BIKE-RAIL INTEGRATION AS ONE SUSTAINABLE TRANSPORT SOLUTION TO REDUCE CAR DEPENDENCE

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This research programme was carried out in collaboration with First Great Western Trains (FGW) as a Great Western Research Studentship which is expected to contribute to knowledge that will assist regional development as well as knowledge exchange between the private sector and academic institutions in the South West, in this case, Bath University, Bournemouth University and the University of the West of England. Access to the rail network and the perspective of the rail industry has been provided by the private sector partner, First Great Western and the information exchanged could inform policy changes within the rail industry, as well as other organisations within the South West and other parts of the country, with an interest in promoting more sustainable travel options

ABSTRACT

The level of bike-rail integration (combining cycling with rail) in the UK presents an unrealised sustainable mobility potential: two per cent of rail passengers access the rail network by bicycle, contrasting with 40 per cent in the Netherlands. Cycling on its own has distance limitations but in combination with rail it can substitute for longer car journeys and is one means of reducing car dependence.

The overall objective of this PhD research project was to understand existing bike-rail integration behaviour in the UK, using as the research location two stations in the South West of England (Bristol Temple Meads and Bristol Parkway), to inform the design, development and implementation of initiatives to increase its incidence. It therefore had two distinct research phases: an exploratory phase and an action research phase.

The exploratory phase demonstrated that bike-rail integrators were mainly motivated by saving time or money and taking exercise. The majority were male, in their thirties, in full-time employment and cycled on average 3.7 km to the station. These data in conjunction with a conceptual 'ecological' model developed from a critical review of behaviour change theory were used to inform the design and implementation of a pay-as-you-go self-hire cycle network (Hourbike) and an intervention to attract car drivers to switch to rail with either walking or cycling access. In the first year of Hourbike, seven per cent of users had never really cycled before and one per cent of car drivers responded to the opportunity to try rail with walking or cycling access rendering rich qualitative data from non-users about the attractors and barriers to bike-rail integration.

The process of incorporating theory into practice is described providing useful insights for future interventions which are discussed in the light of theory. Opportunities are identified in the context of the national policy to implement station travel plans which emerged in the latter phases of the research.

Contents page

List of tables

List of charts

List of figures, pictures and maps

Chapter 1 Introduction

"While 60 per cent of the (UK) population lives within a quarter of an hour's cycle ride of a railway station, only two per cent of journeys to and from stations are made by bicycle. There is a huge opportunity here, particularly in providing an environmentally friendly option for travel to work, but facilities at stations must improve and cater for this market" Executive Summary Low Carbon Transport: a greener future (DfT 2009a)

This research project stems from the normative perspective that there is a need for travel behaviour change towards less travel and more sustainable modes to mitigate the negative impacts of car use on the environment, health and quality of life. In particular, the dominance of the car in the rural and urban landscape has made the most sustainable transport modes a less attractive option. The focus of this research is cycling combined with rail - bike-rail integration - as one sustainable transport option which can enable individuals to become less car dependent. The current level in the UK is very low at two per cent of rail passengers accessing the rail network by bicycle (DfT 2007a) which contrasts with a level of 40 per cent in The Netherlands (NS 2009).

Cycling as a stand-alone mode can offer a better alternative to the car than public transport for short journeys, as it offers flexibility and is door-to-door (Hillman 1997). In combination with rail, cycling can substitute for longer car trips by providing a more seamless journey that can compete with a car in terms of speed and flexibility (Martens 2004). In the longer term, bike-rail integration could enable individuals to live without a car or reduce their car ownership. An increased level of bike-rail integration could provide a relatively high quality service for people who cannot drive a car or afford to buy a car (Martens 2004).

In addition there are potential benefits for the rail industry itself, as cycle access can extend the catchment area: for a given journey time, cycling increases the accessible area by 15 times over walking[1] (Countryside Agency 2004). This could be significant in aiding the economic performance of particular rail lines at certain times of day. The investment required to encourage cycle access is likely to be low relative to the cost of the equivalent journey-time savings on the rail network itself and relative to increasing car parking availability at stations.

