly on:

- Modern bus stations

Interestingly awareness of Hull's new bus station scored lower than the mean. However the feedback provided in the focus groups on Hull's new bus station was largely negative.

Bus Service Improvements:
Warwick has an overall awareness score of 38% and scores highly on all features:

- 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

Dartford has an overall awareness score of 24% and scores highly on the following features:

- Dedicated drivers for each bus route
- Simplified ticketing
- Simple fares
- Simplified network or services & branded buses for each route

Table 5.3 Overall Awareness of Features by Area - Mean %

Area	Overall Awareness %	Bus Information Improvements	Bus Interior Improvements	Bus exterior/ Bus waiting environment improvements	Bus Service Improvements
Leeds	24	23	28	33	15
Hull	9	3	7	20	4
Nottingham	24	20	26	37	16
Cambridge	16	9	8	23	19
Dartford	34	36	38	43	24
Burnley	16	7	23	31	7
Warrington	15	14	13	26	7
Tyne&Wear	14	11	23	22	6
Poole	21	24	20	31	11
Warwick	45	32	53	60	38
All	22	18	24	33	15

Looking at the awareness scores of different types of features it is not surprising that exterior factors such as bus stops bus stations and new buses score more highly because they are more visible.

Although some areas score particularly well on particular attributes e.g. Nottingham Environmentally friendly bus, Burnley Leather Seats, Warrington New Bus Station, two areas in particular Warwick and Dartford score highly on most features and have the highest awareness scores.

In other areas such as Hull, Tyne and Wear awareness of features is particularly low.

Impact

Respondents were also asked to say which features had a major impact and also to state whether these new features had led them to make more bus strips.

The detailed tables are also shown in **Appendix D**.

To recap the awareness percentages are for both bus users and non bus users alike. The percentage stating the features had a major impact are only for those who were aware of the features and these respondents were asked about whether the features had led them to make more bus strips. As a consequence some of these percentages are based on very small numbers (sometimes less than 10) so the percentages stating that the features had made a major impact can be misleading.

The correlations between the three attributes shown in **Table 5.4** are positive but small. The correlation between making more bus trips and indicating a major impact is 0.12 so this does question what people were thinking of when they said the features had made a major impact. The correlations between awareness and making a major impact and making more bus trips are 0.12 and 0.08 respectively.

Table 5.4 % Awareness, major Impact and stating increase in trips

	Overall Awareness %	Average % Improvements Major Impact	% Making More Bus Trips
Leeds	24	77	2
Hull	9	12	5
Nottingham	24	19	2
Cambridge	16	36	2
Dartford	34	38	21
Burnley	16	31	6
Warrington	15	34	19
Tyne&Wear	14	37	8
Poole	21	55	19
Warwick	45	27	4
Mean	22	37	9

5.3.2 Marketing Initiatives

The tables outline the results for the awareness of Marketing Initiatives

Table 5.5 shows the awareness of the marketing initiatives was very low. Overall the average was only 5%. This was highest in Dartford and Warwick (14% and 12% respectively).

Table 5.6 shows that the proportion of those who were aware, saying the initiatives had made a major impact was 24% although this is misleadingly high since based on very low numbers. Of those aware 6% said the initiatives had caused them to make more trips.

In terms of overall impact 6% of the 5% of respondents who were aware of the improvements had increased the number of bus trips made. (This represents less than 1% of respondents).

Table 5.5 % Awareness of Features by Area - Marketing Initiatives

	Promotional materials through your front door letter box	Adverts on radio/ television	Different coloured buses for different routes	Posters/bill boards on streets and in public places	Personal Tele-marketing	Offering Information on Services	Discounted tickets for trial periods	Newspaper Advertising	Mean
Leeds	1	2	3	1	0	0	1	1	1
Hull	4	2	2	3	0	0	5	0	2
Nottingham	8	10	19	4	0	3	13	1	7
Cambridge	3	2	9	3	0	1	2	0	2
Dartford	25	17	18	16	3	7	22	1	14
Burnley	5	0	10	2	0	1	2	1	3
Warrington	13	0	2	3	1	1	4	1	3
Tyne&Wear	3	3	26	2	0	4	6	3	6
Poole	3	2	16	3	1	3	3	0	4
Warwick	28	5	29	10	0	2	19	2	12
All	9	4	13	5	1	2	8	1	5

Table 5.6 % Saying Major Impact - Features by Area - Marketing Initiatives

	Promotional materials through your front door letter box	Adverts on radio/television	Different coloured buses for different routes	Posters/bill boards on streets and in public places	Personal Tele-marketing	Offering Information on Services	Discounted tickets for trial periods	Newspaper Advertising	Mean
Leeds	0	17	14	0	0	0	0	50	10
Hull	0	0	0	25	0	0	0	0	3
Nottingham	20	11	51	27	100	57	3	50	40
Cambridge	14	0	46	14	0	50	25	0	19
Dartford	22	25	26	24	25	6	36	50	27
Burnley	8	0	4	17	0	0	20	50	12
Warrington	42	100	25	11	0	33	9	50	34
Tyne&Wear	14	63	36	33	0	70	53	0	34
Poole	38	33	34	22	50	29	25	100	41
Warwick	4	0	21	16	0	33	0	0	9
All	17	20	30	21	27	33	18	26	24

To recap the awareness percentages are for both bus users and non bus users alike. The percentage stating the features had a major impact are only for those who were aware of the features and these respondents were asked about whether the features had led them to make more bus s trips. As a consequence some of these percentages are based on very small numbers (sometimes less than 10) so the percentages stating that the features had made a major impact can be misleading. This is especially so in the case of marketing awareness.

Table 5.7 Marketing Initiatives % Awareness, Major Impact and Stating Increase in Trips

	Average % Awareness	Average % Improvements Major Impact	% Making More Bus Trips
Leeds	1	10	4
Hull	2	3	0
Nottingham	7	40	0
Cambridge	2	19	2
Dartford	14	27	6
Burnley	3	12	14
Warrington	3	34	6
Tyne&Wear	6	34	13
Poole	4	41	2
Warwick	12	9	10
All	5	24	6

5.4 Conclusions

The general conclusion is that there is low awareness of the people surveyed which included users and non users of the bus and consequently the overall impact is considered to be low.

The conclusion from this seems to be that high awareness may not be translated into making more bus trips.

6 Modelling Outputs

6 Modelling Outputs

6.0 Introduction and Background

This chapter summarises the very detailed quantitative modelling that was undertaken. A series of models has been estimated with the focus always upon how the introduction of bus soft measures[2] will impact upon bus demand.

The final models estimated are as follows:

1) Elasticity based demand models.
2) Unpacking SP models.
3) Information SP models.
4) Mode choice based demand models.
5) Route choice SP models.
6) Route choice RP models.
7) Route choice joint SP/RP models.
8) Fare simplification SP models.
9) NTS based models.

It should be noted that the elasticity based demand models are recognised as the key forecasting models and that the unpacking models provide the key value inputs used in the predictions. As such the focus is upon these and present them upfront in Sections 6.2 and 6.3. The remaining models are reported in less detail in the following sections but nonetheless provide strong contextual evidence for informing the debate. The structure of this chapter is outlined in more detail below.

Section 6.2 discusses the elasticity based demand models. Demand models are presented for car users and bus users separately with the former looking at the modal shift between car and bus when bus quality attributes are introduced to the current bus services, whilst the latter examines the reduction in bus demand when bus quality attributes are taken away from the current quality bus service.

The valuation of soft bus attributes is estimated in Section 6.3. These valuations have been estimated from the unpacking SP experiments and cover a wide range of attributes ranging from CCTV to trained drivers.

In Section 6.4 the information SP model results are outlined. Values have been estimated for a number of specific information related interventions for example real time passenger information (RTPI) in various locations (bus stations, bus stops and city centres) and smart text services that send real time bus travel information direct to the user's mobile phone.

Section 6.5 focuses upon the mode choice models. These were estimated on the same dataset that were used to estimate the demand elasticity models in Section 6.2 and represent a more conventional approach to the same issue. They also provide some context with regards the external consistency of the values of time.

The chapter then goes on to discuss, in Section 6.6, a series of route choice models. These are based on the current experience faced by bus users of choosing which bus service to travel into work by. The quality bus services travel along one route and the non-quality bus along another route. The models here estimate values of time and also the value of quality as

[2] We note that the term 'bus soft measures' is interchangeable with bus soft attributes and bus soft interventions.

presented by a quality ratings index. The aim here is not to use the results to forecast changes in demand but to demonstrate that quality bus does have real impact on bus patronage.

Section 6.7 reports on the findings of a complementary piece of research on fares simplification that was commissioned as part of the bus soft factors study but which came on line half way through the project. The key findings from a SP and a stated response (SR) experiment are presented.

Section 6.8 reports the results of the NTS style models which have been estimated on trip data collected during the study surveys.

6.1 Elasticity Based Demand Model and Valuation of Soft Bus Attributes

This section reports on the elasticity based demand models for car users and bus users before presenting the valuations found for a raft of soft bus attributes.

6.1.1 Elasticity Based Demand Model

The elasticity based demand model was based upon the main SP exercises undertaken in the CAPI survey. The aim was to determine the impact of new and improved buses on demand.

Whilst the SP exercises were conventional in the sense of offering choices between two modes, (car and bus), characterised by standard variables, such as time, cost, headway and bus type, the emphasis here is upon directly estimated demand elasticities rather than valuations. This is because the purpose of this study is to estimate demand impacts rather than the more traditional approach of estimating values and then deducing the demand impacts by what these valuations would imply in conjunction with some reference fare or time elasticity.

Nonetheless it is possible to estimate conventional choice models to this data. This has been done and the results are reported in Section 6.5.

The demand models reported here are based on car commuters' choices between car and bus, where the emphasis was on making car less attractive and bus more attractive, and bus commuters' choices between bus, car and other possibilities, where the emphasis was on making bus less attractive and, for those with a car available, making car more attractive.

The main SP exercises offered choices between car and bus in all ten case study areas. The attributes used to characterise bus were: fare; journey time; reliability, in terms of average lateness; frequency, in terms of minutes between buses; and bus type. The bus type could be the new bus was present or not in the area. Two other levels were that the on-bus features only were present and the off-bus features only were present.

The attributes used to characterise car were cost, time and a combination of walk time from the car parking space and time spent searching for a parking space.

The attribute levels for time, cost and lateness were specified as proportionate changes on the respondent's current levels. If these were unknown, best estimates were used as defaults.

The use of proportionate changes facilitates the modelling outlined below. Pre-specified levels were offered for frequency and bus type.

The bus users' SP exercise focuses on making bus less attractive. This is because they cannot make more bus commuting journeys as a result of bus becoming more attractive. Hence the demand function can only be specified for deteriorations on the current position. To do otherwise would lead to lower elasticities than the true market response. The same argument applies to the demand function specified for car commuters. However, there was concern that in the bus SP exercise there was a need to offer some scenarios where bus was improved, and this was the case in the second, fifth, eighth and tenth scenarios offered. These are not used in the modelling.

6.1.2 Data Collection

CAPI based surveys were conducted in all ten case study areas. The sample of bus users obtained was 1,146. Surveys were conducted amongst those who had a quality bus service in their area to determine their reaction to the removal of the quality bus. 820 car users were surveyed. These did not have a quality bus service for their journey to work but there were such services in the area. In each case the respondent was shown a show card to illustrate what a quality bus looked like.

6.1.3 *Modelling Approach*

The modelling approach is based around analysis of changes in demand induced by the changes in bus and car characteristics. For each of the 80 scenarios offered, the number who remain with the mode in question is calculated and expressed as a ratio relative to the number in total who were offered that scenario and who currently use that mode. Thus the model takes the form:

$$\frac{V_N}{V_B} = \prod_{i=1}^{n} \left(\frac{X_{iN}}{X_{iB}} \right)^{\alpha_i} e^{\sum_{j=1}^{m} \beta_j (Z_{jN} - Z_{jB})}$$

If, say, current car users are analysed, then VB is the base or total number who evaluated a particular scenario. VN is the new volume of demand, that is all those who stated that they would remain with car.

Xi is any continuous variable, such as time or cost. Thus XiN is the new level of the variable relative to the base level XiB and thus the ratio is the proportionate change specified in the SP design. The □i are therefore elasticities.

The ZjN are dummy variables representing categorical variables in the new situation whereas the ZiB relate to the base situation. Thus ZjN might indicate the presence of a new bus, relative to a base ZIB of an old bus. The □j denote the proportionate change in demand from, in this example, the presence of a new bus. The model is estimated in the form:

$$\ln\left(\frac{V_N}{V_B} \right) = \sum_{i=1}^{n} \alpha_i \ln\left(\frac{X_{iN}}{X_{iB}} \right) + \sum_{j=1}^{m} \beta_j Z_{jN}$$

This modelling approach was used since it directly yields elasticity estimates which are easily interpreted and compared with other evidence. Rescaling relative to known elasticity evidence to allow for strategic bias is straightforward.

It was also intended to use this modelling approach to test whether a demand function based on generalised cost or separate elasticities performed better. This was not possible given the range of different absolute times and costs offered due to customisation of the SP scenarios around commuters' actual journeys. However, a comparison could still be undertaken of demand impacts deduced from values of bus quality (taken from the unpacking SP and including a package effect) in conjunction with fare elasticities with directly estimated bus quality demand impact. These models are reported below.

6.1.4 *Models with Time Valuations of Bus Quality Change*

For both car and bus users, five demand models are reported as follows, it should be noted that only models III, IV and V have time based changes.

I. Dummy variables specified for changes in on-bus, off-bus and both on and off-bus quality based on the data pooled across the original 80 SP scenarios offered.

II. As I but the data is pooled only up to the area level, thereby allowing the ability to distinguish between the different bus types. Single parameters are estimated for changes in on-bus, off-bus and both on and off-bus quality.

III. As II but for each area the bus quality changes are represented by the time valuations obtained from the unpacking SPs. The parameters vary by on-bus, off-bus and both on and off-bus change but are the same across areas for these three categories.

IV. As III but a single parameter is estimated to the time change that represents the bus quality change regardless of the type of change.

V. As IV but the effect of the bus quality change is allowed to vary with the level of frequency.

In Model I the weights in the weighted least squares estimation is estimated rather than imposed. In addition, and in the car users' models, 40 car users have been removed who in all 12 scenarios choose bus. The results tended to be highly plausible and consistent with other evidence on elasticities.

To allow for the different packages of bus quality changes across areas, disaggregation was undertaken by area type. Thus Model II only pools across the responses obtained in any area. The bus SP exercise was presented in all 10 areas. After removing those scenarios where there was no demand for bus in the new situation, 736 bus observations remained in the demand model. The car SP exercises were administered in areas 1, 2, 3, 5, 7, 8 and 10, yielding 540 car observations.

It was observed that for both car users and bus users the larger data sets of Model II yield very similar parameter estimates to Model I. However, the goodness of fit is somewhat worse as a result of the fewer individuals making up any observation and hence the greater variability in the dependent variable, even after accounting for sample size through the use of weighted least squares.

Given the precision with which the bus quality demand impacts were estimated, and note that this was also an issue in the disaggregate modelling of the individual choice data; there was little point in specifying different dummy variables across areas.

Model III allows for the size of the change in quality by weighting the dummy variable on an area basis according to the time valuation of that change estimated in the unpacking SP. Thus if the unpacking SP estimated that the changes in Area Z have in total a 5 minute valuation whilst those in Area Y have a 10 minute valuation, the variable representing the change in quality would be 10 for Area Y and 5 for Area Z when these changes are observed in the data.

The coefficient estimates therefore indicate the effect on demand from a minute change in service quality regardless of what the actual service quality change is.

Note that this is not the same as using a generalised time approach. Whilst there are analogies in the use of composite terms, the demand impacts do not depend on the proportion that they form of generalised time.

For both the car users' and bus users' models, it is encouraging to find that a better fit is obtained by Model III compared to Model II when the size of the quality change is considered.

What is found in Model III, where separate coefficients are estimated to the time change according to whether it is an on-bus, off-bus or both on and off-bus change (termed all-bus), is that for the car users' model there is no clear pattern. The imprecision of the off-bus coefficient estimate does not help matters when looking at the relativities between on-bus, off-bus and all-bus for all the models. For car users on-bus attributes seem to have more impact than all-bus attributes when both factors are significant (Model III) which slightly muddies the water. It is not clear why this result has occurred although the relative imprecision of the coefficient estimates should be borne in mind.

Hence on grounds of sensible properties, Model IV where the coefficient is constrained to be the same regardless of the source of the quality improvement is preferred even though it is statistically inferior. The parameter estimate is closest to that for the new bus improvement, but it is this which occurs most often in the SP design.

In Model IV, a 12.78 minute improvement as in Area 4, which is the largest amongst the case studies, would be forecast to reduce car commuting by around 1.5%. The smallest improvement, of 6.09 minutes in Area 9, would be forecast to reduce car demand by around 0.75%.

The formulae for the calculations are set out below where T2 is equal to generalised time after the introduction or removal of the quality bus and T1 is equal to the generalised time before the introduction or removal of the quality bus.

Note that the valuations are taken from the unpacking exercise which are outlined in Table 6.6 represent the values of the package of attributes on offer in each of these areas. Using the package value (based on the sum of parts) for Area 1 (11.37 minutes for bus and 11.96 minutes for car) one can see that introducing the new package would reduce car commuting by around 1.4%, whilst taking the quality package away from an existing bus model would reduce bus demand by around 16.4%.

Car Users Model $e^{0.00123 * (T2 - T1)}$ *i.e. for area 1* $e^{0.00123 *(11.37)} = 0.9861$

Bus Users Model $e^{-0.015 * (T2 - T1))}$ *i.e. for area 1* $e^{-0.015 *(11.96)} = 0.8358$

Some care needs to be made when interpreting and comparing these numbers. The car users' model focuses upon the number of existing car users who will switch from car to bus. Quite how this translates through into additional bus users depends upon the relative sizes of the car and bus markets in the area for which forecasts are being prepared. In Section 7.2 this issue is addressed in more detail and present forecasts in **Table 7.2** which assumes a current bus market share of 20% for commuting compared with a 65% share for car (both drivers and passengers). These market shares would translate the modal switch from car to bus as outlined above into around a 6.5% increase in bus demand.

We now need to consider how this compares with the reduction in bus demand of around 16.5% as forecast by the bus users model. The key part of this reduction is to focus upon what part of the 16.5% reduction would shift back to car. This has been calculated in **Table 7.3** and estimates that around 5.11% of current bus users would shift back to car, leaving a reduction of another 11.26% that might be accounted for by passengers switching to another mode of travel, working from home etc. The key comparator between the car users and bus users' model is therefore the bus vs. car modal shift element of both forecasts. The figures would suggest that 6.5% and 5.11% compare very well against each other. The non-modal reduction (11.26% in this example) in the bus model might be slightly on the high side but this is not of great concern since it is the modal shift part of demand that are to be compared and focused upon in the forecasts.

For bus users, Model III indicates a larger effect per minute if both on-bus and off-bus (termed all bus) changes occur simultaneously. However, the precision of the parameter estimates is such that there is no confidence that there is a package effect at work here that implies a larger unit effect when more things are changed. Moreover, the unpacking models have found a striking similarity between the valuation of a package and the sum of the valuations of the package elements.

Even though Model IV is statistically inferior, this is preferred. As stated above it implies that the removal of Area 1's new buses would reduce bus demand by around 16.4%.

Model V allows the bus quality effect to interact with service frequency. For car users, the effect is greater at lower headways, yet the hypothesis from the focus groups is that quality buses are more likely to succeed when a high level frequency is offered. The reverse is apparent here but a clear judgement cannot be made on this because for commuting journeys there is a tendency to find a concentration of high frequency bus services. For bus users, no clear pattern is apparent.

The results for the bus models seem broadly in line with the available evidence and it is felt there is no great need to rescale the models so that the fare elasticity reproduces some other figure. The consistency of the results is compared further with outside evidence in Section 7.2.

The interpretation of the results is not helped by the precision with which the relevant coefficients are estimated. It is worth making three important points here:

- Firstly, the aim is to estimate small effects (akin to estimating cross elasticities and all the problems that involves). Small effects on demand are difficult to discern, even with SP.
- Secondly, the disaggregate choice modelling of this exact same data did not recover estimates which were very precisely estimated. It is certainly the case that this modelling of the data has not been outperformed by the more usual discrete choice modelling approach which is presented in Section 6.5. It seems reasonable to conclude that the more conventional disaggregate choice modelling approach has not outperformed the demand modelling approach of Section 6.2 in terms of the plausibility and precision of results. There are two possible reasons for this. Firstly, the grouping of the data in the demand modelling can be expected to reduce the amount of error in any particular observation, as errors offset in the pooling process. Note that the estimation procedure does place more weight on observations based on more responses which can be expected to be more reliable. Secondly, it may well be that the constant elasticity approach of the demand model provides a more realistic account of individuals' collective behavioural responses than does the conventional logit model. The latter imposes strong variation in elasticities with market share, and in the formulation adopted also according to attribute level, yet econometric modelling of travel demand data often struggles to detect even modest variations in elasticities when explicitly tested for.
- Thirdly, this is the approach recommended by the consultants to the DfT.

Those 40 car users who stated throughout the SP exercise that they would use bus have been removed from the data. Such a pattern of responses was not considered as credible.

A weighted estimate was used, given that the number of observations upon which each demand response is based varies. The procedure estimates the best power (λ) for the weight formula of 1/Volumeλ .

Table 6.1 Car Users' Models

Variables	Model I Estimates	Model II Estimates	Model III Estimates	*Model IV Estimates*	Model V Estimates
Constant	n.s.	n.s.	n.s.	***n.s.***	n.s.
Bus Fare	0.076 (7.1)	0.075 (7.4)	0.072 (7.2)	***0.074 (7.5)***	0.073 (7.3)
Bus Time	0.114 (6.3)	0.119 (6.8)	0.116 (6.6)	***0.119 (6.8)***	0.116 (6.5)
Bus Headway	n.s.	n.s.	n.s.	***n.s.***	n.s.
Late Time	n.s.	n.s.	n.s.	***n.s.***	n.s.
Introduce On Bus	-0.012 (1.5)	-0.013 (1.7)	0.0024 (2.2)	***0.00123 (2.3)***	
Introduce Off Bus	-0.009 (0.8)	-0.006 (0.6)	0.0025 (1.0)		
Introduce All Bus	-0.009 (1.4)	-0.008 (1.3)	0.0011 (2.1)		
New Bus Head5					-0.0009 (0.9)
New Bus Head10					-0.0015 (1.9)
New Bus Head15					-0.0020 (2.3)
Car Time	-0.066 (3.2)	-0.075 (3.7)	-0.070 (3.5)	***-0.071 (3.5)***	-0.069 (3.5)
Car Cost	-0.062 (3.3)	-0.061 (3.4)	-0.058 (3.3)	***-0.060 (3.4)***	-0.061 (3.5)
SearchWalk	n.s.	n.s.	n.s.	***n.s.***	n.s.
Weight Power	-0.7	-1.4	-1.4	***-1.4***	-1.4
Adj R^2	**0.620**	**0.201**	**0.210**	***0.208***	**0.209**
Obs	**80**	**540**			

Note: Adj R^2 is for when an intercept is included; Note: Model IV is the preferred model; t-stats in ( ); n.s. not significant.
Note: In models I and II dummy variables are specified for the change in bus service quality hence the coefficients are negative. In models III and IV the bus service quality improvement is represented by a reduction in journey times (a negative term) hence the coefficient is positive.

Table 6.2 Bus Users' Models

Variables	Model I Estimates	Model II Estimates	Model III Estimates	*Model IV Estimates*	Model V Estimates
Constant	-0.142 (6.4)	-0.147 (6.0)	-0.137 (5.7)	***-0.132 (5.7)***	-0.149 (5.4)
Bus Fare	-0.651 (11.2)	-0.703 (10.8)	-0.702 (10.9)	***-0.698 (10.9)***	-0.711 (10.9)
Bus Time	-0.224 (4.2)	-0.212 (3.5)	-0.214 (3.5)	***-0.219 (3.6)***	-0.164 (2.5)
Bus Headway	-0.109 (6.0)	-0.111 (5.3)	-0.111 (5.3)	***-0.112 (5.4)***	-0.097 (3.4)
Bus Av Late	-0.047 (3.4)	-0.051 (3.2)	-0.051 (3.3)	***-0.053 (3.4)***	-0.050 (3.1)
Remove All Bus	-0.117 (6.0)	-0.130 (5.8)	-0.016 (6.8)	***-0.015 (6.8)***	
Remove On Bus	-0.063 (2.2)	-0.047 (1.5)	-0.011 (2.1)		
Remove Off Bus	-0.003 (0.1)	-0.006 (0.3)	-0.012 (2.0)		
New Bus Head10					-0.014 (4.0)
New Bus Head15					-0.007 (2.0)
New Bus Head20					-0.009 (2.4)
New Bus Head30					-0.018 (4.5)
Car Time	n.s.	n.s.	n.s.	***n.s.***	n.s.
Car Cost	n.s.	n.s.	n.s.	***n.s.***	n.s.
Half Search & Walk	n.s.	n.s.	n.s.	***n.s.***	n.s.
No search 1mWalk	n.s.	n.s.	n.s.	***n.s.***	n.s.
Weight Power	-1.5	-0.9	-0.9	***-0.9***	-0.9
Adj R^2	**0.734**	**0.210**	**0.220**	***0.223***	**0.215**
Obs	**72**	**729**	**729**	***731***	**728**

Note: Model IV is the preferred model; t-stats in ( ); n.s. not significant

6.2 Valuation of Soft Bus Attributes

The values of the soft bus attributes used in the elasticity demand modelling came from the unpacking SP experiment, which was one of the main SPs offered to respondents in all ten case study areas. A discrete choice logit model was used to estimate the SP experiment which offered respondents a choice of two buses, one deemed a quality bus and the other a non-quality bus. The choice was based upon existing bus services known to the respondent in order to make the experiment as realistic as possible. The quality attributes offered with the quality bus were also based on the existing set of attributes that was available in real life and different combinations were offered to the respondent with the trade off being journey time savings on the non-quality bus. A discrete choice logit model was used to estimate the different values.

Sometimes the whole package of attributes was offered in order to try and estimate a package effect. The quality attributes offered within each area are outlined in **Table 6.3**. The experimental design meant that attributes were switched on and off for different choice scenarios and in some instances the full set of attributes was offered in order to estimate the package effect.

No figures have been provided for the introduction of a customer charter or leather seats because user valuations of these factors are not statistically different from 0. No figures have been provided for in-vehicle seating plan because the modal valuations were counter intuitive.

Table 6.3 Quality Attributes Offered in Unpacking SP

Area	Att1	Att2	Att3	Att4	Att5	Att6	Att7
1 Poole	New LF Bus	On-Screen Displays	Trained Drivers	Climate Control	CCTV at Bus Stops	RTPI	
2 Hull	New LF Bus	CCTV on Buses	Simplified Ticketing	New Interchange Facilities			
3 Tyne & Wear	New LF Bus	Trained Drivers	CCTV on Buses	New Bus Shelters	Simplified Ticketing	RTPI	
4 Kent	New LF Bus	Trained Drivers	Audio Announcements	Climate Control	CCTV at Bus Stops	New Bus Shelters	RTPI
5 Cambs.	New LF Bus	Trained Drivers	RTPI	New Bus Shelters			
6 Leeds	New LF Bus	On-Screen Displays	CCTV on Buses	Audio Announcements	Climate Control	New Bus Shelters	RTPI
7 Warrington	New LF Bus	Trained Drivers	RTPI	New Interchange Facilities			
8 Lancashire	New LF Bus	Trained Drivers	CCTV on Buses	New Bus Shelters	RTPI		
9 Warwick	New LF Bus	Trained Drivers	New Bus Shelters				
10 Notts.	New LF Bus	Trained Drivers	CCTV on Buses	Simplified Ticketing	New Bus Shelters	RTPI	

LF – Low floor

The full final model estimations are presented in **Appendix E** but for now a cut down model is reported in **Tables 6.4a and 6.4b** which only reports the coefficient values for individual attributes and for the full packages for each case study. The model is based upon 14,409 observations and has decent explanatory powers with an adjusted R^2 of around 0.13.

Table 6.4a Final Unpacking Model – Individual Attributes

Variables	Estimates
Audio Announcements	0.187(2.2)
CCTV on Buses	0.389(4.8)
CCTV at Bus Stops	0.445(5.2)
Customer Charter	0.134(1.2)
Climate Control	0.190(2.5)
New Interchange Facilities	0.194(2.6)
Leather Seats	0.166(1.2)
New Bus with Low Floor	0.272(6.9)
On-Screen Displays	0.197(2.7)
In-vehicle Seating Plan	0.338(2.5)
RTPI at Bus Stop	0.259(5.3)
New Bus Shelters	0.166(2.6)
Simplified Ticketing	0.219(3.7)
Time Saving	0.153(6.9)
Trained Drivers	0.402(6.6)
Adj R^2	**0.133**
Obs	**14,409**

Note: t-stats in brackets; RTPI – Real time passenger information

Table 6.4b Final Unpacking Model – Full Packages

Variables	Estimates
Full package_Poole (Area 1)	2.21(22.0)
Full package_Hull (Area 2)	1.18(6.1)
Full package_Tyne & Wear (Area3)	1.99(5.2)
Full package_Dartford (Area 4)	2.07(11.0)
Full package_Cambridge (Area 5)	1.00(7.4)
Full package_Leeds (Area 6)	1.71(7.9)
Full package_Warrington (Area 7)	1.25(10.0)
Full package_Burnley (Area 8)	1.60(4.6)
Full package_Warwick (Area 9)	1.10(4.7)
Full package_Nottingham (Area 10)	1.42(7.9)
Adj R^2	**0.133**
Obs	**14,409**

Note: t-stats in brackets.

The series of soft bus intervention values which have been estimated directly from the model are presented below. They are presented in **Table 6.5** and **Table 6.6**, the former including values and t stats for the overall values and the latter including values segmented by bus and car users. Overall, the highest valuations are associated with safety type interventions (i.e. CCTV at both bus stops and buses) and trained drivers; whilst the lowest value is associated with a customer charter which was specific to Tyne & Wear and which promised minimum standards of service and fare refunds if these were not met.

The t-stats for the unsegmented values in **Table 6.5** are reported alongside the values to indicate the significance of the estimated values. All values are significant at the 95% level with the exception of 'customer charter' and 'leather seats'. It is probably worth defining at this stage the most obscure attribute in the table, namely 'in-vehicle seating plan'. This relates the organisation of the bus into specific seating areas aimed at different types of customer and reflected in the type of seats, sometimes single seats for those wishing for more privacy and other times the more traditional double seat. It is also worth pointing out that the attribute 'trained drivers' is a proxy for 'driver quality', i.e. smoothness of ride and interactions with passengers.

Table 6.6 sets out the values presented in Table 6.5 segmented by bus and car users. This demonstrates the relative important each group places on each type of intervention. Generally, this represents intuitive values, for example these values suggest that bus users' value interventions such as CCTV at bus stops, the in-vehicle seating plan and climate control highly which reflects common safety and comfort concerns of bus users. Conversely the values suggest that car users place more relative importance on interventions including CCTV on bus, leather seats, new interchange facilities and simplified ticketing. This seems to be commensurate with the different concerns and expectations car users generally have of buses.

A comparison with existing UK based evidence is not always possible but an attempt to do this is made in **Section 7.2**. It is concluded that that the values from this study tend towards the lower range of values as reported by the existing evidence.

Table 6.5 Values of Soft Bus Interventions

Attribute	Value in Mins (t stats)	Attribute	Value in Mins (t stats)
Audio Announcements	1.22 (2.2)	New Interchange Facilities	1.27 (2.6)
CCTV at Bus Stops	2.91 (5.2)	On-Screen Displays	1.29 (2.7)
CCTV on Buses	2.54 (4.8)	RTPI	1.69 (5.3)
Climate Control	1.24 (2.5)	Simplified Ticketing	1.43 (3.7)
New Bus Shelters	1.08 (2.6)	Trained Drivers	2.63 (6.6)
New Bus with Low Floor	1.78 (6.9)		

Table 6.6 Segmented Values of Soft Bus Interventions

<table>
<tr><th rowspan="2">Attribute</th><th colspan="2">Value in Mins</th><th rowspan="2">Attribute</th><th colspan="2">Value in Mins</th></tr>
<tr><th>Bus</th><th>Car</th><th>Bus</th><th>Car</th></tr>
<tr><td>Audio Announcements</td><td colspan="2">1.22</td><td>New Interchange Facilities</td><td colspan="2">1.27</td></tr>
<tr><td>CCTV at Bus Stops</td><td>3.70</td><td>2.49</td><td>On-Screen Displays</td><td>1.90</td><td>0.89</td></tr>
<tr><td>CCTV on Buses</td><td>1.66</td><td>3.18</td><td>RTPI</td><td>1.47</td><td>1.74</td></tr>
<tr><td>Climate Control</td><td colspan="2">1.24</td><td>Simplified Ticketing</td><td>0.84</td><td>2.06</td></tr>
<tr><td>New Bus Shelters</td><td colspan="2">1.08</td><td>Trained Drivers</td><td>2.46</td><td>2.78</td></tr>
<tr><td>New Bus with Low Floor</td><td>1.19</td><td>2.23</td><td></td><td></td><td></td></tr>
</table>

Only overall figures are presented for audio announcements, climate change and new bus shelters because the segmented bus and car user values obtained from the models are not statistically significant.

Earlier work by SDG (1996) maintained that under certain circumstances a combination of different soft bus interventions can be valued more than the sum of the individual interventions due to the halo effect or interactions between the variables. The package effect as it was termed has been identified in further studies (e.g. Espino et al. 2006 & 2007, Laird & Whelan 2007) and varied according to the number of attributes examined.

No s trong ev idence f or the pac kage ef fect has been i dentified t hrough t his r esearch. Statistically there is no pattern to distinguish between the packages and the difference between the two sets of numbers is minimal and as such a capping exercise to scale individual attributes has not been applied here.

Table 6.7 Comparison of Values of Soft Bus Intervention Values

Area	Number of Attributes	Valuation from parts (Minutes)
1 Poole	**6**	**11.54**
2 Hull	**4**	**7.02**
3 Tyne & Wear	**6**	**11.15**
4 Dartford	**7**	**12.55**
5 Cambridge.	4	7.18
6 Leeds	**7**	**10.84**
7 Warrington	**4**	**7.37**
8 Burnley	5	9.72
9 Warwick	3	5.49
10 Nottingham	6	11.15
AVERAGE	**5.2**	**9.40**

Note: t- stats in ( ) [1] Percentage is based upon difference divided by full package value.

Table 6.7a Comparison of Segmented Values of Soft Bus Intervention Values

Area	Number of Attributes	Valuation (Minutes)		
		Full Sample	Bus Users	Car Users
1 Poole	**6**	**11.54**	**11.96**	**11.37**
2 Hull	**4**	**7.02**	**3.89**	**10.16**
3 Tyne & Wear	**6**	**11.15**	**8.70**	**13.07**
4 Dartford	**7**	**12.55**	**12.36**	**12.78**
5 Cambridge.	4	7.18	6.20	7.83
6 Leeds	**7**	**10.84**	**9.76**	**11.58**
7 Warrington	**4**	**7.37**	**5.32**	**9.44**
8 Burnley	5	9.72	7.86	11.01
9 Warwick	3	5.49	4.73	6.09
10 Nottingham	6	11.15	8.70	13.07
AVERAGE	**5.2**	**9.40**	**7.95**	**10.04**

6.3 Information Stated Preference

The information SP was based on the smallest sample size of all the SP experiments, with 248 respondents generating 2,232 observations. A discrete choice logit model was again applied to the unpacking SP data set. Each respondent was presented with a range of choice scenarios which offered a reduction in bus journey time versus a combination of information options such as real time information displays at various points (i.e. city centre. bus station & bus stops), real time text messaging with various charges (free up to 20p), being texted the scheduled timetable and real time information as displayed on the web.

A cut down version of the final model used in the estimations is presented in **Table 6.8** which reports the coefficient estimates for the individual information attributes. A more detailed version is presented in **Appendix F**.

Table 6.8 Values of Information Interventions

Variables	Estimates
RTPI city centre	0.698(4.5)
RTPI bus station	0.714(3.7)
RTPI bus stops	0.839(6.7)
SMS-RTPI 10p	0.258(1.7)
SMS-RTPI 20p	-0.0314(-0.2)
SMS-RTPI 5p	0.228(1.0)
SMS-RTPI free	0.537(4.2)
Audio Announcements on Bus	0.184(1.1)
SMS_timetable –free	0.106(1.7)
Time saving	0.166(4.0)
Web	0.239(1.9)
Adj R^2	**0.229**
Obs	**2232**

RTPI – real time passenger information; SMS – SMS Text message (various costs); t-stats in ( )

We now focus upon **Table 6.9** which reports the values of the information interventions estimated by the model alongside the t-stats to give an indication of significance.

Table 6.9 Values of Information Interventions

	Valuation in Minutes (t-stats)		Valuation in Minutes (t-stats)
Real Time Information in City Centre	4.20 (4.5)	SMS Real Time Information _10p	1.55 (1.7)
Real Time Information at Bus Station	4.30 (3.7)	*SMS Real Time Information _20p*	*-0.19 (-0.17)*
Real Time Information at Bus Stops	5.05 (4.7)	*Audio Announcements on Bus*	*1.11 (1.1)*
SMS Real Time Information_Free	3.23 (4.16)	SMS_Timetable - free	0.64 (1.7)
SMS Real Time Information _5p	*1.37 (1.00)*	Web Based Information	1.44 (1.9)

Italics - insignificant

The values appear to be highly plausible with real time information displays at bus stops, bus stations and city centres valued most highly. SMS messages which are free are also highly valued and not surprisingly those that are not free are less so. The lowest valuation appears for SMS messages that only send the scheduled timetable, which in itself is a free service. Clearly the higher valuation for a SMS message that cost 10 pence to send and receive compared to that of which costs 5 pence would appear out of line but a look at the estimation results points to there being no significant difference between the two values. In addition the SMS 5 pence value is not significant at the 95% level or the 20p level. An effort was made to fit a functional form between the SMS Real Time Information options for which a charge was levied (5p, 10p & 20p) to see if this improved the significance, however it had the opposite effect prompting a preference to report the individual coefficients instead.

Overall the values for the real time information interventions are higher than those estimated as part of the unpacking exercise. This is not surprising since the unpacking exercise on average offered the respondents more attributes across different areas, i.e. not just information. This will have been taken into account by respondents and will have resulted in smaller values for the information attributes as compared with those reported for the Information SP were only information attributes were being traded off.

It should also be noted that the base against which these values are estimated is one in which there is 'no provision of information'. In reality (the Do Minimum in an appraisal) there will always be some form of information available which would be expected and this will be expected to reduce the value.

6.4 Mode Choice Demand Model

This model has been estimated from the same data set as used in the demand elasticity model. It offers a more conventional way to forecast demand, using a discrete choice logit model formulation, but is not preferred to the demand elasticity models reported in Section 6.2.

Separate models are reported for both car and bus users and are outlined in the sections below. It should be noted that most mode choice model specifications are generic in that the coefficients for each mode take on the same value. This is not the case here were it has been allowed the coefficient values to vary between the two modes in question within each model.

6.4.1 Car User Models

The 820 respondents yield 9,840 choice observations. Of these 35 respondents have choices other than car or bus, whilst 1,205 observations are removed where coding errors led to excessive times or costs being presented for one or both modes as the times and costs offered in the SP are driven off the current levels. This leaves 8,600 observations and the results for this data set are reported as Model I. The vast majority (89%) of choices are in favour of car despite the emphasis on making the car worse and bus better.

The alternative specific constant favours car, as would be expected, and is equivalent to about 80 minutes of car time. Note that this will also include the net effect of the disutility involved in walking to and from buses since this attribute was not included in the SP exercise.

Variations in bus late time do not impact upon car users' choices and nor do variations in bus headway. It is worth pointing out that the variation in average late time is limited, taking on the levels of 0, 1 and 2 whilst all the service headways were respectable.

Car walk time has a significant impact on choice, and is valued 2.27 times car in-vehicle time. However, search time variations do not have a significant effect, and again there are here only small variations given the variable was specified as proportionate variations and some motorists specified zero search time for the current situation.

Bus time and car time are both highly significant and similar. The same is true for bus cost and car cost. The value of time of around 8.6 pence per minute seems plausible for motorists.

As for the benefits of improved bus quality, the overall package is worth 5.3 minutes of bus time. However, just providing the on-bus facilities is valued more highly at 8.3 minutes whilst the off-bus improvements are far from significant. Once again, as was apparent in the direct demand model, the imprecision of the off-bus coefficient estimate does not help matters when looking at the relativities between on-bus, off-bus and all-bus for all the models. The coefficients for all-bus and on-bus are not significantly different (t = 0.63) which might indicate that people focus upon on-bus attributes at the expense of off-bus and would also explain the insignificance of the Bus Off coefficient. This slightly muddies the water and it is not clear why this result has occurred.

Consideration of a better fit was obtained by allowing an incremental time effect for when the on-bus improvements were present (Levels 1 and 3 of the bus variable) in place of the additive dummy variables. This allows the value of time to vary with the quality of bus. This was the correct sign in terms of reducing the bus time coefficient but it was minor and far from statistically significant.

Given the precision with which the quality coefficients are estimated, it made little sense examining how they vary across the quality levels prevailing in each case study area.

Model II removes those who always chose the same alternative and did not have a genuine reason for doing so. The latter includes always choosing the same because it was the best, or the quickest or the cheapest. Those who stated that they did not take the exercises seriously, found it difficult or considered it unreal, as a reason for always choosing the same mode, were removed. As can be seen this has very little impact on the results.

Model I II specified incremental interaction effects for those individuals who stated that they ignored a variable or found it unrealistic. The full model is not reported in this section since it does not have a great impact on the main coefficients, with search time becoming significant but still less than in-vehicle time, the coefficient for proving the on-bus facilities becoming larger although not significant, and now a lesser sensitivity to fuel cost than bus fare which seems realistic.

It is expected the incremental effect to indicate a coefficient closer to zero if the variable has been ignored. The only significant effect was for car time.

Unrealistic is defined as anyone expressing that the attribute in the SP was very or fairly unrealistic. There are too few of the former to make it sensible to distinguish between the two. A large number of significant effects were discerned but, as has been pointed out, the impact on the main effects is small. The full models are reported in **Appendix G** for those readers who wish to examine them in more detail.

Table 6.10 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)
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 ( )

6.4.2 *Bus User Models*

The same pattern of modelling is followed for the bus users; mode choice models which are reported in the table below.

From 13,752 SP records covering 1,146 individuals, 182 observations were removed where the choice was an undefined 'other' and 1,109 observations with large times and costs due to recording errors. Once again a discrete choice logit model was used in the estimation.

Of the remaining 12,461 SP choices, the vast majority (73%) were for bus and in 3,828 cases car was apparently available for the commuting journey. A wide range of choices other than car and bus were possible, and the attractiveness of these options was represented by alternative specific constants (ASCs) as set out in the table below. Note that walking time to and from the bus was not included in the SP exercise and thus its disutility will be discerned by the ASC for bus.

Given bus is the base ASC set to zero, it is not surprising that all the ASCs are negative since the options are either inferior or, as in the case with car, unavailable, whilst the ASC discerns the net effect of the disutility stemming from the time and cost associated with the option.

The car terms all seem plausible. With regards bus, late time has a relatively high value, as might be expected, but bus time is not significant. The bus fare coefficient exceeds the fuel price coefficient which is not surprising.

The low value of bus time in the bus model does not seem to be the result of simple correlations with other attributes. Neither can it be concluded that the low bus coefficient is the result of people ignoring time, which in some circumstances might be a reason since bus time rarely varies, since bus time does have a significant effect in the bus elasticity demand model.

Table 6.11 Bus Users' Mode Choice Models

Variables	Model I Estimates	Model 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)
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 ( )

Given the poor result for bus time, the valuations of bus quality are better expressed relative to the car time coefficient.

Given that the bus time coefficient was not significant, it made little sense to examine whether bus quality impacted on the value of bus time. It was found that the introduction of the bus all quality bus exceeds the valuation of either introducing just the on-bus or just the off-bus facilities. However, the values are much larger, with the introduction of the quality bus now valued at 20 minutes.

When those who always chose the same option apparently because they did not take the exercise seriously or found it too difficult were removed, the sample is reduced by only 0.3% to 12,425. There is little point in reporting this model.

However, these respondents are removed for Model II which reports the same analysis as was conducted for car users relating to ignored and unrealistic variables.

Model II contains significant incremental effects for whether a variable was considered realistic and significant and right sign incremental effects for ignored variables, The inclusion of these terms does not make a great deal of difference to the main results and so have not to reported the coefficient estimates in Table 6.11. The full models can however be found in **Appendix G**.

Even though an effect from ignoring bus time has been identified, this does not help to produce a robust result for the main bus time coefficient.

Isolating the ignoring of the bus quality attributes does impact on the main effects. In terms of equivalent car time, the introduction of the all quality bus attribute is worth around 24 minutes. The provision of just the on-bus facilities is valued more highly at 26.4 minutes. These values seem somewhat on the large side.

6.5 Route Choice Models

When putting together the set of choice experiments for this project an opportunity was identified to estimate some highly innovative route choice models which could use a combination of RP and SP data based on the current experience of bus users who faced a very real choice of using two different bus services operating along two routes for their journey to work, one of which was a quality bus service and the other a non quality bus service.

To this end a number of areas were identified where bus travellers had a choice between a quality and non-quality bus service when making their journey to work. Apart from the quality aspects of both services, the important distinction between the services was that each operated on different routes. It was therefore possible to translate this into a real choice faced by bus travellers.

The survey team were asked to identify and survey respondents who had such a choice and, where possible, to ensure that such respondents lived closer to the non-quality bus route than the quality bus route. This last point was important so as to ensure a real trade off between the services.

Due to the lack of suitable choice contexts, the RP and SP surveys were conducted in only 3 out of the 10 case study areas. The areas surveyed were Kent, Leeds and Warwick. RP data was collected for both competing bus services focusing upon the respective journey attributes of both services (fare, journey time, walk time to and from bus stops and headway). In addition respondents were asked to rate the quality of the different services, the overcrowding experienced and also the reliability of both services.