Currently there is particular emphasis on the contribution of transport to climate change. The UK government has published a strategy 'Low Carbon Transport: a greener future' (DfT 2009a) to meet the requirements of the carbon budgets set out under the Climate Change

[1] See Section 9.6 this research suggests a 10 fold increase

Act 2008. This strategy includes making cars more efficient but also promoting alternatives – public transport, cycling and walking.

The negative impact of car ownership and use extends well beyond emissions as it has enabled more dispersed land use patterns, resulting in a growth in journey lengths, rather than the number of trips, with the result that individuals are travelling further to do the same things (Buchan 2008). This increase in journey length reduces the potential for cycling. This is compounded by the volume of traffic in some areas of the UK making more active travel modes - walking and cycling - less attractive and reducing physical activity levels, a contributor to the rise in obesity (Davis, Valsecchi & Fergusson 2007). Research in the United States found that each additional kilometre walked per day is associated with a nearly five per cent (4.8%) reduction in the likelihood of obesity, while an additional hour spent in the car per day is associated with a six per cent increase in the likelihood of obesity (Frank, Andresen and Schmid 2004).

Hence, an increase in bike-rail integration has the potential to contribute to reducing carbon emissions by substituting car journeys, increasing physical exercise and improving the economic sustainability of the rail network.

The catalyst for this PhD research project was the observation that, despite these potential benefits, existing cycle parking facilities at station and on trains were functioning at capacity in the Bristol area in the South West of England and it appeared that the status quo was actually discouraging bike-rail integration. The existing situation was creating problems for bike-rail integrators, rail passengers and the rail industry itself.

Though cycle access is currently very low (DfT 2007a), the pressures of rail passenger growth and the shift towards promoting more sustainable travel options may lead to higher levels of use and this will have considerable practical implications for the rail industry in terms of space both on trains and in and around stations. This low level of bike-rail integration has manifested itself in a lack of research about the existing practice and the overall objective of this PhD research project was to understand this behaviour in order to inform the design, development and implementation of initiatives to increase its incidence and to trial two particular solutions.

Chapter 2 outlines the enormous growth in motorised transport, its impact and the resulting car dependence which has led to a shift of UK national transport policy away from accommodating growth and towards demand management with an emphasis on behaviour change to more sustainable modes including cycling and bike-rail integration. The UK policy context in which bike-rail integration takes place is introduced.

Chapter 3 argues that the low level of cycling in the UK is a limiting factor for the promotion of bike-rail integration and therefore part of the literature review draws on the experience of promoting cycling on its own, as well as in combination with rail, mostly in other Northern European Countries. There are two reasons for this: first, in practice, nearly all of the literature on bike-rail integration identified derived from this geographical area and, second, as this thesis will argue, cultural context is an important factor in the promotion of bike rail integration and therefore those countries with closer cultural similarities were considered the most relevant. Cycling on its own is relevant to this thesis because if the option to combine it with rail is more available allowing the replacement of long car journeys it could enable individuals to reduce their car dependence. This chapter also discusses factors relevant to the promotion of bike-rail integration.

Chapter 4 draws on the existing literature and theory around behaviour change and travel decision making to investigate the likely attractors and barriers to cycling and bike-rail integration. Chapter 5 builds on this discussion to create a conceptual ecological model which illustrates a number of influencing factors. It highlights the complex interactions between the different factors showing that any effective intervention to promote bike-rail integration will require addressing the practical, social and psychological barriers. The concept of social marketing is introduced as a means to apply the conceptual model in practice and lays the groundwork for Chapter 8, which outlines the trialling of two interventions to promote bike-rail integration implemented in this research - a pay-as-you-go self-hire cycle network (Hourbike) and an intervention to attract those driving to the UWE campus to switch to rail with either walking or cycling access.

It is this ecological conceptual model that underpins the main argument of the thesis, which is that an individual's travel decision making cannot be divorced from his or her social and cultural context. Another crucial element in the theoretical discussion of the thesis is the idea that changing behaviour can change attitudes. This is important as, in many cases, the application of social marketing has sought to identify target groups through attitude and reported behaviour surveys on the understanding that certain attitudes are a necessary pre-requisite for behaviour change. In contrast, the present research proposes that if behaviour change can in fact alter attitudes then providing opportunities to trial a behaviour to travellers without attitudinal or behavioural profiling is a potentially resource-efficient alternative. It is argued that those that change their behaviour may trigger social processes which encourage others to change their behaviour, such as through word of mouth and peer modelling within their social networks, as proposed by the Diffusion of Innovations Model (Rogers 2003). Hence, the effect of an intervention is amplified through social diffusion.

The overall research approach and strategy is outlined in detail in Chapter 6 including the two distinct phases: exploratory research and action research. The two research phases are inextricably linked both using two railway stations, Bristol Temple Meads and Bristol Parkway in the South West of England as research sites. Bristol is the largest city in the South West and Bristol Temple Meads the busiest station servicing over seven million journeys to and from the station, with Bristol Parkway servicing nearly two million in 2007/2008[2] (Office of the Rail Regulator 2009).

As the results of the exploratory phase feed into the action research phase the logical structure of this thesis dictates that some of the literature that relates directly to the justification for the choice of the two interventions appears in Chapter 8 after the exploratory research phase results are reported in Chapter 7.

The first phase of the empirical research was exploratory, as outlined in Table 1 on the next page, and was designed to ascertain the demographics of bike-rail integrators, their attitudes towards the different methods and their level of experimentation. Their motivations, cycling histories and social context were also explored using both primary qualitative and quantitative data collected using different methods: observation, face-to-face surveys, semi-structured interviews, cycle parking and barrier counts. This information was supplemented with an internet survey placed on the First Great Western Trains (FGW) booking website which provided additional information on bike-rail integrators from a wider geographical area but also on rail users who do not currently access the rail network by bicycle.

[2] These calculations are based on the national Lennon database of ticket sales

Table 1 Research questions exploratory phase

RESEARCH QUESTIONS	METHODOLOGY
Who are existing bike-rail integrators?	Observation, face-to-face survey, semi-structure interviews, cycle parking and barrier counts
In what types of behaviour do they engage?	
Why do they engage in this behaviour?	
Would existing rail users consider cycle access? **Would existing bike-rail integrators consider bike hire?**	Internet survey, face-to-face survey

The second, action research phase built on the knowledge from the exploratory phase to design and implement two interventions to promote bike-rail integration, as outlined in Table 2 below and reported in Chapter 8.

Table 2 Research questions action research phase

RESEARCH QUESTION	ACTION RESEARCH
How can 'soft measures' or ‘smarter choices’ be effectively applied to promote bike-rail integration?	The data collected from the exploratory phase, a literature review and a theoretical discussion of travel decision making and behaviour change were used to develop, design and implement two trial interventions – a pay-as-you-go cycle network, Hourbike and an intervention to attract those driving to the UWE campus to switch to rail with either walking or cycling access.
What are some of the practical and organisational barriers to promoting bike-rail integration?	Culmination of data collected throughout this research project including the correspondence, meetings, reports amongst the collaborative partners of three different possible interventions.

Chapter 8 also uses the example of the development of the Bristol Parkway Station Travel Plan (BPSTP) as a manifestation of the change in national transport policy towards behaviour change as a way of drawing together and applying the theory and data collected in this research. All the different strands within this research are brought together in Chapter

9 which further develops insights and makes recommendations and suggestions for future research.

As this research was taking place at a time and in an area where there was limited capacity for passengers within overcrowded trains, two decisions about the research strategy were made early on in the project.