The SP was based around the RP data collected in the first part of the survey and was based upon a standard binary choice experimental design (see Wardman and Shires, 2008), presenting each respondent with the same choice context as the RP situation, with a total of 9 scenario choices per respondent. This meant that the quality bus identified as the quality bus in real life was offered in the SP and likewise for the non-quality bus. Both buses were differentiated by the following attributes with all other attributes (such as reliability and crowding) specified as the same for each route:

- Journey Time;
- Headway;

- Bus Fare;
- Walk time to and from bus stops (out of vehicle time); and
- Bus Quality.

The principles underlying the SP design were that the times and costs were to be driven by those on the non-quality route. This permitted the exploration of premium pricing on the quality route as well as faster journey times. Headways could take on a range of values between the two routes whilst it was not unreasonable to expect out of vehicle time to be generally higher for the quality route given more limited stopping patterns.

6.5.1 *Data Cleaning*

A substantial amount of effort has gone into the cleaning of the dataset which consisted of 681 respondents. Detailed checking of the data revealed a number of cases where errors had been made in recording the respondents RP data (62 respondents). Whereas in the RP route choice modelling a judgement was made to recode such errors with confidence and retain them within the data set no such option was open for the SP modelling since the SP presentations were based upon the original RP data which at the time the SPs' were presented to the respondents still contained the coding errors.

As a consequence all 62 respondents were not included within the SP dataset. In addition there was a number of missing RP values for some respondents that led to their exclusion from the SP data set since they related to the attributes presented in the SP choice scenarios. The result was an initial working data set for the SP model estimations of 5,493 choice observations.

6.5.2 *Model Results*

Initially RP and SP models were estimated separately and these are shown in **Tables 6.12** and **6.13** respectively.

In the case of the RP model further data cleaning was undertaken after a closer inspection of the data revealed a number of apparently irrational choices. These were comprised of two sets of respondents. The first chose the non-quality bus despite it being out-performed by the quality bus option in terms of in-vehicle time, walk time, headway and fare (i.e. the quality bus service dominates the non-quality service). There were a total of 13 respondents in this group. Why do people make such choices? Perhaps they have work colleagues or friends who catch the non-quality bus? Perhaps they drop their children off at school en route? Such behaviour is difficult to take account of and given the small number of respondents involved a decision was taken to remove them from the sample leaving a working sample of 606 individuals. The final RP model is reported in **Table 6.12**. Given the insignificance of in-vehicle time and headway and that fact that they had incorrect signs a decision was made to removed them from the estimation.

It can be seen from **Table 6.12a** that values for walk time are reported at 12.0 pence per minute, which is a little on the high side, whilst 1 point on the quality ratings scale is worth 16.9 pence. The average difference between the ratings of the quality and non-quality bus was 1.63 which implies an average value for quality bus of around 27.5 pence which if one assumes a value of travel time of 5 pence per minute equates to around 5.5 minutes which is in line with some of the package effects estimated in the unpacking models.

Table 6.12 RP Route Choice Model

Variables	Estimates
Walk Time	-0.0736 (-6.8)
Fare	-0.6156 (-2.1)
Quality Bus Rating Scale	0.1043 (3.1)
Adj R^2	**0.087**
Obs	**606**

Note: t-stats in ( )

Table 6.12a RP Route Choice Model - Values of Attributes

Attribute	Value in Pence (t stats)
Walk	12.0(-6.8)
Quality Bus Rating Scale	-16.9 (3.1)

Note: t-stats in ( )

Moving onto the SP Route Choice model the final model is reported in **Table 6.13**. This model is an incremental model, taking into account whether respondents found the SPs unrealistic or not. In this model in-vehicle time and headway are highly significant and have the correct sign. The other coefficients also have the correct signs and are highly significant whilst the goodness of fit is acceptable at around 0.13. The value for in vehicle time (**Table 6.13a**) is very plausible at around 4 pence per minute as is the value for headway at around 55% of in vehicle time. Walk time is slightly less than in-vehicle time and this is not unknown. For some respondents it might be unrealistic to vary walk time and hence it is ignored, whilst walking may be perceived as beneficial for some on health grounds. Weather can also have an impact upon people's valuations (with good weather lowering the value) and this may be a factor here.

The quality rating coefficient is statistically significant and, given that a higher rating reflects better quality, it indicates that quality does have a positive effect upon bus users' actual behaviour. The value of this is around 10.4 pence per point on the bus rating scale which translates into an average value of 22.7 pence given an average difference of 2.18 between the quality ratings for the two buses within this model. However, it is better to present the value of quality in terms of in vehicle minutes which is around 2.6 minutes per bus rating scale which translates into around 5.7 minutes a very similar value to the RP model.

Table 6.13 SP Route Choice Model

Variables	Estimates
In-vehicle Time	-0.0752 (-14.7)
Walk Time	-0.0631 (-6.9)
Headway	-0.0408(-16.3)
Fare	-1.8910(-11.5)
Quality Bus Rating Scale	0.1958 (13.6)
	Unrealistic
In-vehicle Time	*0.0197(2.3)*
Walk Time	-0.0362(-2.2)
Headway	-0.0106(2.0)
Fare	-0.9387(-3.9)
Adj R^2	**0.13**
Observations	**5,294**

Note: t-stats in ( )

Table 6.13a SP Route Choice Model – Values of Attributes

Attribute	Value in Pence (t stats)	Value in Minutes (t stats)
In-vehicle Time	4.0 (-14.7)	1.00 (-14.7)
Walk Time	3.3 (-6.9)	0.84 (-6.9)
Headway	2.2 (-16.3)	0.54 (-16.3)
Quality Bus Rating Scale	-10.4 (13.6)	-2.6 (13.6)

Note: t-stats in ( )

It is normally best practise to combine RP and SP data to estimate a joint model based upon both datasets. Such a model has been estimated and is based upon the best SP model as reported in **Table 6.13,** and which took the form of an incremental model taking into account whether respondents found the SPs unrealistic.

The joint model is reported in **Table 6.14** and it can be seen that the value of in-vehicle time remains the same as in the SP model, whilst the value of walk time increases in the pooled model above that of in-vehicle time which one would expect. The value of headway increases slightly but the main effect is to dampen the value of the quality bus ratings reducing it from 2.6 minutes to 1.66 minutes per point on the scale. Which given the average difference between the scales of 2.1 equates to 3.5 minutes which is lower than the package values estimated by the unpacking exercise.

Table 6.14 Pooled Route Choice Model

Variables	Estimates
In-vehicle Time	-0.08958 (-17.8)
Walk Time	-0.1002 (-12.1)
Headway	-0.05926 (-18.3)
Fare	-2.233 (-15.2)
Quality Bus Rating Scale	0.1484 (9.2)
	Unrealistic
In-vehicle Time	0.02073 (2.2)
Walk Time	-0.2329 (-1.7)
Headway	0.01662 (2.5)
Fare	-0.3288 (-1.9
Scale Factor	**0.6975 (54.6)**
Adj R^2	**0.05**
Observations	**5,882**

Note: t-stats in ( ).

Table 6.14a Pooled Route Choice Model – Values of Attributes

Attribute	Value in Pence (t stats)	Value in Minutes (t stats)
In-vehicle Time	4.0 (-17.8)	1.0 (-17.8)
Walk Time	4.5 (-12.1)	1.12 (-12.1)
Headway	2.7 (-18.3)	0.66 (-15.2)
Quality Bus Rating Scale	-6.6 (9.2)	-1.66 (9.2)

Note: t-stats in ( ).

6.6 Fares Simplification Model

Some travellers complain about the lack of transparency of bus fare structures and it is often extremely difficult for potential users to predict what the fare for a particular journey might be. Uncertainty about the fare might well dissuade them from making the journey by bus. Additional work was therefore commissioned by DfT to explore these issues and this is reported here in some detail with further findings contained in **Appendices H and I.**

The analytical work was based on data from a computer-aided telephone interview (CATI) survey among infrequent bus users in three areas (Warwickshire, Manchester and Leeds) where the current can be regarded as complex but in which the degree of complexity varies (Warwickshire being most complex and Leeds the least complex). The questionnaire described in **Appendix H** explored respondents' knowledge of the current fare structure and any difficulties which they experienced in predicting the fare for an unfamiliar journey. It also included questions designed to gauge their behavioural response to potential simplifications of the existing fare structure (introduction of fixed fares or of zonal fares) or to the introduction of smartcards (which might reduce the need to know a precise fare before travelling). Two types of question were used to gauge this response; a stated preference (SP) experiment offering respondents a series of seven choices between two buses for a medium distance journey which varied in terms of journey time, fare structure and fare level; and a series of stated response (SR) questions asking how their usage of bus might change under a number of different scenarios. An important feature of both the SP and SR questions was that, for scenarios with "as now" and "zonal" fares, respondents had to estimate the fare for themselves.

Data from the SP questions was used to produce models summarised in **Table 6.15** below while data from the SR questions was used to support the models summarised in **Table 6.16**. Although the modelling results are interesting, the main value of this investigation of the effect of fares simplification lies in the more detailed analyses described in **Appendix H**.

6.6.1 *Model Estimations*

Models were estimated on the SP data from 286 respondents (15 cases from the original data set of 301 were incomplete or otherwise unusable). Models estimated for each of the three areas and for the combined dataset are outlined in **Table 6.15**.

A correction was found to be necessary during the estimation 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.

Table 6.15 Fares Simplification Full Set of Results from SP Analysis

Variables	Warwick	Manchester	Leeds	Full Data Set
VTTS (pence/min)	10.76 (4.2)	7.28 (6.1)	7.10 (5.0)	8.96 (8.2)
VTTS (£/hr)	6.46 (4.2)	4.37 (6.1)	4.26 (5.0)	5.38 (8.2)
WTP fixed (pence)	86.54 (3.1)	37.35 (2.5)	28.79 (3.3)	46 (4.6)
WTP zonal (pence)	65.72 (1.7)	-15.83 (-0.7)	-21.73 (-1.6)	12 (0.9)
Fixed vs Time (min)	8.04 (2.5)	5.13 (2.3)	4.05 (2.9)	5.09 (4.0)
Zonal vs Time (min)	6.11(1.7)	-2.17 (-0.7)	-3.06 (-1.4)	1.29 (0.9)
Adj R^2	**0.097**	**0.12**	**0.097**	**0.103**
Obs	**588**	**558**	**570**	**1,716**

Note: t-stats in ( ).

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 those 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 this area has higher incomes than Manchester or Leeds i.e. Economic Trends 633 (August 2006) reports gross disposable household income per head of £13,025, £11,487 and £11,505 respectively)[3].

---

[3] Regional Household Income Presenting estimates of regional gross disposable household income (GDHI) at current prices Authors: Eve MacSearraigh, John Marais, Steffi Schuster

Economic Trends, no 633, pp 29-63.
ISSN: 0013-0400

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 28.79p in Leeds. Whilst some of this difference can be explained by the higher incomes in Warwick the majority of the explanation is driven by the fact that the –the more complex the existing fare structure, the more people are prepared to pay more for fixed fares and the most complex fares of the three areas are to be found in Warwick. Another possible factor at play here is that finding out what fares are in Warwick would appear to be much more difficult than in the other areas, something that was experienced firsthand by the researchers during the study.

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 (Section 6.3).

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 Table 6.15 (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.

The models shown in **Table 6.16** would, if applied to a population the same as the study respondents[4], yield the following predictions:

If fixed fares were introduced as specified the overall impact on trip numbers would be negative (a reduction of 12 trips per year, which is about 5% of the current average of 228 trips per year recorded by the respondents).

People with driving licences in non-metropolitan areas would expect to increase their bus trips by an average of 47 trips per year (= 21%). People with driving licences in metropolitan areas would expect to increase their bus trips by an average of 6 trips per year (= 3%). People without a driving license in non-metropolitan areas would expect to reduce their bus trips by an

---

[4] The prediction of additional trips per year if current fare structure was replaced by a fixed fare structure is made by combining the forecasts for four subgroups:

1. People in metropolitan areas with a driving licence (of whom we know there to be 92)
2. People in metropolitan areas without a driving licence (of whom we know there to be 109)
3. People in non-metropolitan areas with a driving licence (of whom we know there to be 54)
4. People in non-metropolitan areas without a driving licence (of whom we know there to be 46).

Thus, applying the constants and appropriate dummies we forecast:

(92 x (-14.29 +61.25 – 41.28)) + (109 x (-14.29 – 41.28)) + (54 x (-14.29 +61.25)) + (46 x (-14.29)) = (92 x 5.68) – (109 x 55.57) + (54 x 46.96) – (46 x 14.29) = - 3656.07.

Which, given a population of 301 people, implies an average reduction of 12.15 trips per year.

average of 14 trips per year (= -6%). People without a driving license in metropolitan areas would expect to reduce their bus trips by an average of 56 trips per year (= -24%).

Table 6.16 Regression Models Built on the Stated Response Data

Variables	1 - ETripF	2 - ESpendF	3 - EtripZ	4 - EtripH
Constant	-14.29 (0.8)	-19.35	-53.88	11.87
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 (3.2)*	*	*58.41 (2.9)*	*
MetroD	*-41.28 (2.1)*	*	*	*
Rich D	*	67.35 (2.2)	*	*
EasyD	*	*	*	-13.58 (2.5)
KnowD	*	*	*	-11.57 (2.2)
FreqUserD	*	*	*	*
QualD	*	*	*	*
ChangD	*	*	*	*
CarD	*	*	*	*
FemaleD	*	*	*	*
NTED	*	*	*	*
AplusD	*	*	*	*
Adj R^2	0.051	0.015	0.030	0.029
Obs	246	246	246	246

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 zonal 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 (approximate or exact) before travelling (otherwise =0)
FemaleD = 1 if respondent is female, (otherwise = 0)
NTED = 1 if respondent said they "certainly" are the type of person who likes to work out all the pros and cons before making a decision, (otherwise = 0)
Aplus D = 1 if respondent has A level, or higher, qualifications, (otherwise = 0)
CarD = 1 if respondent's household had 1 or more car, (otherwise = 0)
Note: t-stats in ( )

The overall impact on expenditure on bus fares (and thus on revenue) would be marginally positive (an increase of £10 per year which is about 3% of the current average of £354 per year recorded by the respondents). People with annual household incomes over £20, 000 would expect to increase their spend on bus travel by £48 per year (= 14%). People with annual household incomes up to £20,000 would expect to reduce their spend on bus travel by £19 per year (= -5%)

If zonal fares were introduced as specified the overall impact on trip numbers would be negative (a reduction of 24 trips per year, which is about 11% of the current average of 228 trips per year recorded by the respondents).People with driving licences would expect to increase their bus trips by an average of 5 trips per year (= 2%). People without a driving license would expect to reduce their bus trips by an average of 54 trips per year (= -24%).

If fares were harmonised to those of the dominant operator the overall impact on trip numbers would be insignificant (an increase of less than 1 trip per year on the average of 228 trips per year recorded by the respondents). People who do not find the existing fares easy to predict and do not feel the need to know the fare before travelling would expect to increase their bus trips by an average of 12 trips per year (= 5%). People who do not find the existing fares easy to predict and like to know the fare before travelling would not expect any significant change in the number of bus trips made per year. People who find the existing fares easy to predict and like to know the fare before travelling would expect to reduce their bus trips by an average of 25 trips per year (= -11%) and those who find the existing fares easy to predict but do not feel the need to know the fare before travelling would expect to reduce their bus trips by an average of 13 trips per year (= -6%).

These results suggest that the introduction of fixed fares (at the levels specified) would result in a 5% reduction in trips and a 3% increase in revenue. It would have a more positive impact on bus trips in non-metropolitan areas and, while people with driving licences would expect to increase their use of buses, people without licenses expect to reduce it. The distinction between metropolitan and non-metropolitan areas is not apparent in the expected spend; the only influencing factor seems to be household income - with richer households expecting to increase their spend.

The results suggest that the introduction of zonal fares (as specified) would result in an 11% decrease in bus trips. The net impact on trips by people with driving licenses is very small but those without driving licenses expect to reduce their bus use.

The effect of a harmonisation of fares would appear to be very small.

Other findings from the questionnaire (outlined in more detail in **Appendix H**) which are relevant to any attempt to model the effect of fares simplification on bus use can be found in **Appendix I**.

6.7 NTS-Based Analysis

Analysis of NTS was undertaken as a separate stream to the SP and RP model estimations. The aim of the work was to investigate whether or not access to quality buses has increased bus use. Only bus users are included in the study, since only for these individuals is there information on the bus services available to them. Thus, the study is limited to whether the access to quality buses affects the number of journeys a bus user makes, but not whether individuals choose to use the bus or not.

The two main surveys (PAPI and CAPI) carried out in this project differ in a number of ways, so that they are not strictly comparable, which limits their usefulness for the analysis. The major differences, as shown in the table below are:

- Bus users make up 33% of the PAPI survey, but 63% of the CAPI survey; in the CAPI survey only bus users are included in Dartford, Leeds and Warwick.
- 43% of bus users in the PAPI survey use quality buses, while 71% of those in the CAPI survey use quality buses. In the CAPI survey all bus users in all areas with the exception of Dartford, Leeds and Warwick use quality buses. The limited number of observations of non-quality bus users in the CAPI survey limits the possibility of estimating the effect of quality buses.
- All individuals in the CAPI survey are employed, while only 49% in the PAPI survey are employed. Since bus demand is not the same for the employed as it is for others, this causes problems in combining the two surveys.

Table 6.17 Characteristics of the Two Data Sets

	Individuals	Bus Users	Quality Bus Users	Employed
PAPI Survey	2609	852 (33%)	368 (43% of bus users)	1268 (49%)
CAPI Survey	2286	1439 (63%)	1027 (71% of bus users)	2286 (100%)

6.7.1 Model Estimations

A model explaining the number of journeys by bus was developed using the full NTS data for the years 2002 to 2005 (i.e. covering Great Britain). Since only bus users could be included in the analysis of the survey data to estimate the impact of quality buses, only individuals with at least one bus journey during the 1-week diary period were included. The dependent variable was the number of bus journeys during the diary week. The model was then simplified to include only explanatory variables included in the two surveys. It was found that the simplification did not have a significant effect on the coefficients of the variables included in both models, but only that the intercept increased. The model was estimated for all bus users and for only employed bus users. The major difference was an increase in the intercept term when only the employed were included. The model was also estimated excluding income variables because the number of individuals not reporting their incomes in the surveys was quite high and including income in the survey models would reduce the sample substantially (by about half). This was found to have no significant effect on the other coefficients, so that excluding income from the survey models should not affect the results.

6.7.2 *Econometric Results*

The dependent variable is the number of bus journeys taken during the week. The independent variables included in the models are self-explanatory in the tables. All independent variables are binary variables equal to 1 if the condition holds and 0 otherwise. Because of this, one category in each group needs to be omitted from the estimation and the coefficients of the included categories are interpreted in relation to the omitted category, or the reference case. The reference case is defined as: male, aged 40-49, working full time (if employed) otherwise not employed, with an individual income between £10 000 and £20 000 (when included) living in a single-adult household without children, having one car, living in rented accommodation.

Two of the more successful models are shown in the tables below. Both of these are based only on data from the PAPI survey, since no reliable results could be obtained using the CAPI survey or both surveys together largely because of the differences between the two surveys.

The model in **Table 6.18** allows the impact of quality bus to vary by area by including a quality dummy for each area along with the area dummies. The dummy for Hull is excluded so this is taken as the reference case and the other area dummies are in relation to Hull. The effect of quality bus on demand is measured by the coefficient of the area-quality dummies denoted by Q following the area name. All areas but Leeds and Warrington have a positive coefficient, suggesting a higher average bus use for quality buses, but this is only significant (at the 10% level) in the areas in bold: Poole, Burnley and Nottingham. Warrington appears to be different than the other areas in that it has a large positive coefficient for the area dummy and a large negative coefficient for the area-quality dummy, both of which are highly significant. However, omitting Warrington does not change the results significantly. This model gives some evidence of access to quality buses resulting in a higher bus use, but significantly so only in Poole, Burnley and Nottingham.

The model in **Table 6.19** is similar to the previous one, but instead of including a separate quality dummy for each area, includes a quality comparator, VALUE, based on the valuation of attributes for the buses in each area (as reported in Table 6.6). Two quality valuations were used, one based on the full package and the other from parts. In both cases the coefficient of the VALUE variable was positive, suggesting a higher bus use for quality buses, but the latter measure was found to be more significant (a probability value of 0.076 compared to 0.166). The results in the table are based on this measure.

Using an area-specific valuation of quality buses to estimate the effect of quality buses appears to give better results than allowing separate effects for each area (as in the previous table) or assuming an equal effect of quality buses in all area (including a single dummy for quality bus in all areas). As opposed to the single effect, it allows the relative quality of the buses in the different areas to impact demand so that differences in quality are taken into account. On the other hand, trying to capture separate effects for each area (as in **Table 6.17**) results in high standard errors since the estimates of the separate effects are based on a small number of observations.

Overall this stream of work has been a little disappointing and the statistical evidence from the surveys carried out does not consistently show that access to Quality Buses always has a positive impact on the number of bus journeys undertaken. Although it has been possible to obtain some evidence on the basis of the PAPI survey, the data from the CAPI survey have not produced any reasonable results. The reason for this is that the majority of respondents in the CAPI survey are quality bus users, so that the sample does not provide a sufficient number of individuals without access to quality buses to provide a significant estimate of the difference in bus use between the two groups. Given the large variation in the number of bus journeys per week which cannot be explained by the explanatory variables in the model (and in the surveys), the impact of quality buses would need to be substantial or a much larger sample needed to produce statistically robust estimates.

Table 6.18 Final NTS Model

Variables	Estimate	Variable	Estimate
Constant	2.020 (1.5)	Poole	1.860 (1.4)
Woman	-0.013 (-0.0)	Tyne & Wear	0.080 (0.1)
Age 16-19	2.550 (2.8)	Dartford	1.763 (1.5)
Age 20-29	0.991 (1.4)	Cambridge	0.464 (0.3)
Age 30-39	-0.105 (-0.1)	Leeds	-0.368 (-0.3)
Age 50-59	1.126 (1.3)	Warrington	6.974 (4.1)
Age 60-69	-0.586 (-0.7)	Burnley	0.098 (0.1)
Age 70+	0.199 (0.3)	Warwick	0.912 (0.8)
Part-time worker	-0.921 (-1.2)	Nottingham	1.559 (1.4)
2 Adults	0.554 (1.0)	Poole Q	2.364 (1.9)
3 Adults	0.969 (1.4)	Tyne & Wear Q	0.063 (0.0)
Children	-1.139 (-2.2)	Dartford Q	0.678 (0.5)
No Car	1.160 (2.2)	Cambridge Q	1.800 (1.4)
Cars < adults	1.278 (1.7)	Leeds Q	-1.046 (-0.9)
Company car	0.072 (0.0)	Warrington Q	-5.783 (-2.9)
Owns house/flat	0.041 (0.1)	Burnley Q	7.151 (1.9)
Income < £5k	0.284 (0.5)	Warwick Q	0.123 (1.2)
Income: £5k - £9.9k	-0.019 (-0.0)	Nottingham Q	3.464 (2.6)
Income: £20k - £29.9k	-0.228 (-0.3)	Hull Q	0.383 (0.3)
Income: £30k+	-0.621 (-0.7)	Employed	1.399 (2.1)
Adj R^2	**0.184**	**Obs**	**411**

Table 6.19 Model Including Valuation of Bus Quality

Variables	Coefficient	Variable	Coefficient
Constant	2.011 (1.7)	Income < £5k	0.577 (1.0)
Woman	0.071 (0.2)	Income: £5k - £9.9k	0.187 (0.3)
Age 16-19	2.249 (2.5)	Income: £20k - £29.9k	-0.276 (-0.4)
Age 20-29	1.213 (1.7)	Income: £30k+	-0.822 (-0.9)
Age 30-39	-0.008 (-0.0)	Poole	2.442 (2.5)
Age 50-59	1.027 (1.2)	Tyne & Wear	-0.294 (-0.3)
Age 60-69	-0.493 (-0.6)	Dartford	1.661 (1.8)
Age 70+	0.265 (0.3)	Cambridge	1.369 (1.6)
Part-time worker	-1.291 (-1.7)	Leeds	-1.014 (-1.2)
2 Adults	0.548 (1.0)	Warrington	3.595 (3.0)
3 Adults	0.994 (1.4)	Burnley	0.117 (0.7)
Children	-1.112 (-2.1)	Warwick	0.565 (0.7)
No Car	1.366 (2.6)	Nottingham	2.202 (2.4)
Cars < adults	0.942 (1.3)	Employed	1.630 (2.5)
Company car	-0.267 (-0.1)	**VALUE**	**0.073 (1.8)**
Owns house/flat	0.107 (0.2)		
Adj R^2	**0.156**	**Obs**	**411**

AECOM

7 Comparative Assessment

7 Comparative Assessment

7.0 Introduction

This chapter draws together the primary and secondary research undertaken as part of the study including the literature review and the focus groups. The purpose is to provide supporting evidence for the values presented in Section 6.