Firstly, it was decided to concentrate on finding solutions that could be implemented within the timeframe of a three year PhD research project, for example, improved cycle parking and bike-hire. The growth of rail travel has outstripped the rail industry's expectations so that finding space for passengers, even with an expansion of rolling stock has proved difficult. In the short term, the provision of increased capacity for bike carriage on trains was seen as unlikely: even if there was the will and necessary investment, the lead times for refurbishment and redesign would be long[3].

Secondly, a decision was made to focus the interventions on the promotion of bike-rail integration for more regular journeys as they were more amenable to travel planning (strategies to reduce the environmental impact of travel considered in Section 2.4) and building in routine physical exercise rather than the less frequent journeys for those wishing to bike-rail integrate for leisure or tourism, for example, taking a bicycle on the train for a day trip or cycling holiday.

Considerable potential exists to develop bike-rail integration, particularly off-peak through investment in multipurpose carriages or carriages solely for bike carriage but it would require significant longer term investment as well as institutional changes within the rail industry including revision of the franchise agreements.

The knowledge generated in this research is of interest to those wishing to change travel behaviour generally and more specifically to those designing interventions to promote cycling and bike-rail integration. The conceptual model developed in Chapter 5 could be applied to the design of any intervention to promote cycling and bike-rail integration. The two interventions discussed in this thesis could be modified for implementation elsewhere and incorporated into the recent government initiative to implement station travel plans (STPs) (DfT 2007b) aimed at encouraging sustainable access including cycling.

[3] The Netherlands with the highest level of bike-rail integration in the western world manages demand for bicycle carriage through pricing and a ban at peak times

The simultaneous barrier and bike parking count methodology developed in the exploratory phase of this research could be applied elsewhere to measure the use of cycle facilities at railway stations and the proportion of those taking their bicycles on trains. A modified form could be used at cycle parking facilities elsewhere.

The research findings highlight the relevance of the specific context in which a station exists to the design of an intervention to promote bike-rail integration: the train operator with varying policies relative to cycle access and carriage, the catchment area and its topography, the levels of congestion and the availability of alternative access modes. Though the research was conducted at two stations in the South West, the insights gained are of relevance elsewhere.

Chapter 2 Sustainable mobility, the context for the promotion of bike-rail integration

This chapter makes the case for the promotion of bike-rail integration and argues that the negative impacts of car use have precipitated a shift in national transport policy towards reducing car use and changing behaviour to more sustainable modes such as cycling and rail use. The chapter starts by considering the impact of this growth in transport and shows the potential for an individual to reduce his or her carbon emissions by changing travel behaviour. The impact of car dependence on spatial planning is discussed and how the increased journey length within lower density development reduces the potential for making the same journeys by bicycle alone. The combination of cycling and rail could be a substitute for more of these car journeys. Car dependence is shown to have implications in terms of the ability of individuals to perceive or even consider alternatives; a necessary step for behaviour change to occur (see Chapter 4). The final section looks at the overall shift in transport policy in the UK and then the policy context for the promotion of bike-rail integration.

2.2 The growth of transport and its impact

This section looks at the potential for bike-rail integration to reduce some of the negative impacts of the enormous growth in motorised transport, with particular emphasis on carbon emissions as this is currently a focus for transport policy change.

Short car journeys can be substituted with cycling alone but, in combination with rail, the distance limitation of cycling can be overcome. Cycling has a lot to offer as an alternative to car travel: its emissions are lower and its infrastructure requirements are low-intensity in terms of energy and carbon. Space requirements are also much lower than those needed for the use and parking of cars. From an accessibility perspective, private costs are also low relative to private car ownership and often also to public transport use. In the developed states increasingly concerned about poor public health, cycling offers the benefit of routine exercise built into the daily rhythms of travellers' lives, "In short, it is hard to beat cycling when it comes to environmental, social and economic sustainability" (Pucher and Buehler 2008 p4).