This section seeks to draw out comparisons between the different elements of the study in terms of the outputs that have been identified and to generate the recommended approach and valuations for use in future modelling of impacts during scheme development, option appraisal and business case preparation.

The sections of this chapter explore the consistency of the modelling results (Section 7.2) both externally and internally, before then looking at the behavioural response of the data sample and the forecasts that the preferred model suggest (section 7.3) and comparing them with other forecasting methods (Section 7.4). In Section 7.5 the relationship between hard and soft factors is reviewed in light of the study results. The rating of soft measures and how they impact on travel demand and model share are considered in light of the minimal numeric evidence from the case studies (Sections 7.6 and 7.7).

7.1 Consistency of Modelling Results

We now look at the external and internal consistency between the modelling results. The former compares the values of time and elasticity estimated by the study models with what might be taken to represent the conventional wisdom. The latter consists of assessing the consistency of the cross and own elasticities according to the relationships of economic theory.

7.1.1 Elasticities

In this section the external evidence is considered with regards to elasticities and valuations to see how they compare with the estimates derived from the modelling exercises undertaken as part of this study. It is noted that the elasticities reported by Wardman (2004) are based on a comprehensive meta analysis and that they, along with the 'Black Book' (TRL, 2004), provides a wealth of evidence. As such they are draw upon heavily during this section.

Bus fare elasticities and fuel price elasticities are estimated by the elasticity based demand models in section 6.2 of this report. A review of the existing literature points to bus users being more sensitive to cost than other attributes. The meta-analysis of public transport fare elasticities reported by Wardman (2004) would 'predict' a long run bus fare elasticity between -0.55 and -0.64 in the commuting market. The TRL (2004) update to the Demand for Public Transport 'Black Book' reports a short run, peak bus fare elasticity of -0.26 although does not report a comparable long run figure. The long run bus fare elasticity for the whole market is reported as -1.25. Dargay and Hanley (2002) is widely cited as the reference work on bus fare elasticities in Great Britain. They recommend a long run fare elasticity across all markets of -0.9. The price sensitivity of commuters is expected to be less than for other bus market segments and as such the results for the demand elasticity bus models seem broadly in line with the available evidence with a bus fare elasticity of -0.7 for the bus users' demand elasticity model.

The elasticity for bus demand with respect to IVT is estimated as -0.22 by the bus model which is less than that reported in the 'Black Book' at around -0.4. This might be because in the context under investigation here, of trips where bus is in a relatively strong position, elasticities might be expected to be lower. In terms of bus headway elasticities the bus model estimates a value of -0.1. The 'Black Book' does not recommend specific headway elasticities but does outline specific service elasticities which can be taken as a good proxy for headway elasticities. The 'Black Book' reports service elasticities with respect to vehicle kilometres of 0.38 in the short run rising to 0.66 in the long run. Clearly the study values are somewhat lower but one would expect service elasticities to be higher in this situation and evidence from CfIT would suggest an implied bus headway elasticity of around 0.03 for bus users and 0.13 for car users (www.cfit.gov.uk/docs/2002/psbi/lek/a1022) which would support this study's estimate.

For car travel, the fuel price elasticity (with respect to car kilometres) is often taken to be around -0.15 in the short run, increasing to around -0.30 in the long run (Graham and Glaister, 2004 & 2001) The results from this study are lower than this at around -0.06. In some respects, this is encouraging since it suggests that there has not been an exaggerated response to fuel cost increases in the SP exercise.

There is no car time elasticity evidence against which to assess the results obtained here. The cross elasticities are assessed below in terms of their consistency with the own elasticities.

Overall there is confidence in the models performance and in how they relate to external evidence. This suggests that the data is reliable and that this reliability extends to the study model estimation results as well.

We note that there is some ambiguity over whether SP based demand measures relate to short or long term effects. The two main reasons for a difference between short and long run demand response are information diffusion and constraints on adjusting behavior. In the former case, adjustments in behaviour are lagged because of the lag in knowledge about some new or amended transport service. This clearly does not apply to SP based forecasts which can be taken to be based on perfect information and are the long run effects that would be achieved under full awareness. With regard to the second point, key constraints on behavioural adjustment are that it takes time to move home or change job. However, it is not automatically the case that respondents do not take into account the longer term effect when making SP choices. Moreover, for bus users the response of change home or job has been allowed whilst for car users such constraints will not impact when considering improvements to bus since moving home or job would only be an issue where their current car journey is made unacceptable. Therefore the study team has erred on the side of the elasticities representing long term effects and see these as most appropriate, where available, in the interpretation of the study findings against other evidence.

7.1.2 Values of Time

Values of time are estimated by the mode choice demand model in Section 6.5 of this report and the route choice models as reported in Section 6.6. For the existing evidence the meta-analysis of a very large amount of British empirical evidence reported in Wardman (2004) is drawn upon.

In incomes and prices of the data collection period, the meta model would predict a value of time for car amongst car users of 8.50 pence per minutes for a 5 mile journey. The car users' mode choice model recovers a value of 8.6 pence per minute which is very similar. As far as bus users are concerned, the bus time coefficient was not significant in the mode choice model. However, the car time coefficient was significant and bus users' value car time at 3.5 pence per minute in units of bus fare. After allowing for the difference between time spent in a car and on a bus, the meta-model predicts a valuation of 3.54 pence per minute which is very similar to the estimated value. Adjusting for the bus effect, the value of bus time amongst bus users would be predicted to be 4.87 pence per minute compared with the value of around 4 pence per minute derived in the pooled route choice model for bus users.

Turning now to the valuations of headway and walk time the 'Black Book' recommends that bus walk time be valued at 1.68 times the value of IVT but notes that this might vary according to the overall trip length and amount of walk time; such that this value might rise to twice the value of IVT for short bus trips and considerable walking. The pooled mode choice model estimates a lower value of walk time of around 1.12 times the value of IVT. The value for walk might have been affected by the weather when the survey was undertaken, however, a more likely reason is that for some respondents it might be unrealistic to vary walk time and hence it is ignored.

With regards to headway and car walk times Wardman (2004) is used for external evidence. With regards to car users' value of walk time relative to car time (for a 2 minute walk and a 5 mile journey) a value of around twice IVT is suggested. This fits in reasonably well with the result which reports a value of around 2.3 IVT as reported in the car user mode choice model.

For bus users a value of car walk relative to the value of car time (for a 2 minute walk and a 5 mile journey) of around 1.8 IVT is reported which again corresponds well with the value suggested by Wardman (2004) of 1.7 IVT. Note that it has not been possible to look at bus value of time because the coefficient estimate is insignificant in the bus users' mode choice model.

Finally the value of bus headway relative to the value of car time can be considered (again because bus time is insignificant) by taking the predicted value of bus headway and dividing it by the predicted value of car time for bus users. For a five mile journey Wardman (2004) estimates a value of around 0.38 IVT which is lower, by quite a margin, than that estimated by the model at around 1.0. This is only value to behave in this manner.

Overall it is felt that the values of time reported by the models sit well against other empirical evidence. This is encouraging with regards the validity and reliability of the SP data collected and improves the confidence in how the model estimations are interpreted.

7.1.3 *Quality Attributes*

A number of the models estimated as part of this study produced valuations for bus quality at two levels:

(1) The individual attribute level, i.e. value of real time information.
(2) The overall level, i.e. current value of the quality bus service.

The former were estimated by the unpacking SP, the information SP and the fare simplification SP and are reported in Sections 6.3, 6.4 and 6.7. The latter was estimated by the route choice models and is presented in Section 6.6.

In this section there is a comparison of the estimated values with the external UK based evidence as reviewed in the first stage of this study.

A direct comparison is not always possible given changes in background factors, contexts and the actual specification of the individual attribute. In addition because the focus of the study was about the demand impacts resulting from bus soft factors and not valuation of soft factors per se only 14 soft factors in the unpacking SP have been looked at. This corresponded to the soft factors identified across all 10 case studies. Despite this an attempt has been made to summarise the evidence in **Table 7.1** below and have highlighted where direct comparisons of the data can be made.

The table draws heavily upon the review of values undertaken by Balcombe et al. (2004) and the TfL (2007) study carried out by SDG, which in essence repeated SDG's 1996 study. Both studies were reviewed as part of the literature review for this study as were the two other studies that are compared in the table, Laird & Whelan (2007) and Wardman (2007). Please note that the values in pence have been uplifted into 2008 prices and values to allow a direct comparison with the study specific estimated valuations.

In general the TfL (2007) values sit towards the lower end of the spectrum followed by the values from this study. It is worth noting that this might be expected since in essence this study has estimated non-London values, whilst TfL's work estimated London values, two very different transport markets. Denser public transport networks result in higher levels of public transport service levels within London, which when combined with greater familiarity of attributes such as real time information etc might serve to dampen valuations within London compared to those outside of London.

In terms of direct comparisons the value of audio announcements is just over twice that of TfL's. With regard to CCTV at bus stops it is noted that the study value is higher than that reported by Balcombe et al. (2004) but observe that their value is for CCTV at an interchange and would expect this to be lower vis a vis a more isolated bus stop. The TfL value is much lower at around 2.5 pence and may reflect denser bus networks with heavier loadings which reduce the sense of vulnerability at bus stops.

Whelan & Laird (2007) report a much higher value for CCTV on buses at around 10.5 minutes which is around 4 times the value reported by the model at 2.54 minutes; whilst the Balcombe et al. (2004) also report a higher value at 16.3 pence. Once again the TfL figures are lower than ours at around 3.63 pence. Again this may reflect higher levels of bus use in the London area and as a result a greater sense of security.

No comparative values could be found for customer charter, in-vehicle seating plan or ‘leather seats’.

With regards to ‘new bus shelters’ the values were around 40% of the value reported by Balcombe et al. (2004). The values from this study were also lower than those reported by TfL which ranged from 6.2 pence (purely an infrastructure valuation) to 10.66 pence if cleanliness issues were also taken into consideration.

With regards the valuation of ‘new buses with low floor’, values output from this study of 7.12 pence are higher than those reported by Balcombe et al. (2004) but considerably lower than those reported by Laird & Whelan (2007) which reported a value of 14 minutes compared with around 1.8 minutes from the model. No corresponding value was estimated by the TfL (2007) study, although a value was estimated for low floor access of around 2.15 pence.

Our value for interchange seems fairly low at 1.25 minutes and this is highlighted by Wardman’s (2007) value of 10.7 minutes. This is echoed by the TfL (2007) study which estimated a combined value for new bus stations of around 32.5 pence (this includes elements of infrastructure, security, personal and cleanliness).

‘On screen information displays’ within buses is valued at 5.16 pence by the model and somewhat higher by Balcombe et al. (2004) at 7.54 pence. The value for TfL (2007) is nearly half of the value from this study at around 2.62 pence.

‘RTPI’ at bus stops was valued very highly by both Balcombe et al. (2004) and Laird & Whelan (2007) at 14.4 pence and 19 minutes respectively. This compares to a much lower value as estimated by this study at around 6.8 pence. Once again TfL (2007) suggests an even lower valuation of 0.75 pence which seems particularly low. This may reflect people’s familiarity with the RTPI concept in London and perhaps a more denser public transport network that results in more frequent services along key bus routes.

No comparative values could be found for simplified tickets but values were reported by Balcombe et al. (2004), TfL (2007) and Laird & Whelan (2007) for trained drivers. In essence this can be seen as a proxy for driver quality in terms of the quality of interaction between driver and passenger and the smoothness of driving. The value from this study was around two thirds the value reported by Balcombe et al. (2004), just under a third of that reported by Laird & Whelan (2007) and nearly double that reported by TfL (2007).

Table 7.1 Comparison of Values of Soft Bus Intervention Values

Attribute	Laird & Whelan(2007)[1]	Balcombe et al (2004)[2]	TfL (2007) [2]	Wardman (2001)	Current Study
Units	Mins	Pence	Pence	Mins	Mins/ Pence[4]
Audio Announcements	***n.a.***	***n.a.***	***2.16***	***n.a.***	***1.22/4.88***
CCTV at Bus Stops	***n.a.***	***9.7p***[3]	***2.50***	***n.a.***	***2.9/11.64***
CCTV on Buses	***10.5***	***16.3p***	***3.63***	***n.a.***	***2.54/10.16***
Climate Control	***n.a.***	***n.a.***	***n.a.***	***n.a.***	***1.24/4.96***
Customer Charter	n.a.	n.a.	n.a.	n.a.	0.88/3.52
In-Vehicle Seating Plan	n.a.	n.a.	n.a.	n.a.	2.21/8.84
Leather Seats	n.a.	n.a.	n.a.	n.a.	1.08/4.32
New Bus Shelters	***n.a.***	***10.83p***	***6.2-10.66***[5]	***n.a.***	***1.08/4.32***
New Bus with Low Floor	**14.0**	**5.4p**	**n.a.**[6]	**n.a.**	**1.78/7.12**
New Interchange Facilities	**n.a.**	**n.a.**	**12.56/15.57/4.79**[7]	**10.7**	**1.27/5.08**
On-Screen Information Displays in Buses	**n.a.**	**7.54p**	**2.62**	**n.a.**	**1.29/5.16**
RTPI at bus stop	***19.0***	***17.4p***	***0.75***	***n.a.***	***1.69/6.76***
Simplified Ticketing	***n.a.***	***n.a.***	***n.a.***	***n.a.***	***1.43/5.72***
Trained Drivers	***9.0***	***15.7***	***5.24***[8]	***n.a.***	***2.63/10.52***

[1] Whelan & Laird reported attribute values in pence. These have been converted into minutes using a VOT of £1.20 per hour as estimated by Laird & Whelan.
[2]Values converted into 2008 prices and values
[3]CCTV at an interchange
[4]The value recovered from the pooled route choice model has been used here.
[5]Values have been estimated for several different aspects of a new shelter. 10.66 pence represents the maximum possible values and includes elements of cleanliness. 6.2 pence represents the values associated with just the shelter infrastructure.
[6]No specific value is reported for a new bus. A value is reported for low floor of 2.15 pence.
[7]Different elements of new bus stations have been valued. 12.56 pence represents the value of the bus infrastructure; 15.57 pence represents the value of security and personal; 4.79 pence represents the cleanliness aspects. The sum of the parts would give a value of 32.42 pence.
[8]This assumes the driver is very polite, helpful and cheerful and delivers a smooth ride with no jerkiness.

Overall the valuations of individual attributes from this study stack up well against existing evidence and seem highly plausible. They tend towards the lower end of existing values, although not, in general, as low as the values reported by TfL (2007). It is noted however that a comparison between this study's values (non-London) and TfL (2007) values (London) may not always be sensible.

Importantly, the values that have been estimated are such that they allow a package of measures to be introduced that will not be valued at more than the fare or journey time of the actual journey, a trait that has led to other studies (i.e. SDG, 1996) having to place a ceiling on what value could be attributed to a package of measure. This again is encouraging with regards the validity of the SP data collected and its reliability.

7.1.4 *Internal Consistency*

The consistency of the estimated own and cross elasticity estimates are considered here based on the relationships that exist between them according to economic theory. The own and cross elasticities are freely estimated, without imposing any constraints. The following relationship exists between cross and own elasticities:

$$\eta_{ij} = \left|\eta_{jj}\right| \frac{V_j}{V_i} \delta_{ji}$$

where η_{ij} is a cross elasticity of demand for mode i with respect to some characteristic (say cost) of mode j, η_{jj} is the own elasticity (here cost) on mode j, the ratio of V_j and V_i denote the relative volume of demand of modes j and i and δ_{ji} is the diversion factor that denotes the proportion of those switching away from mode j who choose mode i.

A reasonable estimate (West Yorkshire Local Transport Plan 2 Monitoring Report, 2008) of the shares of car and bus for commuting trips into Central areas are 65% and 20%. Diversion factors are obtained from Wardman and Vicario who asked travellers to indicate their next best means of travel or alternative course of action and developed models to explain such diversion factors. Their work indicates that 36% of bus commuters would switch to car and 55% of car commuters would switch to bus.

Table 7.2 reports the estimated cross elasticities from the elasticity models of **Tables 6.1** and **6.2** and compares them with cross elasticities deduced from the estimated own (direct) elasticities. It should be noted that the estimated cross elasticities are from one model (either bus users or car users) and the estimated own elasticities are from the other.

There is a high degree of correspondence between the estimated and deduced cross elasticities of car demand with respect to bus fare, bus average late time and bus headway. As for the cross-elasticities of bus demand with respect to car cost and car time, the estimated results were insignificant. Whilst it might be claimed that this is unsurprising given that the deduced elasticities are low, they are in fact higher than the car cross elasticities where significant estimates were obtained. Nonetheless, the cross elasticities of bus demand with respect to car characteristics are not the main concern here; rather the cross elasticities of car demand with respect to the features of bus travel.

Table 7.2 Internal Elasticity Calculations

Cross Elasticity wrt:	Estimated Cross Elasticity	Deduced Elasticity	Own Elasticity	V_j	V_i	Diversion Factor
Bus Fare	0.073	0.077	-0.704	20%	65%	0.36
Bus Time	0.118	0.024	-0.217	20%	65%	0.36
Bus Head	0.00	0.012	-0.111	20%	65%	0.36
Bus Late	0.00	0.006	-0.052	20%	65%	0.36
Car Cost	0.00	0.105	-0.059	65%	20%	0.55
Car Time	0.00	0.125	-0.070	65%	20%	0.55

A further consistency check can be carried out by looking at the forecasts predicted by the car and bus demand elasticity models as reported in section 6.2. The national mode share for commuting is 61% for car, 9% for car passengers and 7% for bus (Transport Statistics GB, 2008) however this does not reflect data on which the models from this study are based.

The respondents who took part in the survey were all commuting into the city and town centres, as such the commuting mode split needs to reflect the stronger position of bus and the weaker position of car in such situations.

The forecasts have been based on a West Yorkshire average which reflects a mode share for car (drivers and passengers) of 65% and a mode share for bus or 20%. This is discussed in greater detail in section 6.10 but is now used to calculate the forecasted changes as outlined in **Table 7.3**.

Table 7.3 Consistency Forecasts Based on Bus and Car Users Demand Elasticity Models

Area	Number of Bus Soft Attributes	Valuation of Attributes (minutes)	Modal Impact Driven by Car Model		Change in Bus Demand Driven by Bus Model[2]	
		From parts	Change in Car Demand	Change in Bus Demand[1]	Switch to Car	Other Reduction
1 Poole	6	11.54	-1.39	4.51	6.9	15.31
2 Hull	4	7.02	-1.24	4.04	1.8	3.90
3 Tyne & Wear	6	11.15	-1.59	5.18	4.2	9.33
4 Dartford	7	12.55	-1.56	5.07	4.9	11.00
5 Cambridge.	4	7.18	-0.96	3.12	2.8	6.17
6 Leeds	7	10.84	-1.41	4.60	3.9	8.69
7 Warrington	4	7.37	-1.15	3.75	2.4	5.29
8 Burnley	5	9.72	-1.35	4.37	2.8	6.19
9 Warwick	3	5.49	-0.75	2.43	1.8	4.11
10 Notting'm	6	11.15	-1.59	5.18	3.8	8.48
Average	**5.2**	**9.40**	***-1.30%***	***4.23%***	***3.6%***	***7.94%***

1 This is based upon an assumed commuting modal split of car driver + car passenger (65%) and bus (20%).
2 This is based upon the response to a question in the CAPI that asked whether bus users could travel to work by car on a regular basis if they wished to – 31% indicated that they could.

The fourth and fifth columns for **Table 7.3** are driven by the car users demand elasticity model. It is believed that this is the key forecasting tool from the set of models that have been developed. The second and third columns relate to a set of bus soft attributes that have been identified as being introduced in each of the 10 case study areas. The fourth column gives the change in current car demand that will result from the introduction of each set of soft bus attributes in the area in question.

So for example in Poole a set of seven bus soft attributes is introduced into the area which the unpacking model indicates is worth around 11.45 minutes. The result is that 2.02% of existing car users stop using the car to commute to work and switch over to bus. As a modal split factor of 3.25 is assumed this results in an increase in bus demand of nearly 6.6%.

At the same time there is a bus users' model that indicates what the demand implications are if same set of bus soft attributes were taken away. In order to test the internal consistency between the car and bus users' models the CAPI survey was used to find out the percentage of bus users who said that they could travel to work by car on a regular basis if they wished to. It was found that 31% of bus user could travel to work by car. On this basis its was possible to calculate what the modal switch from bus to car would be if the set of bus soft attributes outlined in columns two and three were removed. These are presented in column six with other reductions (working from home, switch to other modes etc.) presented in column seven.

If columns five and six are compared it can be seen that the levels of modal switch forecast by the car users model and implied by the bus users model are very similar to one another. This indicates a strong level of internal consistency between both of the demand elasticity models.

7.1.5 *Conclusions*

This section has looked at the external and internal consistency of the models. Overall it is felt that the values of time, the values of bus soft factors and the elasticity values sit well against other empirical evidence. This is encouraging with regards the validity and reliability of the SP data collected and improves the confidence in how the model estimations are interpreted.

Similarly there is encouragement through the internal consistency checks presented in **Table 7.3**. There is a high degree of correspondence between the estimated and deduced cross elasticities of car demand with respect to bus fare, bus average late time and bus headway. There is satisfaction with the consistency between the prime forecasting tool, the car users' demand elasticity and the bus users' demand elasticity model.

Taken together both sets of consistency results indicate that a great faith can be put in the reliability of the SP data collected as part of the CAPI survey and that this also extends to the models that have been estimated from the same sources of data.

7.2 Behavioural Response and Forecasts

In this section there is consideration of who responded to the CAPI surveys carried out as part of the study and how that might influence the forecasts developed with regards the demand elasticity based models (bus users and car users) reported in section 6.2. The bus users' model provides a useful contextual tool for seeing what the impact upon bus demand is if one removes existing soft bus attributes, however the principal forecasting tool is the car users' model. This forecasts the effects of improvements in bus quality as an elasticity based function, relating changes in car demand to changes in bus service quality.

The overall aim of the study was to investigate how bus soft interventions would impact upon bus use for current commuters. By default the sampling was targeted in and around current bus routes (within walking distance) to ensure that current bus users had a choice between quality and non-quality bus and so that car users faced a real choice between using the car or using the bus to get to work (it should be noted that the car users surveyed correspond to car drivers since they were seen as the key decision makers relative to car passengers).

This fact is borne out be an analysis of the CAPI data which reveals that in the sample around 83% of car users live within 6 minutes of a bus stop and that 96.1% live within 13 minutes of a bus stop. The figures for bus users are very similar with just under 80% living within 6 minutes of a bus stop and 93.7% living within 13 minutes of a bus stop. This is comparable with the national picture obtained from NTS data as outlined in **Table 7.4**.

Table 7.4 Walk Time to Bus Stop for Car and Bus Users (NTS, 2002-06)

Area Type	Walk Time to Bus Stop	Car/Van Drivers	Bus Users
London Boroughs	6 mins or less	89.4%	89.1%
	7-13 mins	98.2%	99.1%
	14 mins +	100.0%	100.0%
Met built-up areas	6 mins or less	90.9%	90.8%
	7-13 mins	98.6%	99.3%
	14 mins +	100.0%	100.0%
Other urban over 250K	6 mins or less	89.1%	94.1%
	7-13 mins	97.8%	99.3%
	14 mins +	100.0%	100.0%
Urban over 25K to 250K	6 mins or less	91.3%	94.2%
	7-13 mins	98.7%	99.6%
	14 mins +	100.0%	100.0%
Urban over 10K to 25K	6 mins or less	86.6%	91.0%
	7-13 mins	96.3%	99.0%
	14 mins +	100.0%	100.0%
Urban over 3K to 10K	6 mins or less	87.1%	88.9%
	7-13 mins	97.6%	98.0%
	14 mins +	100.0%	100.0%
Rural	6 mins or less	72.8%	83.0%
	7-13 mins	83.7%	95.2%
	14 mins +	100.0%	100.0%

One factor that cannot be known with certainty is whether the car users in the sample were inclined to consider bus either as a realistic alternative to car or, more importantly, whether they would use bus under any circumstances. If it was the case that all car users in the sample would consider using the bus then that would suggest the sample was biased and lead to overestimation of future bus usage as a result of bus soft interventions, the study team is not however in a position to state this and assume that this is not the case.

A more important factor however was that in all cases the respondents who were surveyed were making commuting journeys to the city/town centre from the suburbs/outer lying areas. This has important ramifications for forecasting the changes in bus demand as predicted by the demand elasticity models. The national mode share for commuting is 61% for car, 9% for car passengers and 7% for bus (Transport Statistics GB, 2008). If the bus demand forecasts were based upon these figures then a 2% modal shift away from car to bus commuting would lead to an increase in bus demand of just over 16% or a factor of 8[5], increasing to a factor of 10 if car passengers were treated as car drivers - both sizeable increases.

It is known however that such forecasts would be misleading as the sample upon which the models are estimated from make commuting trips into the city/town centres from the suburbs/hinterlands of those same cities/towns, not commuting trips to other cities/towns. The ability to substitute bus travel for car travel is therefore considerably stronger for the sample and is not reflective of the national picture which also includes people who might, for example, be commuting between Leeds and Manchester, for which no viable bus service is available.

To illustrate this fact and its importance for the forecasts **Table 7.5** has been constructed which reflects the commuting modal split for a selection of major towns in West Yorkshire. These figures have been used to calculate an assumed mode split between car (65%) and bus (20%), with the figures for car including both car passengers and car drivers.

Table 7.5 West Yorkshire Cities Commuting Mode Split

Yr 2008	**% Modal Split**					
Cities/Towns	**Walk**	**Cycle**	**Motorcycle**	**Car**	**Bus**	**Train**
Bradford	4.6	0.2	0.3	71.3	17.1	6.4
Halifax	4.7	0.3	0.5	68.0	20.7	5.9
Huddersfield	6.3	0.4	0.4	59.1	25.7	8.1
Wakefield	3.7	0.4	0.5	69.6	12.6	13.2
Leeds	2.9	0.9	0.5	55.3	23.7	16.7
Proxy Average				**65.0**	**20.0**	
NTS Figures				**70.0**	**7.0**	

Source: The West Yorkshire Local Transport Plan Partnership (2008)

Clearly there is considerable variability across the cities and towns outlined in **Table 7.5** and the mode splits for car are in most cases lower than for the national picture and the bus share considerably higher. This will have a dramatic effect on the bus forecasts and to illustrate this some demand forecasts using the car user demand elasticity model as outlined in section 6.2 have been put together.

The forecasts (see **Table 7.6**) assume that a new package of soft bus measures worth 10.02 minutes (the average of the packages) is introduced to each of the towns and cities outlined in the table. This results in a set of forecasts that predict a modal shift away from car (in the region of 1.48%) to bus. The impact this has upon bus demand depends upon the existing modal splits as outlined in **Table 7.5**.

The lowest changes in bus demand will be seen where the existing car share is relatively low compared to bus. This is the case in both Leeds and Huddersfield. Conversely the highest change in bus demand will come in cities were the car share is relatively high compared to the

[5] This ignores car passengers.

bus, for example Wakefield. Even then the Wakefield figures are around 55% of those forecast when the national NTS figures are used.

Table 7.6 Forecast Impact in West Yorkshire

	Valuation of Soft Bus Measures (minutes)	**Modal Impact**	
Area		Change in Car Demand	Change in Bus Demand
Bradford	10.02	-1.48%	6.17%
Halifax	10.02	-1.48%	4.86%
Huddersfield	10.02	-1.48%	3.40%
Wakefield	10.02	-1.48%	8.18%
Leeds	10.02	-1.48%	3.45%
Assumed Average	10.02	-1.48%	4.81%
NTS Figures	10.02	-1.48%	14.80%

The forecasts presented in **Table 7.6** reveals that the ratio between existing mode splits will have an important role to play in the magnitude of the bus forecasts produced. They also highlight the danger of using the wrong type of modal splits. Mode splits are therefore a vital input into the forecasting procedure and will vary from city to city. For example, York reports commuting mode splits in its Local Transport Plan of 47% for car and 7.4% for bus (here 20.6% walk), whilst Edinburgh reports (Edinburgh Local Travel Survey 2007-2011) splits of 35% for car and 30% bus (again walk is strong at around 20%).

This discussion leads onto a more detailed consideration of the forecasts for the ten case studies considered in this project. In order to illustrate this have adapted **Table 7.3** which estimated the modal shift using the same procedures as were used to produce the forecasts outlined in **Table 7.6**.

The new forecasts are presented in **Table 7.7**. The forecasts range from a 3.38% increase in bus patronage up to 6.57%, with an average increase of around 4.81%. Clearly the forecasts are somewhat artificial in that a generic commuting mode choice split of car (65%) and bus (20%) has been assumed when area specific mode splits should be applied. At first glance the forecasts seem very plausible but it is now assessed how they stack up against existing evidence.

Table 7.7 New Area Forecasts

Area	Number of Bus Soft Attributes	Attribute Valuation (minutes)	Modal Impact Driven by Car Model	
		From parts	Change in Car Demand	Change In Bus Demand[1]
1 Poole	6	11.54	-1.39	4.51
2 Hull	4	7.02	-1.24	4.04
3 Tyne & Wear	6	11.15	-1.59	5.18
4 Dartford	7	12.55	-1.56	5.07
5 Cambridge.	4	7.18	-0.96	3.12
6 Leeds	7	10.84	-1.41	4.60
7 Warrington	4	7.37	-1.15	3.75
8 Burnley	5	9.72	-1.35	4.37
9 Warwick	3	5.49	-0.75	2.43
10 Notting'm.	6	11.15	-1.59	5.18
Average	**5.2**	**9.40**	***-1.30%***	***4.23%***

[1] This is based upon an assumed commuting modal split of car driver + car passenger (65%) and bus (20%).

The use of evidence from the 10 case studies on patronage impact outlined in section 3 of this report and other external evidence might provide a sense check but there is a difficulty in that it is difficult to disentangle the impacts of different attributes since few are introduced independently of other, 'soft' or 'hard' interventions, so determining the actual effect of each factor can prove difficult.

In addition the changes to concessionary fares legislation in recent years have compounded the problems in estimating patronage impacts and these need to be netted out to see the true impact.

A further problem encountered when comparing patronage growth across routes is if one does not take into account the base from which patronage growth is based. Large increases can often be the result of a low starting point.

A study carried out by Cairns et al (2004) reminds that whilst soft bus interventions changes can result in an initial increase in patronage, it is estimated to take two years for the full affects to be appreciated. Again this can create problems for estimating and comparing patronage impacts.

Further studies such as the Faber Maunsell (2004) for GMPTE have also shown that under certain circumstances growth can occur along control corridors that outperforms that experienced in corridors with quality bus measures in place: although the author did note that this finding was driven by differences in trip purposes and the comparative patronage of each route.

The biggest problem however preventing a like for like comparison is related to the fact that the forecasts in this study are based upon the commuting market and so any like for like comparison would have to take this into account.

Some of the problems just outlined arise when an attempt is made to compare the results with the patronage impacts found in Section 3. In some areas such as Warwick (GoldLine) there seems to be some correspondence with the figures from this study, with 2.6% actual growth in adult passengers net concessions in 2008 vs 3.58% as estimated by the model. In other areas such as Kent (Fastrack) there would appear to be no correspondence with 78% actual growth in adult fares net concessions between September 2007 and March 2008 vs 6.01% as estimated by the model.

In the case of the former there is an established service (number 66) being relaunched as the G1 service with the same service frequency and fare structures as previously. New vehicles were deployed on the route with golden livery and leather seats. Drivers received specialised training and wore 'chauffeur-style' uniforms. In addition a customer charter was introduced which set out minimum performance standards and refunds for passengers suffering a delay of more than 20 minutes.

In the case of the latter there is a brand new service serving the Thames Gateway area with 25,000 new homes and 50,000 new jobs being forecast. The service operates for part of its route (5.5 kms) on segregated running and includes other hard bus measures such as a high frequency service. A number of soft factors are also present including high quality shelters, simplified ticketing and fares systems, real time information systems and novel branding.

Clearly whilst both schemes contain examples of soft bus measures the Kent (Fastrack) scheme also contains some significant hard bus measures and is building from a smaller base. This would suggest that the forecasts provided by the models are more relevant to established bus services were the main focus of change is the introduction of bus soft measures rather than bus services which are being transformed by a mixture of both hard and soft measures or which are building from a relatively small base to being with.

With this in mind the "Routes to Revenue Growth" report probably adds better contextual evidence. The report examined nine case studies involving either, route specific or network changes (The Ten Percent Club, 2006). Some related to Quality Partnership, others were independent of them. Each was based upon existing routes or networks and each reported patronage growth against a background decline. The key changes are outlined below in **Table 7.8**.

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. However, they offer a picture which is more in line with the Goldline results and to an extent ours, although in all cases the patronage forecasts are not specifically for the commuting market.

Table 7.8 Routes to Revenue Impacts

Routes	Change in Patronage
Route 36 – Ripon, Harrogate & Leeds	+18% per annum
Witch Way – Nelson, Burnley, Rawtenstall & Manchester	+16% per annum
'More Routes' – Poole & Bournemouth	+10% per annum
Rainbow 5 – Long Eaton & Nottingham	+8% per annum
'Showcase Routes' - Bristol	+3% per annum
Networks	
Corby Star Network	+30% per annum
Go2 Network	+18% per annum
Brighton & Hove Network	+5% per annum
Medway Towns Network	+4% per annum

Source: The Ten Percent Club (2006)

7.2.1 Conclusions

Clearly there is a difficulty in making like for like comparisons with other schemes in terms of the mix of 'soft' and 'hard' attributes used; the problem of separating out 'extraction effects' from parallel routes; netting out concessionary fares effects; determining the counter factual decline in bus markets over time; and focusing purely on the commuting market. What can be said with some confidence is that the forecasts do not tend to exceed the impacts described in other studies and when one takes into account the factors just mentioned they appear very plausible.

7.3 Comparison with Other Forecasts

An alternative approach to that presented in the previous section is to look at how the forecasts from this study compare with forecasts based upon conventional elasticities using the values of soft bus attributes estimated by the unpacking model and those estimated by other studies and to compare those with the forecasts produced by the demand elasticity model for car users.

To illustrate this there has been the identification of the following packages of soft bus measures from the literature and presented them in **Table 7.9**. The first two values are actual 'packages' as estimated by Laird & Whelan (2007) and SDG (1996). The remaining packages are implicit with the first value simply the average value of the sum in parts of the 10 case studies examined in this study. The remaining two values have been created from **Table 6.14** and again are a sum of the attributes that are comparable between the Balcombe et al. (2004) review and the current study.

Table 7.9 UK Soft Bus Measures Package Values

Study and 'Package'	Values in In-Vehicle Minutes	Values in Pence
Laird & Whelan (2007) Quality Bus Package Stops & Vehicles - urban bus users	11.5 (commuters)	
SDG 1996 'perfect service'	21.75	
Implicit Packages:		
Current Study – Average of Case Study areas	10.02	
Current Study Compilation	17.26[1]	55.68 pence
Balcombe et al. (2004)	11.60[1]	82.87 pence

1Note these have been converted in minutes using a value of time of 4.87 pence as reported by Wardman (2004).
Adapted from Bristow and Davison (2007) Internal Literature Report.

We have carried out three sets of calculations for each of the studies outlined in **Table 7.9**. The first set of calculations use conventional elasticities and apply them to the values outlined above. These have been drawn these from the discussion of external evidence and use a fare elasticity of -0.9 and a journey time elasticity of -0.4.

For the second set of calculations the 'conventional' elasticity values estimated from the bus users demand elasticity model, -0.7 for fare and -0.22 for journey time, are used. For the final set of calculations the car users demand elasticity model is used to forecast the change in demand as used in **Table 7.10**. In all cases the starting point is a base bus fare of £1.73 and a base bus journey time of 20.9 minutes. These have been derived from the CAPI data set and are the average values from across the 10 case studies.

Table 7.10 Comparison of Forecasting Methodologies

Study	Conventional Elasticities - Bus Forecasts	Conventional Elasticities Taken From Study Models - Bus Forecasts	Car Users Demand Elasticity Model - Bus Forecasts
Laird & Whelan	+37.7%	+19.2%	+5.9%
SDG	n.a.	n.a.	+11.2%
Current Study Average	+29.8%	+15.4%	+5.2%
Current Study Compilation – Pence	+41.8%	+31.2%	n.a.
Balcombe et al. – Pence	+79.8%	+57.8%	n.a.
Current Study Compilation – Minutes	+37.3%	+19.0%	+5.9%
Balcombe et al. – Minutes	+96.0%	+44.8%	+8.8%

n.a. not applicable (cannot estimate)

The results of the forecasts paint an intriguing picture. The first point to note is that forecasts cannot be calculated for the SDG package value using conventional elasticities because in this case the value of package in question is larger than the journey time in question. In reality the forecaster may have rescaled the value of the package to prevent this from happening, but this has been kept in to illustrate the problems that valuing bus soft factor measures close to the actual bus journey itself can have. It should be noted that this is not a problem when the car users demand elasticity model method is applied.

The second point that quickly becomes apparent is that using the car users demand elasticity model to forecast impacts produces much lower, and one might say more plausible, forecasts than those produced using conventional elasticities.

The final point to note is that conventional elasticities can give different forecasts via the fare elasticity and the journey time elasticity approaches. This is illustrated by the forecasts for Balcombe et al. and the current study compilation. This cannot happen with the car users demand elasticity approach and can be seen as a major advantage over the conventional elasticity approach.

7.4 Relationship Between Hard and Soft Factors

Although this study pertains explicitly to the role of soft factors in determining demand for bus travel, it is prudent to examine bus soft factors in the context of hard factors, which play a critically important role in determining travellers' attitudes to bus services.

The analysis undertaken of the case studies in terms of consultation with operators and use of patronage data provided demonstrated the role of hard factors. Several schemes that have been identified as having evidence of success have employed hard factors such as new infrastructure and increase service frequency in addition to soft factors to deliver patronage increases. Newly built infrastructure has been a significant factor in the Hull and Warrington Interchanges as well as in Dartford in relation to the bus-only segregation that forms a key part of the Fastrack scheme. Additionally service frequency has played an important role for scheme including Cambridge and Warwick.

The key hard factors i.e. service headway; key journey times and adult single fare are shown in **Table 7.11**.

Table 7.11 Key Hard Factors in Each Case Study Scheme

Case Study	Headway (mins)	Journey Time (mins)	Adult Single Fare (£)
1 Poole	4 – 8	Bournemouth Gervais Place 32 Bournemouth Station 41	1.70
2 Hull	15	20	1.50
3 Tyne & Wear	15	60	3.50
4 Dartford	10	Bluewater 12 Gravesend 36	Bluewater 1.50 Gravesend 2.50
5 Cambridge	10	Fison Road 20 Cherry Hinton 30	1.70 – 2.10
6 Leeds	10	Pudsey 31 Whinmoor 38	2.30
7 Warrington	30	16	1.15
8 Burnley	20	70	4.00
9 Warwick	10	22	2.50
10 Nottingham	20	27	1.50

The depth interviews undertaken in the case study areas demonstrated that hard factors dominate people's concerns and are major considerations for bus travel; the importance of soft factors differ for certain traveller markets and sectors. In terms of travel to work important soft factors identified were provision of information, bus shelter features and safety travelling to the bus stop.

The qualitative elements of the depth interviews support the outputs of the quantitative elements in terms of the varying degree of interaction between hard and soft factors in relation to different traveller markets and sectors. This demonstrated that safety-related factors are the most important soft factors after hard factor considerations such as reliability, frequency, distance to bus stop and fare.

However the qualitative depth interviews also identified that safety factors would dominate traveller concerns and decision making if travellers feel unsafe. However it is clear that travellers avoid using the bus when they are likely to feel unsafe. For example, car available travellers are far more likely to use their cars in the evening.

7.5 Soft Factor Ratings

The relationship between factors and the actual performance of these factors is significant in how travellers rank or value different factors. That is if a factor is underperforming it will be ranked as important to travellers however if the factor is performing to standard travellers may not rank it with equal importance. This was identified through the qualitative analysis.

Soft Factor valuations identified through the unpacking SP experiment demonstrate that the highest valuations relate to safety-related factors such as CCTV at bus stops and on-vehicle and trained drivers which were all valued at over 2.5 minutes. The lowest valued factors were the Go Ahead Customer Charter (0.88 mins) and leather seats and new bus shelters (both 1.08 mins). These valuations show a lower rating of soft factors than suggested by bus operators during the case study consultations. The operators of the case study schemes place substantial importance on the relative success of their schemes on routes simplification and network branding as these factors facilitate the provision of more understandable and accessible traveller information.

The unpacking SP also sought to establish the presence of a package effect, as described in the literature review (Section 2.5). The results presented in Section 6 Table 6.6 demonstrate that although a package effect can exist, the effects are minor. This suggests that previous studies have overestimated the impact of the package effect. However it is difficult to directly compare the results of this study with other studies into package effects since different attributes have been assessed in different contexts.

7.6 Soft Factor Impacts on Travel Demand

The case study schemes demonstrated that very low or no patronage growth resulting from a scheme can be viewed as a successful outcome in cases where the prevailing trend is declining bus patronage.

The depth interviews identified that car available travellers perceive bus as more convenient where parking is difficult or expensive and/or where congestion is bad. This assumes that the bus alternative provides an acceptable level of reliability and service frequency. However such negative issues relating to car travel are the driver of demand for bus travel in this case rather than good things about bus. Soft factors can enhance journey experiences by generally only come into play once hard factors have reached an acceptable level of performance.

This reflects the Blazefield belief identified in the case study consultations that soft factors can "make a good route better, but cannot turn a bad route into a good one".

There is an expectation that buses will be modern, clean and comfortable. If this is not the case some travellers would not use the bus even if the service was acceptable in terms of hard factors.

The preferred elasticity-based demand model suggests that a package of soft factors could reduce car commuting by between 1% and 2%. This equates to an increase in bus demand of between 4% and 8%, based on the application of the 4 to 1 rule. In terms of changing bus demand the largest source of potential future growth is likely to come from the existing car users market who switch to quality bus services.

The PAPI and CAPI surveys described in Section 5 and used as primary data for the modelling identified that the overall level of awareness of the initiatives in the case study areas was relatively low (22%), although the overall figure masks higher levels of awareness in some areas e.g. 45% awareness in Warwick.

Of those who were aware of the initiatives, over a third overall stated that the initiatives had made a major impact. However the major impact recorded did not relate directly to respondents' trip making since only 9% of the respondents aware of the schemes identified that the initiatives had led to them making more trips by bus. This represents only 2% of the total number of respondents.

8 Conclusions and Recommendations

8 Conclusions and Recommendations

8.0 Introduction

This commission has required a comprehensive study of the introduction of soft factors to bus operations and the associated impact on patronage levels.

A structured approach has been utilised including a literature review of previous studies on the subject matter and detailed assessment of ten case studies throughout England including analysis of passenger data, promoter and operator interviews, focus groups, revealed preference and stated preference surveys.

Model relationships have been developed for a number of soft factors in packages and individually in the vase of information and quality bus. The models utilised have been developed in a bespoke manner using primary data collated from the SP and RP exercises carried out in the case study areas and secondary data from the National Travel Survey.

Additional work was commissioned during the course of the study to consider the impact of the simplification of bus fares.

The purpose of this section is to summarise the conclusions of this study and provide recommendations on the models to be applied in option analysis, scheme development and business case development. The recommendations are based on the discussion in Chapter 7 regarding the comparison of the model results with models reviewed in the literature review.

8.1 Conclusions from Phase 1 of the Study

The evidence from the Literature Review was limited and where it did exist it was wide ranging and tended to support the DfT's view for the need for this study. Overall there was evidence of the significance of soft measures in improving the quality of service but very little on its contribution to modal shift away from the car. In addition, the relationship between soft factors (the relative values in the same setting) was also limited and this was one of the many areas of research and knowledge where the study has contributed.

The qualitative research with people in the case study areas demonstrated that soft factors were important. For example in Norfolk and Cornwall there were schemes that had been developed that had not only been successful in their own right but had influenced the competitiveness in the market in general.

The consultation with bus operators and local authorities was wide and extending beyond the ten case study areas, as shown above, however some of the discussions were limited in terms of the commercial viability of soft measures. For example, driver training is one of those soft factors which appear to becoming a 'must have' by bus operators for commercial and marketing reasons if not solely financial reasons. This is evident from the lack of financial support requested from the public sector for such components of the driver training package such as training programmes that have social and economic benefits outside of the financial benefits. On the other hand the availability of real time information is an attribute which appears to have less support in commercial terms and tends to require public sector support funding. In short the merits of driver training were not highlighted in the way one would expect considering the larger operators positive actions in this area.

The 33 in depth interviews and the focus groups demonstrated that there was a great deal of concern regarding personal safety and security especially at night and that any measure that reduced the associated anxiety was valued quite highly. This was supported by the values produced in the qualitative element of the study.