In 1950 there were just under 2 million cars registered in the UK, with only 14 per cent of households owning a car. By 1998 the number of cars registered had reached over 21.6 million vehicles, with over 70 per cent of households owning at least one car (DfT 1998 a).

The higher level of car ownership and usage since the 1950s has enabled a large increase in the total amount of travel and the dispersal of activity. In 1952, 58 billion passenger-km were driven in cars, taxis and vans and by 2006 this figure had increased twelve-fold to 686 billion passenger-km (DfT 2007c Table 1.1). At the same time, as can be seen in Table 3, walking, cycling and bus use have declined and though rail-km travelled have increased this still represents a small share of the total distance travelled.

Table 3 Trips per person by mode per year, mean length and distance travelled

	Trips per Year			Distance per year in Km			Mean trip length in Km		
	1975/76	2006	Change	1975/76	2006	Change	1975/76	2006	Change
Walk	325	249	-23%	408	322	-21%	1.3	1.3	0%
Cycle	30	16	-46%	82	61	-26%	2.7	3.8	+41%
Bus	108	66	-39%	773	574	-26%	7.1	8.7	+23%
Rail	15	24	+60%	520	866	+67%	34.7	36.1	+4%
Car	429	658	+53%	5118	9109	+78%	11.9	13.8	+16%
All Travel	935	1037	+11%	7584	11413	+50%	8.1	11.0	+36%
Sources NTS 1997/99 and 2006 as reported by Mackett 2009									

As can been seen in Table 3, the number of trips by car, the distance travelled by car and the mean trip length per person have all increased between 1975 and 2006. The consequent dispersal of activity has in turn created more car dependence, by reducing the possibility of accessing more distant locations by walking, cycling or public transport. Individuals have chosen to live in locations where their needs can only be met by using a car (Mackett 2009).

This growth in motorised transport has resulted in a 52 per cent increase in CO_2 from domestic transport sources since 1980 (DfT 2006a). On average across the world the transportation sector is responsible for 14% of CO_2 emissions, this figure is higher at 22% in the UK equivalent to 33 Mt of CO_2 (King Review 2007)[4].

This growth has stemmed from falling transport costs over the last forty years that has facilitated globalisation and boosted the international trade of goods by 10-17.5 percent, which is estimated to have raised UK Gross Domestic Product (GDP a measure of the size of the economy) by 2.5-4.4 percent (Eddington 2006).

This link between transport and economic growth has resulted in a constant tension between the objective of facilitating economic growth through improved infrastructure and the need to reduce the climate change, health, quality of life and natural environment impacts. In 1972, the Club of Rome published the famous report which predicted on the basis of a computer model that there were 'limits to growth' as key resources would be exhausted (Meadows 1972).

"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs" as defined by the Brundtland report (WCED 1987) which acknowledged that there are indeed limits to growth. Greene and Wegener argue that transport has to be seen in this wider context of sustainable development and cite the Aalborg Charter (The Charter of European Cities and Towns Towards Sustainability 1994) that states that the objective of sustainable development is "to achieve social justice, sustainable economies and environmental sustainable mobility.

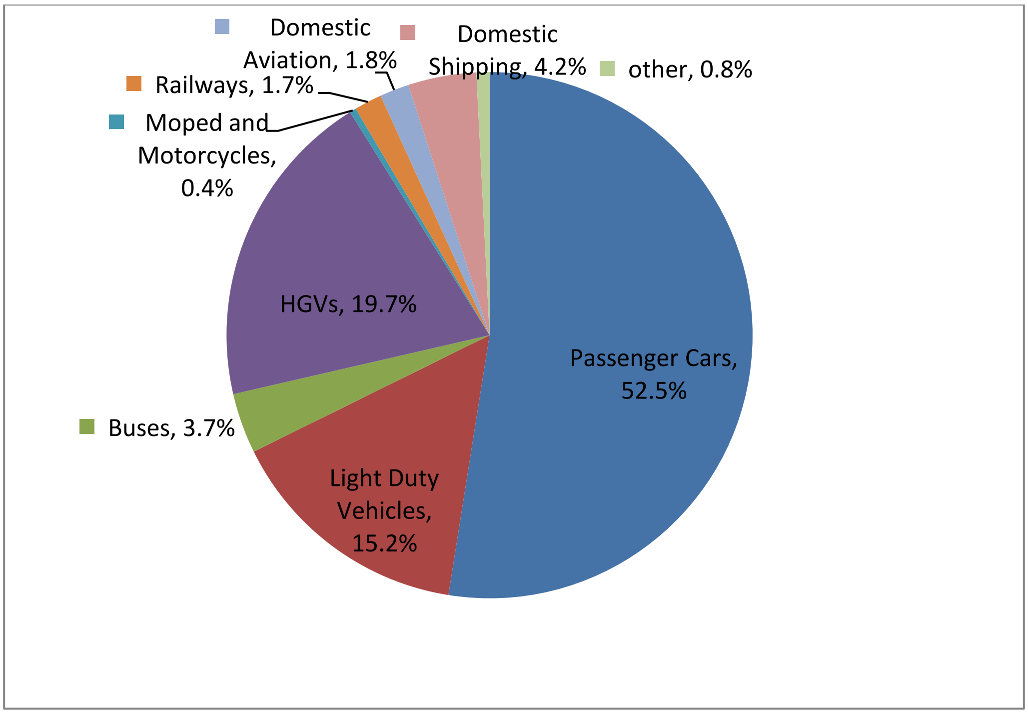
There are signs that this relationship between economic growth and transport growth is changing and a decoupling is taking place. Between 1980 and 1992, traffic (measured in vehicle kilometres) and overall travel (measured in passenger kilometres) grew at a faster rate than GDP (a measure of the total productive capacity of the economy) (DfT 2008a). Since 1992, GDP has increased by 55 per cent compared with rises in road traffic and overall travel of 24 per cent and 18 per cent respectively. The implication is that economic growth is possible without an increase in transport and therefore there is the potential for a reduction in social and environmental impacts[5] (Op.Cit).

[4] It is worth noting that CO2 is one of a number of greenhouse gases associated with road transport. Nitrogen oxides (Nox), released from car exhaust pipes, soil conversion and production use of fertilizer, are around 300 times as potent as CO2 in terms of their impact as greenhouse gases. Methane is 21 times as potent as CO2. Very often the term greenhouses gases' is used interchangeably with CO2 as a generic term for all greenhouse gas emissions based on a CO2 equivalent measure, with weights applied to reflect the potency of other greenhouse gases, as in the King Review (2007).

[5] One explanation for this decoupling may be the changing nature of the economy as teleworking and e-shopping may be substituting some of this travel (Lyons 2009).

The focus of this research is the promotion of bike-rail integration as a substitute for car journeys and as can be seen from the Chart 1 below, passenger car travel is the largest contributor to the overall CO_2 emissions from transport at 52.5 per cent.