8.2 Conclusions from the Case Studies

The ten case studies were selected due to the role that soft measures played in the schemes that had been recently introduced. The cases were also selected as much for their differences than to their similarities. In many of them new low floor vehicles and RTPI played a significant part in the package on offer, however the role of branding and marketing were also common themes across many of the schemes. These two factors were later demonstrated to be key factors in the industry interviews but less valued by respondents in the study areas.

The depth of analysis for each case study included one to one interviews with sponsors (e.g. local authorities) and the bus operators combined with detailed analysis of ticket data by market sector before and after the introduction of the scheme. It important make clear that in many cases the schemes were introduced to reduce decline in passenger numbers and hence no growth can, in these cases, be classified as a success.

The overall conclusion was that the case study analysis provided insight into the relative impact of soft measures especially to fare paying groups. It was also concluded the quantitative evidence demonstrated four of the cases had strong evidence of success and that there was some evidence in four others. On this basis the case studies have been allocated as follows into 3 groups:

1. Cambridge 2. Poole 3. Dartford 4. Leeds	Strong Evidence of Success
5. Warwick 6. Warrington 7. Hull 8. Burnley	Some Evidence of Success
9. Nottingham 10. Tyne and Wear	Limited Information

8.3 Conclusions from the Model Development

The study has involved an extensive programme of data collection and modelling. In contrast with the vast majority of previous work in this area, efforts have been focussed on the demand impacts of bus service quality improvements rather than valuations of them.

From amongst a range of models, developed for a variety of purposes, the principal model for forecasting the effects of improvements in bus quality is an elasticity based function, relating changes in car demand to changes in bus service quality.

The function is outlined below as a formulae where T_2 is equal to generalised time after the introduction or removal of the quality bus and T_1 is equal to the generalised time before the introduction or removal of the quality bus.

Car Users Model $e^{0.00123 * (T2 - T1)}$ *i.e. for area 1* $e^{0.00123 * (-11.45)} = 0.9861$

The changes in bus service quality are specified in time units and were obtained from a separate SP exercise dealing specifically with the valuation of various aspects of on and off bus quality improvement. These values were outlined in Table 6.5 and there is confidence in their estimation and plausibility when stacked against other valuation studies.

For example, in Poole the value of the on and off bus quality package is worth 11.45 minutes whereas in Cambridge the value of the quality package is worth 7.18 minutes. In terms of forecasting the change in bus patronage which can use these bus quality values in conjunction with the demand elasticity model. This results in the model predicts a 2.02% reduction in car demand in the case of Poole and a 3.45% reduction in the case of Cambridge.

The proportionate increase in bus demand depends upon the relative shares of the two modes. Taking car to have a 65% share of entries to the central area for commuting purposes, as opposed to 20 % for bus , would imply a 6.57% increase in demand for bus in Poole and a 3.45% increase in demand for bus in Cambridge.

Clearly the full range of bus soft factors have not been considered within this model however the elasticity demand model can handle other types of improvement, beyond those contained in the SP study, so long as the improvement can be specified in time units.

In concluding this section, the reliability of the model results is discussed and then in turn comment is provided on the contribution of each of the various strands of analysis.

8.3.1 *Reliability of Results*

The demand elasticities and valuations presented here are not only plausible but correspond well with conventional wisdom.

Whilst the valuations are derived from the disaggregate mode choice models, which are not the main forecasting models, they are estimated to the same data that is used to calibrate the demand models. Thus the close correspondence between the values estimated in these models and conventional wisdom is encouraging with regard to the validity of the SP data collected.

More importantly, the elasticity results are largely consistent with the conventional wisdom in this regard whilst the estimated cross elasticities are consistent with the own elasticities estimated in terms of economic theory.

Comparing the demand forecasts against the changes in bus demand observed in the case study areas and non-case study areas is a difficult task. There are a number of issues that make like for like comparisons difficult. These include: (1) Disaggregating the impact of 'soft' and 'hard' factors; (2) Separating out the 'extraction' from parallel bus routes; (4) Netting out the impact of concessionary fares travel; (4) Determining the counter factual decline in bus markets over time; (5) Judging what effect the level of base demand has on overall forecasts (i.e. what is the starting point); and (6) focusing purely upon the commuting market share.

What is concluded is that when these factors are taken into account (i.e. the Goldline case study and The Ten Percent Club) the study forecasts appear in line with what is happening on the ground and are very plausible. In this respect there is great confidence in the study forecasting methodology to produce realistic forecasts when bus soft quality measures are introduced to established bus services without any changes to the 'hard factors'.

In addition it is felt that the demand forecasts from this study are more credible than those that have been obtained previously in terms of both the attribute valuations used and/or by using the method of converting these values into an equivalent cost or time reduction and applying a conventional elasticity. It has been demonstrated in **Table 7.10** that the procedure used in this study of directly estimating demand impacts instead of inferring them dampens the forecasts produced even when the initial values attributed to certain bus soft factor measures are the same as from this study. It is believed this is one of the key findings to come out of the modelling work and recommend that it be taken on board by the client and transport practitioners in general.

8.3.2 *Elasticity-Based Demand Mode Choice Results*

The main elasticity based demand mode choice models provide credible estimates of demand parameters, and particularly those that relate to the introduction or removal of a new service.

The method has been outlined in the sections above and the recommended method and demand parameters can be used to forecast any particular form of improvement, and indeed those beyond consideration in this study, providing that they can be expressed in equivalent time units.

The precise impact will depend upon the relative shares of car and bus for the market in question and transport practitioners should bear this in mind when using them to forecast with.

The model avoids the problem apparent with what might be termed the conventional approach that different forecasts are produced according to whether the bus service quality improvement is expressed as IVT minutes or as pence.

Detailed forecasting work has been carried out based upon these models in section 6.10 and present once again the table of forecasts developed, based on a modal car split of car (65%) and bus (20%).

Table 8.1 Area Forecasts

Area	Number of Bus Soft Attributes	Attribute Valuation (minutes)	Modal Impact Driven by Car Model	
		From parts	Change in Car Demand	Change In Bus Demand[1]
Poole	6	11.54	-1.39	4.51
Hull	4	7.02	-1.24	4.04
Tyne & Wear	6	11.15	-1.59	5.18
Dartford	7	12.55	-1.56	5.07
Cambridge.	4	7.18	-0.96	3.12
Leeds	7	10.84	-1.41	4.60
Warrington	4	7.37	-1.15	3.75
Burnley	5	9.72	-1.35	4.37
Warwick	3	5.49	-0.75	2.43
Nottingham.	6	11.15	-1.59	5.18
Average	**5.2**	**9.40**	***-1.30%***	***4.23%***

[1] This is based upon an assumed commuting modal split of car driver + car passenger (65%) and bus (20%).

8.3.3 *Unpacking SP Models*

The unpacking SP exercises covered a wide range of bus quality improvements and estimated them in time units. These were then entered into the main demand model to estimate a parameter that translates these valuations into demand effects. These are outlined in some detail in section 6.3 and they are presented again here.

Table 8.2 Values of Soft Bus Interventions

Attribute	Value in Mins (t stats)	Attribute	Value in Mins (t stats)
Audio Announcements	1.22 (2.2)	New Interchange Facilities	1.27 (2.6)
CCTV at Bus Stops	2.91 (5.2)	On-Screen Displays	1.29 (2.7)
CCTV on Buses	2.54 (4.8)	RTPI	1.69 (5.3)
Climate Control	1.24 (2.5)	Simplified Ticketing	1.43 (3.7)
New Bus Shelters	1.08 (2.6)	Trained Drivers	2.63 (6.6)
New Bus with Low Floor	1.78 (6.9)		

Table 8.3 Segmented Values of Soft Bus Interventions

Attribute	Value in Mins		Attribute	Value in Mins	
	Bus	Car		Bus	Car
Audio Announcements	1.22		New Interchange Facilities	1.27	
CCTV at Bus Stops	3.70	2.49	On-Screen Displays	1.90	0.89
CCTV on Buses	1.66	3.18	RTPI	1.47	1.74
Climate Control	1.24		Simplified Ticketing	0.84	2.06
New Bus Shelters	1.08		Trained Drivers	2.46	2.78
New Bus with Low Floor	1.19	2.23			

Tests w ere un dertaken t o det ermine whether a ny pac kage ef fects or i nteractions were presents. The package effects that were present were not entirely consistent across areas and are sufficiently small to be ignored.

Tests were also conducted of interaction effects, whereby the valuation on one attribute depends upon the level of another. These were found to be negligible.

8.3.4 *Information SP Models*

The information SP model was developed to provide a relative values between different types of i nformation. T here w as a par ticular f ocus on S MS i nformation de livery s ystems t hat ha ve started to be rolled out across bus networks in recent years, i.e. the NxtBus system in West and South Yorkshire.

The results from t he model v aluations app ear t o be pl ausible as do t he r elativities bet ween similar t ypes of i nformation. I t would a ppear t hat r eal t ime pas senger information s ystems located at bus stops are the highest valued of all the information delivery mechanisms and that SMS scheduled timetables are the least. The results are discussed in some details in Section 6.4 and the key valuations are presented again here.

Table 8.4 Values of Information Interventions

	Valuation in Minutes (t-stats)		Valuation in Minutes (t-stats)
Real Time Information in City Centre	4.20 (4.5)	SMS R eal T ime I nformation _10p	1.55 (1.7)
Real T ime I nformation at B us Station	4.30 (3.7)	*SMS Real Time Information _20p*	*-0.19 (0.17)*
Real T ime I nformation at B us Stops	5.05 (4.7)	Audio Announcements on Bus	1.11 (1.1)
SMS Real Time Information_Free	3.23 (4.16)	SMS_Timetable - free	0.64 (1.7)
SMS Real Time Information _5p	1.37 (1.00)	Web Based Information	1.44 (1.9)

Italics - insignificant

With r egard t o demand f orecasting the s ame di rect demand el asticity m ethodology could be applied as used in the un packing S P valuations. H owever, it is b elieved that t he values may need scaling downward to reflect the fact that they were not valued alongside non-information attributes. H owever i n t erms of pr oviding r elative v aluations f or di fferent t ypes of i nformation systems they are extremely valuable.

8.3.5 *Mode Choice-Based Demand Models*

The conventional approach to modelling SP data is to develop discrete choice models. These have been reported in section 6.5 and could be used to develop forecasts.

However, the preferred approach and demand forecasting model, outlined above, is based on grouping d ata a nd es timating a d emand model which has m uch m ore transparent demand properties and is easier to apply.

8.3.6 *Route Choice Models*

These models were developed in order to examine whether, in a real world context, bus service quality impacts on actual behaviour. This was then supplemented with an SP exercise based on the same context.

It was hypothesised that if new buses could not influence the behaviour of bus users then they are hardly likely to influence car users. In addition, previous studies have often obtained large valuations of bus service quality features, and any corroboration of such large values in actual behaviour would be welcome.

Equally, it is impressive to be able to discern the effects of soft factors on demand given, to the knowledge of the study team, the absence of any such evidence.

As far as the study team is aware, this study is the first to have demonstrated an impact on the actual be haviour of bus s ervice qu ality t hrough c hoice m odelling. B us us ers were f ound t o choose their bus route for the journey to work, when such a choice existed, partly as a function of bus quality.

The models have not here been used for forecasting. However, they could be used to isolate that portion of demand increase on a bus route after service quality improvements have been introduced. The values estimated by the pooled data model are presented here again.

Table 8.5 Pooled Route Choice Model – Values of Attributes

Attribute	Value in Pence (t stats)	Value in Minutes (t stats)
In-vehicle Time	4.0 (-17.8)	1.0 (17.8)
Walk Time	4.5 (-12.1)	1.12 (12.1)
Headway	2.7 (-18.3)	0.66 (15.2)
Quality Bus Rating Scale	-6.6 (9.2)	-1.66 (9.2)

Note: t-stats in ( ).

8.3.7 *Fare Simplification Models*

The work on fares simplification was commissioned half way through the study and was seen as a complimentary piece of research. The analytical work was based on a separate CATI carried out in three areas with different degrees of complexity with regards fare structures. Two types of questions (SP and stated response - SR) were included in the questionnaire to gauge the behavioural response of respondents to potential simplification.

The SP results indicated a real benefit for passengers (5.09 minutes) in moving towards a flat fare system from a more complex one. These varied across the three areas surveyed (86.54 pence in Warwick, 37.35 pence in Manchester and 28.79 pence in Leeds) confirming that as would be expected, the more complex the existing fare structure, the more people are prepared to pay.

The support for moving towards a zonal fare system was less clear (1.29 minutes) and was only significant at the 61% level. A comparison of the three areas reveals that in Manchester and Leeds the utility for zonal fares is actually negative. This might be viewed as an indication that zonal fares are not viewed positively in conurbations (where zones boundaries might be hard to define) but it would be unwise to read too much into the results which are not statistically significant.

The responses to the SR questions were used to develop a series of regression models. The key finding of which was that the introduction of fixed fares would reduce trips by around 5% but increase revenue by 3% and that the affect of fare harmonisation across operators would be minimal.

8.3.8 *Trip Rate Models*

This analysis was based on both NTS data and the study survey data. The aim was to determine whether bus quality impacted on trip making. Given that bus trip rates are influenced by a number of factors, the NTS data served to assist in isolating these effects which was anticipated to have been difficult if sole reliance had been placed on the trip data collected in this study alone.

A series of models were then estimated with the dependent variable specified as the number of bus journeys taken during the week. Two of the more successful models are discussed in section 6.8.

The first allows the impact of quality bus to vary by area by including a quality dummy for each area along with the area dummies. All areas but Leeds and Warrington have a positive coefficient, suggesting a higher average bus use for quality buses, but this is only significant (at the 10% level) in Poole, Burnley and Nottingham.

The second model was similar to the previous one, but instead of including a separate quality dummy for each area, includes a quality comparator, VALUE, based on the valuation of attributes for the buses in each area (the sum of the parts). The coefficient of the VALUE variable was positive (0.073), suggesting a higher bus use for quality buses.

Overall this stream of work has been a little disappointing and the statistical evidence from the surveys carried out does not consistently show that access to Quality Buses always has a positive impact on the number of bus journeys undertaken.

Given the large variation in the number of bus journeys per week which cannot be explained by the explanatory variables in the model, the impact of quality buses would need to be substantial or a much larger sample needed to produce statistically robust estimates using this approach.

8.4 Application of Soft Factor Values

The demand elasticity, information and mode choice models discussed in Sections 6.3, 6.4 and 6.5, and presented in Tables 8.2, 8.3, 8.4 and 8.5 have been applied by the study team to the Greater Manchester Public Transport SPM2-PT model and the multi-modal model for the Fylde area of Lancashire.

It was important to undertake this work using models that the commission consultants had firsthand knowledge of and that were urban in nature with a high standard of bus network modelling.

The Greater Manchester model developed by Greater Manchester Passenger Transport Executive has been used in support of the individual business cases for public transport submitted to the DfT as part of the recent Transport Innovation Fund bid. It uses fixed trip matrices and hence only reallocates between the three public transport modes – bus, rail and Metrolink. An incremental approach has been developed to calculate the modal shift using an elasticity derived from the uplift approach used in the TIF package.

The Fylde Sub Regional Transport Model covers bus, rail and highway modes and has a midsized urban centre, in Blackpool, at its core. The mode choice model was developed from the Hull Multi Model Study, a GOMMS study. The model was used to develop a strategy for the sub region looking at highway and public transport options in a consistent and equal manner.

The models were used to assess the impact of CCTV on bus, improved information at stops and driver training. In both models the generalised costs for bus were reduced using the time based values in Table 8.2.

The experience of the consultants of using these relationships demonstrates that with the right model structure the time values recommended can be easily applied in forecasting the impacts of soft bus measures.

8.5 Recommendations

The overall evidence is that hard factors tend to be more important than soft factors and usually need to be in place before applying soft factors. There is a sense of diminishing return with soft factors still being valued and in some situations having a partial or full financial case. However there are soft factors which do rate highly compared with hard factors especially personal safety and security as identified in the qualitative surveys and confirmed by the valuations for CCTV from the stated preference surveys

The modelling uses combinations of primary and secondary data and in the former case has used stated preference and revealed preference techniques. A number of models have been developed of which the demand elasticity approach has been demonstrated to have produced the model with the most confidence attached. The term confidence relates to both the statistical confidence measured as a T Ratio and the consistency with other studies.

On the basis of what has been set out in this report, the key recommendations are:

- The package values identified in Table 8.1 could be utilised as proxy values for initial development and appraisal of schemes bearing the same characteristics;
- The soft factor values included in Tables 8.2 and 8.3 should be applied from now on in the development and appraisal of schemes that involve soft bus measures; and
- The information values identified in Table 8.4, particularly those with high t-stat values can be applied to the development and appraisal of schemes with such characteristics.

AECOM

Appendix A: Detailed Study Methodology

Appendix A: Detailed Study Methodology

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[6] 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 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.

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

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

To assist the case study selection, a list of possible candidates, together with key information was assembled. The information was gathered from the consultations with stakeholders and from the literature review. The following information was collected and used as criteria for the selection of schemes for the 10 case studies for detailed research:

- Scheme description
- Type of local authority (important to obtain a range)
- Type of operator (important to obtain a range)
- Geographical area (important to obtain a range)
- Key soft features – scope of changes to: (essential to cover all either individually or in packages)
  - In-vehicle experience
  - Information provision and marketing
  - Ticketing and fare structure
  - Roadside infrastructure
  - Safety and security throughout journey
  - Network changes and development
- Key hard features – changes to: (desirable to cover all)
  - Fares
  - In-vehicle time
  - Access & egress time
  - Wait time
- Availability of patronage data (essential)
  - Absolute change in passenger numbers
  - Percentage change
- Details of other developments which could have influenced patronage (desirable)
  - Supporting measures
  - Unrelated measures
- Scheme cost (essential)
  - To the public sector
  - To the operator
  - Other private sector
- When implemented (essential)
- Whether perceived as a success (essential)
  - By operator / promoter
  - By Users
  - Over time
- Willingness of the stakeholders to cooperate with the research (essential)
- Status of market (essential)
  - Contested
  - Non contested

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.

AECOM

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[7] 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

---

7 Short message service or text message

quality of the public realm. Given this the reader is advised to consider these interventions as relating to roadside infrastructure when appropriate.

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 frrm 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[8]. 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 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

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

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 under way (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) Countdown X medium reliability (>=10 headway)	-6.7 -6.9
Hail and Board	
Bus stops close to kerb Bus branding Low floor bus (v high steps) *Compulsory stop versus request* *Split steps (v high steps)*	5.8 2.8 2.4 *1.7* *-0.3*
The driver	
Driver gives change when needed Interaction: appearance X ID *Interaction: appearance X ID badge* *Interaction: appearance X attitude* *Helpful driver* *Smart driver appearance* *Driver shows ID badge*	4.0 2.5 *2.2* *1.9* *1.5* *0.1* *-0.8*
Moving to seat	
Luggage area replaced with standing room Some seats sideways on Medium crowded (v low) Medium smooth vehicle motion (v smooth) Highly crowded (v low) Rough vehicle motion (v smooth)	*2.0* -3.0 -4.7 -6.4 -9.5 -10.5
Travelling in seat	
Roomy seats (v cramped) Value of time, pence per minute *Bucket seats (v standard seats)* Ventilation grille (v opening windows) Dirty bus interior	3.0 1.2 *-1.1* -2.5 -8.5
Leaving the bus	
Two sets of doors Electronic display of next bus stop name *Driver announcements on PA*	4.2 3.9 *-0.9*

Source: adapted from SDG 1996.

Although the modelling does not appear to segment the sample – segmentations are 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 aditional 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 Bilston to Bilston +	 13.2 9.5	 6.6 4.8
Static info to + PA Plus PA to plus PA and electronic display	0.6 -	0.3

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 None to recorded and monitored CCTV	 46 50	 7.3 7.9
Bus station staff None to office staffed 0800 to 1600 None to office staffed 0700 to 2300	 53 71	 8.5 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 None to provided, cleaned regularly, free	 32 52	 5.1 8.3
Roaming staff None to roaming staff providing general assistance	 60	 9.5
Waiting facilities Basic shelter to enclosed shelter Basic shelter to glass cubicles under canopy	 9 18	 1.4 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 s erviced. Figures c ompared favourably t o nat ional figures dr awn t he National Travel Survey.

Existing and pr evious us ers g ave pos itive responses t o t he new bus es a nd 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 an d c leanliness w ere al so r ated a s t he m ost i mproved aspects, a s demonstrated i n Table 4. 6, w hich pr ovides av erage v alues on a Li kert s cale, (where 1 = "It is much better now", 2 = "It is slightly better now", 3 = "There is not di fference", 4 = I t w as s lightly bet ter be fore a nd 5= "It w as m uch better before"), s o t he l ower t he av erage i s t he m ore p ositive t he r esponse. T he 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 w ork by York and Balcombe (1998) ex amined t he i mpact o f l ow floor vehicles on r outes i n Lond on a nd N orth Tyneside r esulting i n c hanges i n patronage between -6.7% and + 17.0%, but in the main positive. F or a l imited number of r outes (3) these i mpacts w ere t hen as sessed r elative t o a c ontrol route, in two cases the impacts was close to zero, whilst in the third growth of around 12% appeared to be at tributable to the low floor vehicle. T he authors suggest t hat t he pot ential i mpact on demand w ould be g reater where whole networks were converted giving passengers the expectation that any bus would be l ow f loor. White (2007) s uggests t hat the evidence base i n t he U K 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 s uggests t hat pr oviding l uxury bus es c an i ncrease p atronage an d achieve m odal s hift w hen c ombined w ith a frequent, w ell m arketed s ervice. Efforts were m ade 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	33.3	**53.8**	27.3	37.5	**45.5**	**44.4**

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)		
disposed people (whose attitude ratings were below average)						
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**
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.

REFERENCES

Accent marketing and Research (2004) Trams v Buses Final Report April 2004. Report to Transport for London.

Accent Marketing and Research (2002) UK Bus Priorities Modal Shift: Final Report. Appendix 6, to the main report Obtaining best value for public subsidy to the bus industry. Report to the Commission for Integrated Transport.

Accent Marketing and Research (1992) Bilston Bus Station: Facility valuation Study Final Report. March 1992. Report to CENTRO.

Accent Marketing and Research and Hague Consulting Group (1999) The value of Travel Time on UK Roads. Report to DETR.

Ajzen I. (1991).The theory of planned behaviour, Organizational Behaviour and Human Decision Processes 50, 179–211

Alpizar F. and Carlsson F. (2001) Policy Implications and Analysis of the Determinants of Travel Mode Choice: An Application of Choice Experiments to Metropolitan Costa Rica. Working Paper in Economics no. 56, September 2001, Department of Economics, Göteborg University.

Australian Transport Council (2006) National Guidance for Transport System Management in Australia. 4 urban Transport.

Australian Greenhouse Office, 2005. Evaluation of TravelSmart projects in the ACT, South Australia, Queensland, Victoria and Western Australia: 2001 – 2005. Commonwealth of Australia, Canberra.

Balcombe R., Mackett R., Paulley N., Preston J., Shires J., Titheridge H., Wardman M. and White P. (2004), “The demand for public transport: a practical guide”, TRL Report TRL593, available from http://www.demandforpublictransport.co.uk/trl593.pdf

Balcombe R.J. and Vance C.E. (1998) Information for bus passengers: a study of needs and priorities TRL Report 330.

Bates J. (2003) Package Effects, Appendix A to FaberMaunsell (2003) Public Transport Quality Literature Review. Report to the Department for Transport.

Beale E.H. (2004) Improving Bus Image: Effects of Introducing Luxury Buses on the Ripon – Harrogate – Leeds Route. MSc Dissertation, Institute for Transport Studies, University of Leeds.

Beale J. R., and Bonsall, P. W., (2007), Marketing in the bus industry: A psychological interpretation of some attitudinal and behavioural out comes, Transport Research F, Volume 10, 271-287

Beirão G., Sarsfield Cabral J., (In Press) Understanding attitudes towards public transport and private car: A qualitative study, Transport Policy.

Booz Allen and Hamilton (2001) Valuation of Sydney Buses Service Quality, State Transit.

Booz Allen Hamilton (2000) Valuation of public transport attributes. Transfund New Zealand Research Report No 184.

Bos I.D.M., Van der Heijden R.E.C.M., Molin E.J.E. and Timmermans H.J.P. (2004) The choice of park and ride facilities: an analysis using a context-dependent hierarchical choice experiment. Environment and Planning A 36(9), 1673-1686.

Brantingham P. J., Brantingham P. L., and Wong, P. S. (1991) How Public Transit Feeds Private Crime: notes on the Vancouver "Skytrain" experience, *Security Journal* 2 (2), 91-95

Bristow A L, Mackie, Shires J, Whelan G, Preston J and Huang B (2002) Achieving best value for public support of the bus industry Part 1: Summary report on the modelling and assessment of seven corridors, in LEK / Commission for Integrated Transport (2002) Obtaining best value for public subsidy for the bus industry

Byatt M., Oscuro G. and Rookes M. (2007) Improving Efficiency: An Evaluation of Sydney Buses "Bondi Bendy" Prepay Service. Paper to Thredbo 10, The 10th International Conference on Competition and Ownership in Land Passenger Transport, 12th-17th August, 2007, Hamilton Island, Australia.

Cairns, S., Sloman, L., Newson, C., Anable, J., Kirkbride, A., Goodwin, P. (2004) Smarter Choices – Changing the Way We Travel. Final Report of the Research Project – The Influence of Soft Factor Interventions on Travel Demand. Report to the Department for Transport.

Cherchi E. and Ortuzar J de Dios (2002) Mixed RP/SP models incorporating interaction effects: modelling new suburban rail services in Cagliari. Transportation 29(4) 371-395.

Cohen A. (2007a) Personal communication, August 2007.

Cohen A. (2007b) Personal communication, August 2007.

Colquhoun Transportation Planning (1992) Bus Information Systems: Research into user perceptions.

Confederation of Passenger Transport (2006) On the Move. Passengers, Partnerships and Growth: The Changing Face of the UK Bus Industry.

Confederation of Passenger Transport (2002) Better buses: a manifesto CPT, London.

Cooper T., Love T., Donovan E., (2007) Research into integrated crime prevention strategies for rail station environs. Final Report prepared for the Office of Crime Prevention, Australia

Cozens, P., Neale, R., Whitaker, J., and Hillier D., (2003) Managing Crime at Railway Stations – a Case Study in South Wales, International Journal of Transport Management, 1, 121-132

Crime Concern (2004) People's Perceptions of Personal Security and their Concerns about Crime on Public Transport: Research Findings. Report for the Department for Transport

Daugherty GG, Balcombe RJ and Astrop AJ (1999) A comparative assessment of major bus priority schemes in Great Britain. Transport Research Laboratory Report 409.

Davison, L.J. and Knowles, R.D., (2006). Bus quality partnerships, modal shift and traffic decongestion. *Journal of Transport Geography,* 14(3), 177-194.

Department for Environment, Food and Rural Affairs (2007) Synthesis of Climate Change Policy Appraisals.

Department for the Environment, Transport and the Regions (1998), DETR, 1998. A New Deal for Transport: Better for Everyone, London: The Stationery Office.

Department for the Environment, Transport and the Regions (1999) From Workhouse Through to Thoroughbred: A Better Role for Bus Travel, London: The Stationery Office.

Department for Transport (2007a) Values of Time and Operating Costs, TAG Unit 3.5.6, February 2007.

Department for Transport (2007b) Public experiences of and attitudes towards bus travel.

Department for Transport, (2004) The Future of Transport: a network for 2030. London: The Stationery Office.

Derek Halden Consultancy (2003) Barriers to modal shift, report to Scottish Executive Social Research.

Douglas Economics (2006) Value and Demand Effect of Rail Service Attributes. Report to RailCorp, December 2006.

Douglas Economics (2004) Value of Rail Travel Time Study. Report to RailCorp, May 2004.

Douglas N. and Karpouzis (2006a) Valuing Rail Service Attributes through Ratings Surveys, paper to the 29th Australasian Transport Research Forum, Brisbane, September 2006.

Douglas N. and Karpouzis (2006b) Estimating the passenger cost of train overcrowding, paper to the 29th Australasian Transport Research Forum, Brisbane, September 2006.

Douglas N. and Karpouzis (2005) Estimating the passenger cost of station crowding, paper to the 28th Australasian Transport Research Forum, Sydney, September 2005.

Dziekan K. and Kottenhoff K. (in press), Dynamic at-stop real-time information displays for public transport: effects on customers, Transportation Research A.

Enoch M., Potter S. (2002) Marketing and the British Bus Industry, Municipal Engineer 151, 49-56

Espino R., Ortuzar J. de Dios and Roman C. (2007) Understanding suburban travel demand: Flexible modelling with revealed and stated choice data. Transportation Research A, in press.

Espino R., Roman C. and Ortuzar J, de Dios (2006) Analysing demand for suburban trips: A mixed RP/SP model with latent variables and interaction effects. Transportation 33(3) 241-261

Evmorfopoulos A.P. (2007) Valuing "soft" factors improvements in urban bus services. MSc Dissertation, Institute for Transport Studies, University of Leeds.

FaberMaunsell (2004) Quality Bus Corridor Patronage Impact Study. Report for the GMPTE

FaberMaunsell (2003) Public Transport Quality Literature Review, prepared for the Department for Transport.

FaberMaunsell (2000) Stated Preference Working Paper: Croydon Tramlink. Report to Transport for London.

Fearnley N. and Nossum A. (2004) Public transport packages of measures 1996-2000 economic valuations. TOI Report 738/2004. English language summary.

Fearnley N. and Sælinsminde K. (2001) Testing stated preference techniques and stated choice design: a method study of public transport passengers' valuation of quality. TOI Report 544/2001, English language summary.

Fitzroy F. and Smith I. (1999) Season tickets and the demand for public transport. Kyklos, 52(2) 219-238.

Fitzroy F. and Smith I. (1998) Public transport demand in Freiburg: why did patronage double in a decade? Transport Policy 5(3) 163-173.

Fujii, S. and Taniguchi, A. (2006) Determinants of the effectiveness of travel feedback programs — a review of communicative mobility management measures for changing travel behaviour in Japan. Transport Policy, 13, 339-348.

Gilbert C.L and Jalilian H. (1991) The demand for travel and for travelcards on London Regional Transport. Journal of Transport Economics and Policy 25(1) 3-29.

Goodbody Economic Consultants in association with Atkins (2004) Parameter Values for Use in Cost Benefit Analysis of Transport Projects. Report to the Department for Transport,

Grotenhuis, J. W., Wiegmans B. W. and Rietveld P. (2007) The desired quality of integrated multimodal travel information in public transport: Customer needs for time and effort savings Transport Policy, 14 (1), 27-38

GMPTE (undated?) Executive Summary: Safety Travel Officer Initiative

Guiver J, (2007) Modal talk: Discourse analysis of how people talk about bus and car travel, Transportation Research A 41, 233-248

Hensher D.A. and Prioni P. (2002) A Service Quality Index for Area-wide Contract Performance Assessment. Journal of Transport Economics and Policy 36(1) 93-113.

Hensher D.A., Stopher P. And Bullock P. (2003) Service quality – developing a service quality index in the provision of commercial bus contracts. Transportation Research Part A 37(6) 499-517.

Heuman D., Buchanan P., Wedderburn M. and Sheldon R. (2005) Valuing walking: evaluating improvements to the public realm.

Holdsworth N., Enoch M. P., Ison S.G. (2007), Examining the Political and Practical Reality of Bus-based Real Time Passenger Information, Transport Planning and Technology, 30(2-3) 183-204

Institute for Transport Studies, University of Leeds and Transport Studies Unit, University of Oxford (2002) Achieving Best Value for Public Support of the Bus Industry: Part 1 Summary Report on the Modelling and Assessment of Seven Corridors. Report to CfIT.

Knutsson S. (2003) Valuing Rider Quality in Swedish Special Transport Services – new Findings. Journal of Public Transportation 6(3) 65-83.

Laird J. and Whelan G. (2007) Quality Bus Model: Re-analysis of the CFIT data. Report to the Department for Transport.

LEK / Commission for Integrated Transport, 2002 Obtaining Best Practice for Public Subsidy for the Bus Industry, CfIT:London (2002).

Le Masurier P., Pownall C. and Cummings P. (2006) Do passengers prefer articulated buses to conventional buses? Paper to the 34^{th} European Transport Conference, 18^{th}-20^{th} September, Strasbourg.

Litman T. (2007) Valuing Transit Service Quality Improvements: considering comfort and convenience in transport project evaluation, Victoria Transport Policy Institute.

Loukaitou-Sideris A., Liggett R. and Hiroyuki I. (2001) Measuring the effects of built environment on bus stop crime, Environment and Planning B: Planning and Design 28 (2) 255-280

Louviere J.J. (1984) Hierarchical information integration: a new method for the design and analysis of complex multiattribute judgement problems Advances in Consumer Research 11 pp 148-155.

Mackie P.J., Wardman M., Whelan G.A., Fowkes A.S. and Nellthorp J. and Bates J. (2003) Values of Travel Time Savings in the UK. Report to the Department for Transport.

McDonnell S., Ferriera S. and Convery F. (2007a) Bus Priority Provision and Willingness to Pay Differentials As a Result of Modal Choice and Residential Location – Evidence from a Stated Choice Survey. Paper to the European Association of Environmental and Resource Economists, 15th Conference Thessaloniki 28th June – 1st July 2007

McDonnell S., Convery F. and Ferreira S. (2007b) Impact of modal choice and residential location on willingness to pay for bus priority provision: evidence from a stated preference survey of catchment area residents in Ireland. TRB Annual Meeting 2007.

Molin E.J.E and Timmermans H.J.P (2006) Traveller expectations and willingness-to-pay for Web-enabled public transport information services. Transportation Research Part C 14(2) 57-67

Morris M., Ison S., and Enoch M. (2005), The role of UK local authorities in promoting the bus, Journal of Public Transportation, 8 (5) 25-40

Nellthorp J. and Jopson A. (2004), "New Horizons Research into Citizens' Understanding of Journey Quality: Implications for Appraisal", draft final report prepared for the DfT.

NERA (2006) The Decline in Bus Services in English PTE Areas: the Quest for a Solution, NERA, London

Nossum A. and Killi M (2006) Trafikantenes verdsettinger av enkle kollektivtiltak: Drøftinger og anbefalinger. (Passengers valuations of public transport quality measures: discussions and recommendations). TOI, PT/1851/2006. AVAILABLE ONLY IN NORWEGIAN.

Nossum A. (2003) Public transport in the Osloregion – Travellers' valuation of time. TOI report 633/2003, English language summary.

Ortuzar J de Dios (2007) personal communication 12/6/07

Phanikumar C.V. and Maitra B. (2007) Willingness-to-Pay and Preference Heterogenity for Rural Bus Attributes. Journal of Transportation Engineering, January 2007, 62-69

Phanikumar C.V. and Maitra B. (2006) Valuing Urban Bus Attributes: An Experience in Kolkata. Journal of Public Transportation, 9(2) 69-87.

Rye T, And Enoch M. P. (2004), The role of marketing in quality bus corridor promotion, Municipal Engineer, 157, 61-66

Sloman L (2003) Less Traffic where people live: how local transport schemes help cut traffic. Report supported by the Royal Commission for the Exhibition 1851, Transport for Quality of Life and Transport 2000, London.

Socialdata (2006a), Worcester: Sustainable Travel Demonstration Town, Interim Evaluation of ITM Programme (Stage 1), Prepared for Worcester County Council May 2006

Socialdata (2006b), Peterborough: Sustainable Travel Demonstration Town, Interim Evaluation of ITM Programme (Stage 1), Prepared for Peterborough City Council July 2006

Socialdata (2006c), Darlington: Sustainable Travel Demonstration Town, Interim Travel Behaviour Research, Final Report, Prepared for Darlington Borough Council April 2006

Socialdata (2007), Darlington: Sustainable Travel Demonstration Town, Second Interim Travel Behaviour Research, Final Report, Prepared for Darlington Borough Council March 2007

Steer Davies Gleave (2007) Phase 1 Willingness to Pay Valuations, memorandum to Transport for London. 23rd July 2007.

Steer Davies Gleave (2006) Multi-Modal stated Preference Study, presentation to Transport for London 20/10/06

Steer Davies Gleave (2004) Valuation of Station Facilities, Draft Final Report to GMPTE.

Steer Davies Gleave (1996) Bus Passenger Preferences, Report to London Transport Buses.

Stangeby I. (2004) Safe Public Transport, Public transport users' experience of using public transport and measures to increase safety, summary report, TOI report 704.

Stradling S., Carreno M., Rye T., Noble A., (In Press) Passenger perceptions and the ideal urban bus journey experience, Transportation Research F.

Stradling, S.G., Noble, A., Carreno, M., Jeffery, G. And Marshall, I. (2004). Eight reasons people don't like buses. Proc. Symposium on Non-rational factors influencing travel mode, 3rd International conference in Traffic and Transport Psychology, Nottingham, 5-9 September 2004.

Stagecoach (2007) Stagecoach study reveals bus partnerships deliver better value to taxpayers than London-style regulation. Press release 2/8/07.

Streeting M. and Barlow R. (2007) Understanding key drivers of public transport patronage growth – recent South East Queensland experience. Paper to Thredbo 10 The 10th International Conference on Competition and Ownership in Land Passenger Transport, 12th-17th August, 2007, Hamilton Island, Australia.

Swanson J., Ampt E. and Jones P. (1997) Measuring Bus Passenger Preferences. Traffic Engineering and Control, June 1997 330-336.

Synovate (2007) Safety and Security when Travelling around London. Report for Transport for London

Tang L. and Thakuriah P. (2007) An Analysis of Anticipated Behavioral Responses to Real-Time Transit Information Systems, Prepared for WCTRS

TAS, (2002), Monitoring Quality Bus Partnerships. A Report for the Department for Transport Vol. 1, The Evidence Transport Advisory Service, Preston: TAS

TAS, (2001) Quality Bus Partnerships Good Practice Guide, Preston: TAS

TAS (1998) Modal shift: essential components of success. Proceedings of a Local Transport Today/TAS Partnership Conference: The Role of Buses in the New Transport Policy Environment, London, 23 June 1998.

TAS, (1997) TAS, Bus Industry Monitor, Preston: TAS

The Ten Percent Club (2006) Routes to revenue growth: the message from nine successful bus services, Local Transport Today Limited, London.

Transit (2007) Uni-link's wireless internet trial is a first for UK urban bus operation, page 9. 10/8/07.

Transit Cooperative Research Programme (2007), Report 11: Elements needed to create high ridership transit systems, Washington: TRB

Transport for London (2007) Business Case Development Manual, Appendix E4.7 Bus Improvement and Benefit Values (pence per journey).

Tversky A. and Kahneman D. (1991) Loss Aversion in Riskless Choice: A Reference Dependent Model. Quarterly Journal of Economics. 106(4) pp1039-1061

Van der Waerden P., Borgers A., Timmermans H. and Berenos M. (2007) Users Evaluation of Transport Mode Characteristics with Special Attention to Public Transport. Paper to the 11th World Conference on Transport Research, 24th-28th June, Berkeley, California.

Wall G., and McDonald M. (2007) Improving bus service quality and information in Winchester, Transport Policy, 14, 165-179

Wardman M. (2007) Personal Communication, 30th August 2007.

Wardman M. (2004) Public transport values of time. *Transport Policy,* 11, pp363-377.

Wardman M. (2001) A review of British evidence on time and service quality valuations, Transportation Research E 37(2-3) 107-128

Wardman M. and Bristow A.L. (in press) Valuations of aircraft noise: experiments in stated preference, Environmental and Resource Economics.

Wardman M. and Whelan G. (2001) Valuation of improved railway rolling stock: a review of the literature and new evidence, Transport Reviews 21(4) 415-447.

Wardman M., Bristow A.L., Murphy P.A. and Heaver C. (2003) Valuation of Aircraft Noise using Stated Preference Methods within a Broader Quality of Life Dimension. Paper to European Transport Conference Strasbourg 8-10th October 2003.

Wardman M., Hine J. and Stradling S. (2001) Interchange and Travel Choice, Volume 1. Report for the Scottish Executive.

White P. (2007) Factors behind recent patronage trends in Britain and their implications for future policy. Paper to Thredbo 10 The 10th International Conference on Competition and Ownership in Land Passenger Transport, 12th-17th August, 2007, Hamilton Island, Australia.

White P. (2002) Public transport: its planning, management and operation, 4th Edition. Spon Press, London.

White P.R. (1983) Further developments in the pricing of local public transport, Transport Reviews 3(4) 329-340.

Yahya, N., Nelson J.D. and Mulley C. (2007) Evaluating the Effect of "Quality" on Bus Users' Satisfaction. Paper to the 11th World Conference on Transport Research, 24th-28th June, Berkeley, California.

York I. and Balcombe R.J. (1997) Evaluation of low-floor bus trials in London and North Tyneside. TRL Report 271.

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*			
Staff present	9 p/trip (*,†)	Edinburgh bus users, SP	2002
Accessibility *of vehicles*			
Low floor	2.8 p/trip (*)	London bus users, SP	1996
	Pushchair: 4 -12 p/ trip (*)	London, Tyneside bus users	1994?
		London, Tyneside bus users	1994?
Two sets of doors	Wheelchair: 1-57 p/trip	London bus users, SP	1996
Wide entrances	4.2 p/trip (*)	Australia bus users, SP	1999
	7 p/trip (**)		
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 Polite, helpful, cheerful Helpful	 4.0 p/trip (*) 7.7-13.8 p/trip (*) 1.5 p/trip (*)	 London bus users, SP England bus users, SP England bus users, SP	 1996 2001 2001
Cleanliness *in-vehicle* Dirty bus interior Clean enough Very clean	 -8.5 p/trip (*) 11 p/trip (**) 15 p/trip (**)	 London bus users, SP Australia bus users, SP Australia bus users, SP	 1996 1999 1999
Packages of attributes (bus): *At stops:* Shelter and seats Shelter, lighting and seats CCTV on buses AND at stops *Vehicles:* New vehicles (vs status quo) New low-floor vehicles	 7 p/trip (**) 14 p/trip (*,†) 5.8-16.6 p/trip (*) 7.8-12.7 p/trip (*) 4.7-14.3 p/trip (*)	 Australia bus users, SP Edinburgh bus users, SP England bus users, SP England bus users, SP England bus users, SP	 1999 2002 2001 2001 2001
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 Better lighting Waiting room (heated+lit) CCTV Intercom	 17/25 p/trip (*) 3/4 p/trip (*) 5/7 p/trip (*) 10/14 p/trip (*) 4/23 p/trip (*)	 GB, National Rail GB, National Rail GB, National Rail GB, National Rail GB, National Rail	 2000 q4 2000 q4 2000 q4 2000 q4 2000 q4
Customer service *at stations* Staff presence	 10/15 p/trip (*)	 GB, National Rail	 2000 q4
Crowding *in-vehicle* at 80% load factor at 100% load factor at 120% load factor	all (***) 0 0.5 p/minute (seated) 12 p/minute (standing) 1.0 p/minute (seated) 13 p/minute (standing)	 GB, National Rail, commuting GB, National Rail, commuting GB, National Rail, commuting GB, National Rail, commuting GB, National Rail, commuting	 2000 q4 2000 q4 2000 q4 2000 q4 2000 q4
Rail vehicle quality – packages: Express Sprinter vs Sprinter Express Sprinter vs Slam-Door Mark 2 vs Slam Door Rail vehicle refurbishment: Major refurbishment of Slam Door vehicles (changes to seating layout and comfort, ride quality, decor, ventilation and noise level) Typical refurbishment	 0.9% of fare (****) 1.5% of fare (****) 1.4% of fare (****) 2.5% of fare (****) 1.5% of fare (****)	 GB, National Rail GB, National Rail GB, National Rail GB, National Rail GB, National Rail	 1997 1997 1997 1997 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.