Chart 1 CO_2 emissions from domestic transport by source - UK 2006

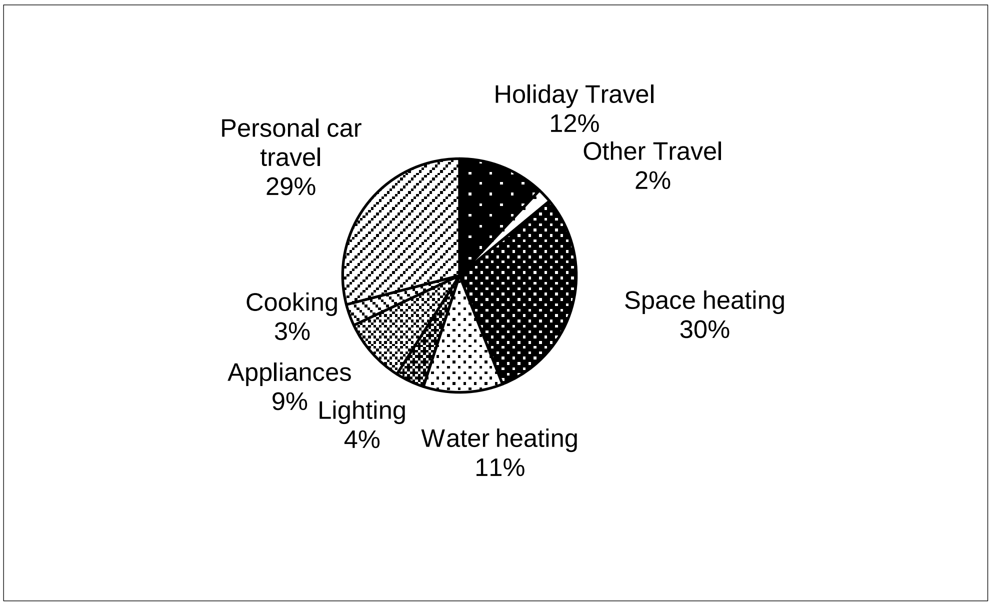


Source Carbon Pathways Analysis Figure 1.1 2008 based on data from *National Atmospheric Emissions Inventory 2006 (DfT 2008b)*

There is scope to decarbonise road transport, and the different options of cleaner fuels, more efficient vehicles and smarter driver choices have been explored. These suggest that existing technologies can reduce new car emissions by around 30 per cent and are already close to market (King Review 2007). These measures to improve efficiency will need to be supported by measures designed to influence the behaviour of individuals to limit their overall propensity to drive to try to ‘lock in’ and preserve the savings made through technological change as well as promote alternatives (RSA CarbonLimited 2008).

When carbon emissions are examined on a national per capita basis as shown in Chart 2 below it suggests that individuals could be empowered to significantly reduce their own carbon emissions by changing their travel behaviour. Car use represents 29 per cent of the national per capita annual carbon emissions and for travel overall it is 43 per cent (BERR 2007).

Chart 2 Individual annual carbon emissions (average per capita carbon emissions in 2005 1.16 tonnes of carbon per year)