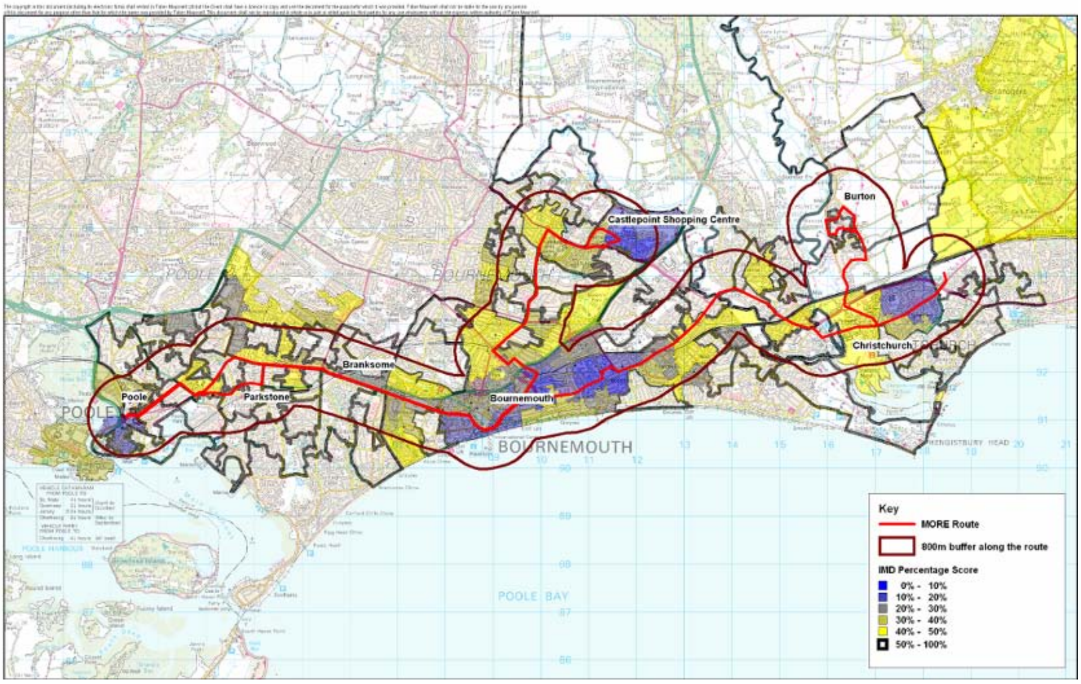
AECOM

Appendix C: Case Study Route Maps

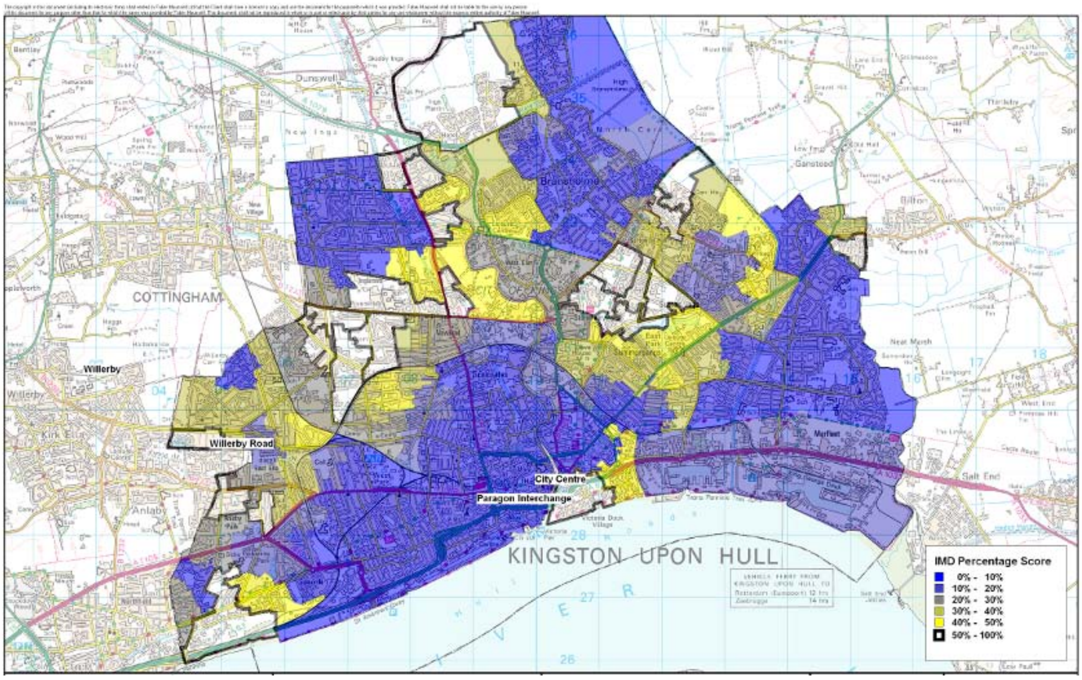
Appendix C: Case Study Route Maps

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

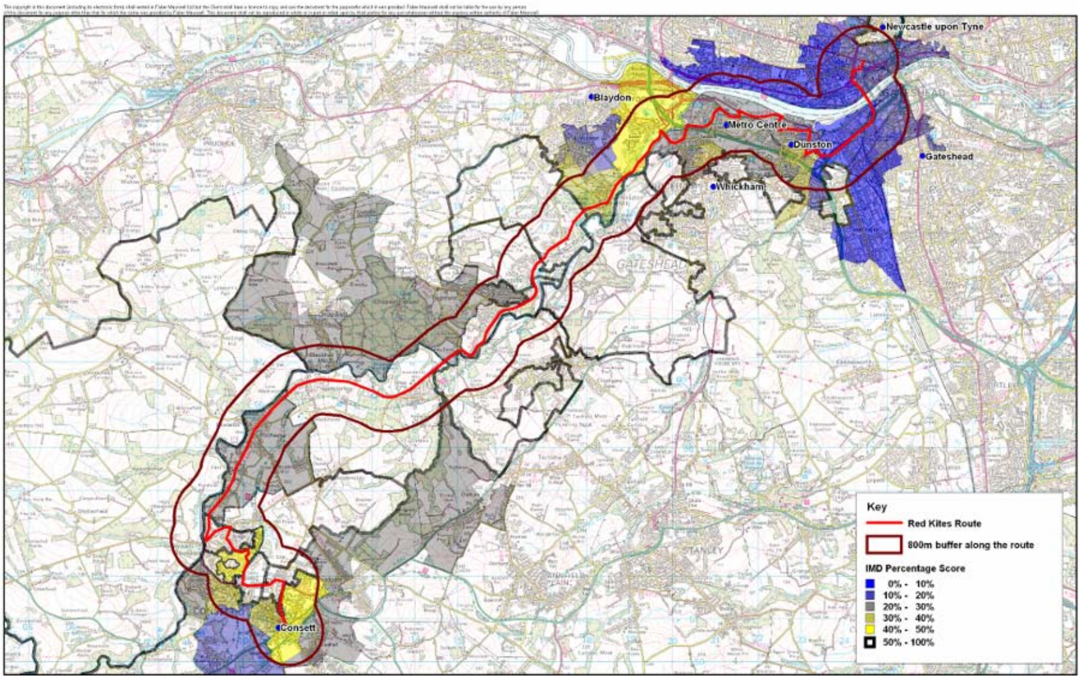
Area 1 Poole



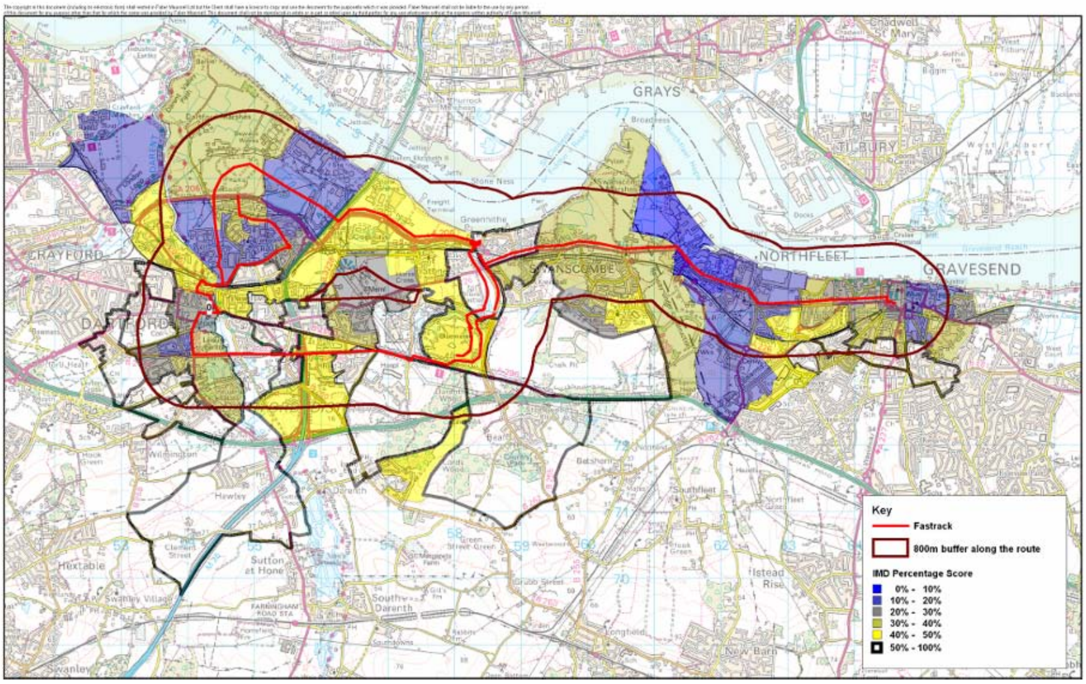
Area 2 Hull



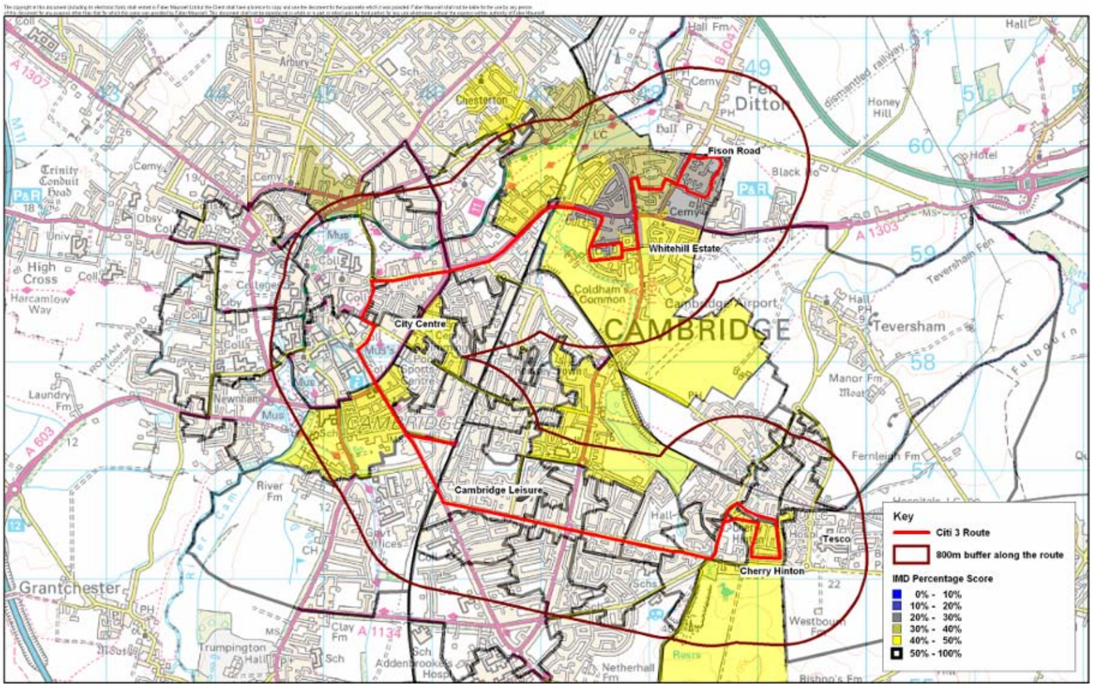
Area 3 Tyne and Wear



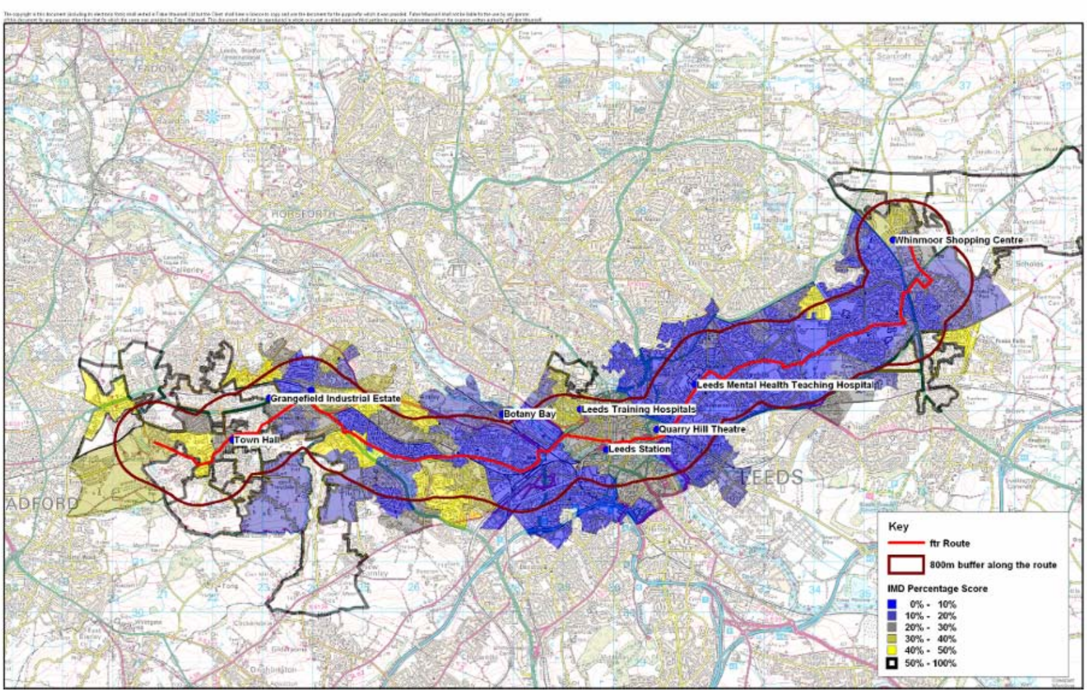
Area 4 Dartford



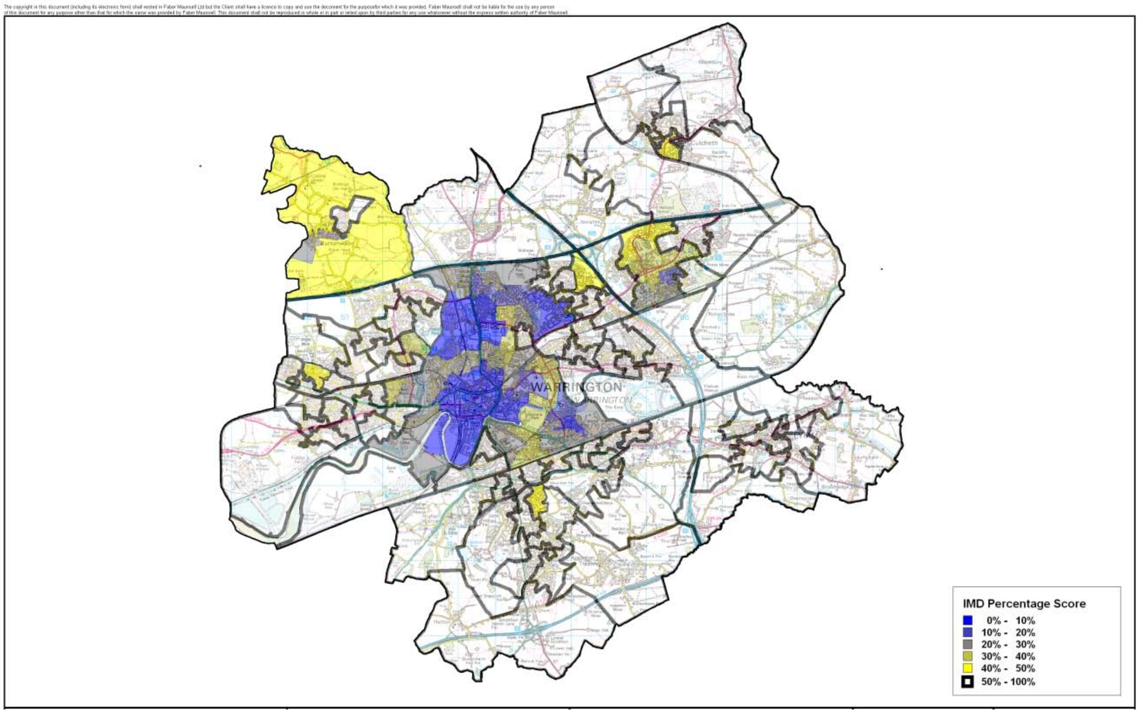
Area 5 Cambridge



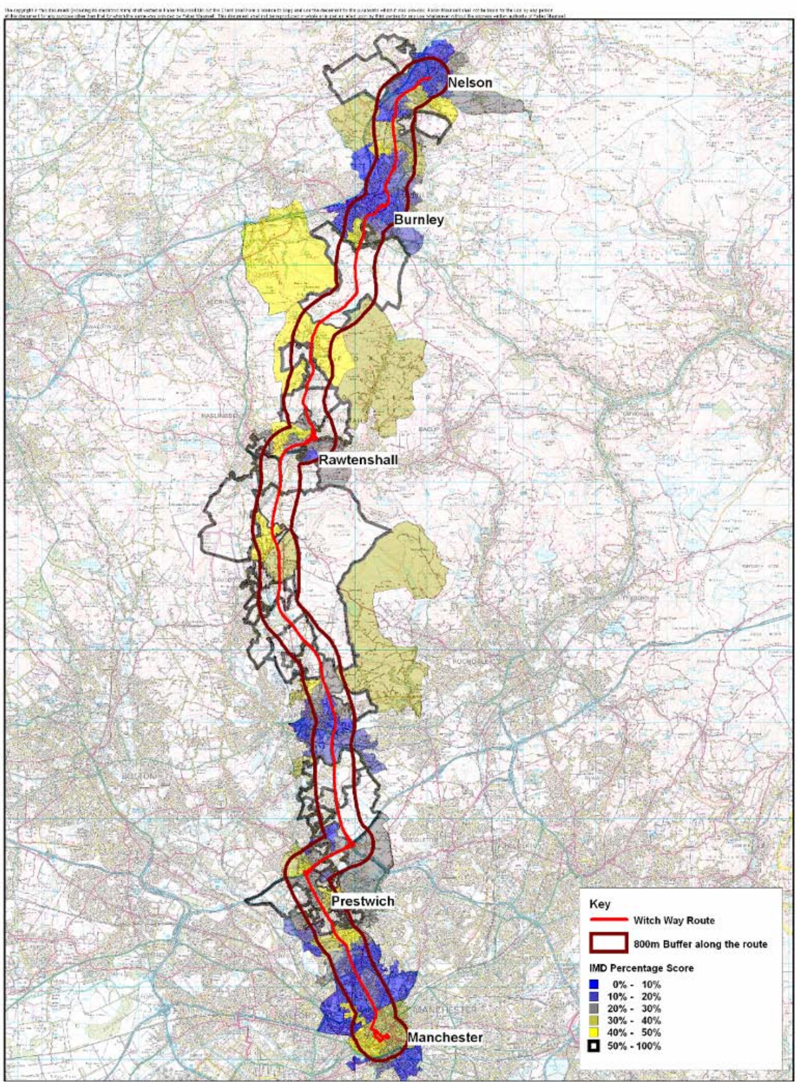
Area 6 Leeds



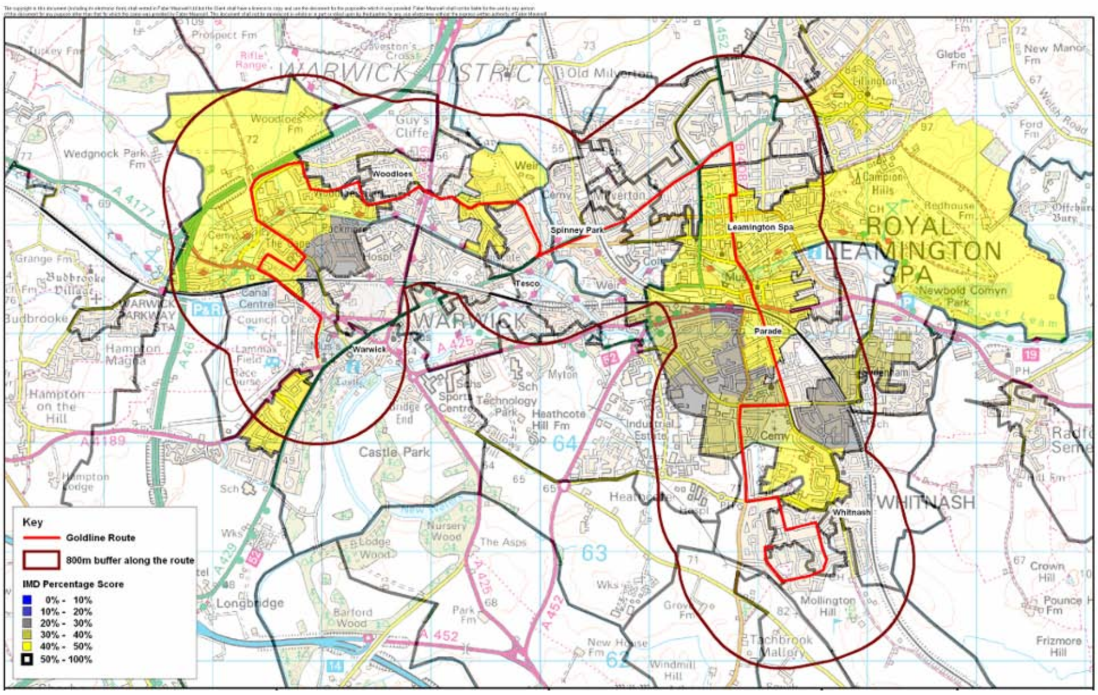
Area 7 Warrington



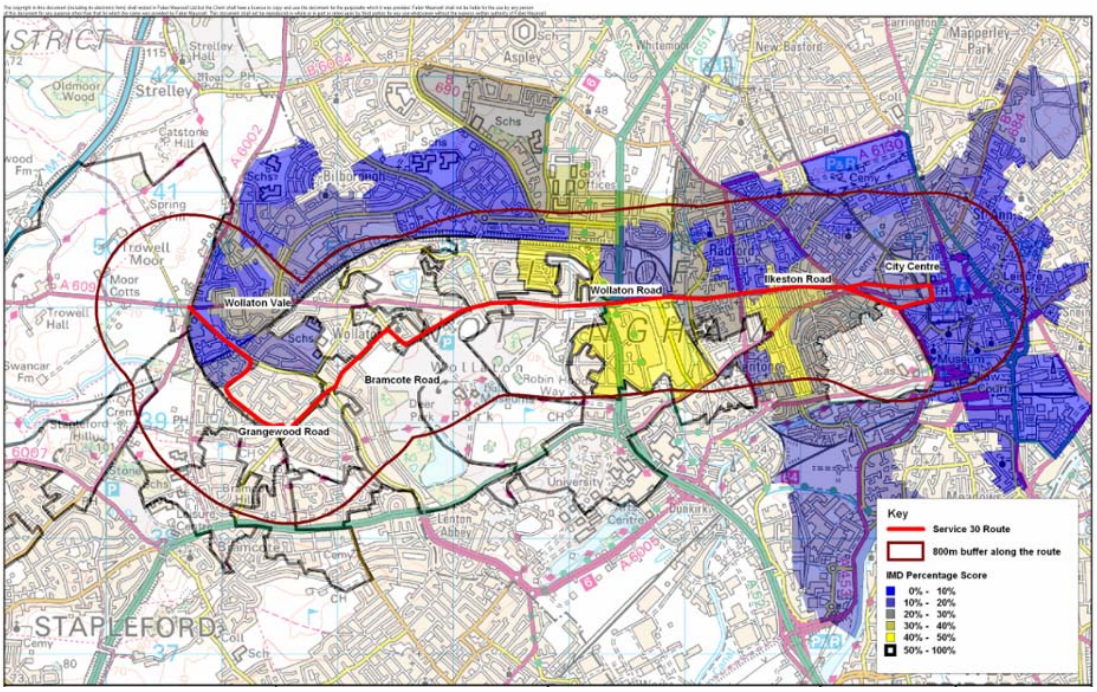
Area 8 Burnley



Area 9 Warwick



Area 10 Nottingham



FABER MAUNSELL | AECOM

Appendix D: Attitudinal Awareness and Impact of Bus Features

Appendix D: Attitudinal Awareness and Impact of Bus Features

.
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

AECOM

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

AECOM

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

AECOM

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 ( )

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 a CATI (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 educ ational q ualification 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 f are d ue to i ntroduction o f 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

5. 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 clarrification.

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?**

12. **Are you sure about that?**
a. Certain(→16)
b. Not certain

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

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

15. **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)

16. **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

17. 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

18. 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

19. 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)

20. How sure are you about that?

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

21. *(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

22. 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)

23. How sure are you about that?

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

24. 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)

25. How sure are you about that?

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

26. 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)

27. How sure are you about that?

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

28. 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

29. **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

30. 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)

31. **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

32. **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

33. **What factors did you take into account in that choice?** *(code all 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 all 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 not 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)**

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

83. *Interviewer to record their impression of how well the interview went (tick one):*
a. Excellent (stop)
b. Good
c. poor
d. very poor

84. *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

<u>Locations for list of places "X" at question 9</u>

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)

<u>Briefing pack content</u>

(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

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.