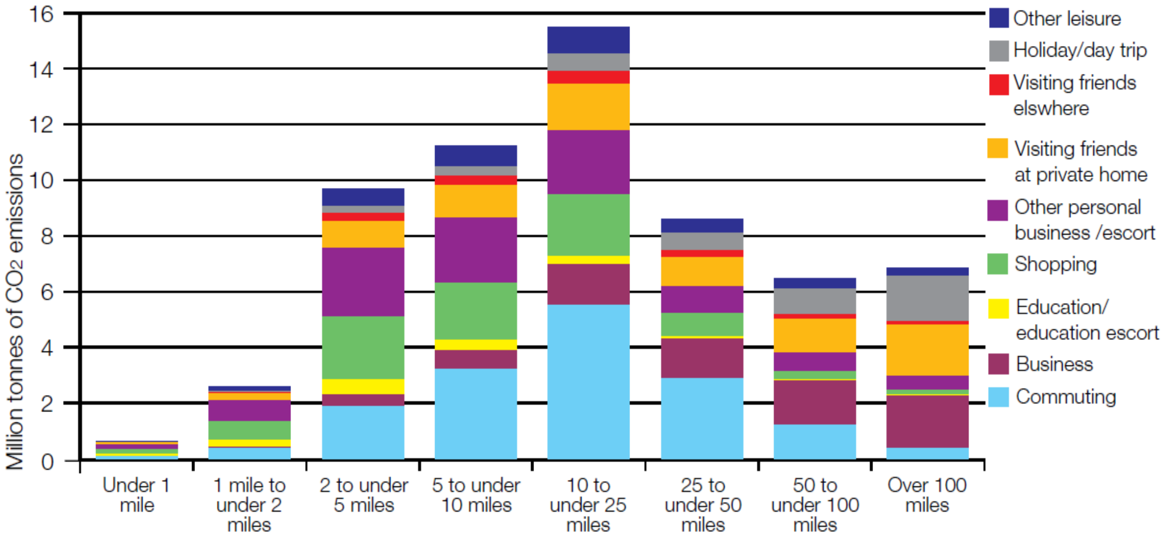


Source Energy White Paper 2007 using DEFRA data

There will be some individuals within this average for whom transport takes less of a percentage of their overall emissions profile; perhaps those without a car. Others who fly a great deal will have a much higher percentage taken by their travel. What Chart 2 makes clear is that potentially an individual's travel decisions can have a considerable impact on his or her carbon emissions, hence a transport policy shift to encourage behaviour change towards more sustainable modes which will be discussed in Section 2.4.

The first report of the Climate Change Committee has shown that there will be major differences in the potential for modal shift depending on journey type and distance, and that if cycling could replace all car journeys of less than five miles that would remove 19 per cent of emissions. However, a significant proportion of journeys are more than 25 miles, many of them one-off type journeys that may be more difficult to shift (Climate Change Committee 2008). It suggests that the greatest potential lies in commuting journeys in the medium distance bands 2-25 miles as shown in Chart 3.

Chart 3 Estimated CO_2 emissions from household cars by journey purpose and journey length GB, 2002/2006 average



Source DfT 2008b p 27

For trips between 10 and 25 miles, emissions associated with commuting trips by car are high (over one third of the total) (DfT 2008b). Average car occupancy rates are lowest for commuting trips and for business trips. They also have the highest proportion of single occupancy trips, at 91 per cent and 87 per cent respectively. The combination of cycling with rail can substitute for this distance band and may be particularly suitable for commuting. The 2008 National Travel Survey shows that 87% of rail trips were less than 50 miles in length and 66 per cent were less than 25 miles (DfT 2009b).

The choice of cycling or bike-rail integration instead of using a car would result in a reduction in CO_2 emissions. On average, passenger rail currently emits approximately half the carbon dioxide per passenger-km of cars and average emissions per passenger-km have fallen by an estimated 22 per cent since 1995/6 (ATOC 2007). These figures were arrived at using average figures, and vehicle loadings are a key factor so, for example, a fully-loaded car will perform well on a CO_2 per passenger km basis compared to the most efficient train with a few passengers. A reduction in CO_2 emissions would only occur if it was a substitution for a car journey rather than the generation of an additional trip. Equally, if promoting cycle access to rail encourages more rail travel using existing rail capacity at off-peak times, it will not result in any increase in overall emissions from rail (DfT 2008b).

A comparison of CO_2 emissions associated with motorised transport modes and cycling in Ireland (Walsh, Jakeman, Moles and O'Regan 2008) illustrates the complexity of these calculations and the direct and indirect effects. These authors argue, for the case of cycling, that the carbon dioxide exhaled as a result of increased physical activity and the emissions embodied in the manufacture of the bicycle should be taken into account. So, though a cyclist does have a lower (direct and indirect) emission factor than other modes except walking, the difference from public transport is less than might be expected and car travel is strongly dependent on occupancy levels.

A Dutch study, an extended life-cycle analysis approach to compare the environmental impact of transport modes in Holland, used a more holistic approach, taking into account the energy use, use of space, social and economic impacts (Bouwman & Moll 2002). Their analysis of energy use included both the direct and indirect effects, so included the fuel use as well as the manufacturing and infrastructure provision. This study also compared trip chains: walking-bus, cycling-bus, walking-bus-train, walking-train and cycling-train. The train and bicycle emerged as having the least environmental impact which held across different travel distances.

This section has shown that cycling on its own and in combination with rail offer potential to replace car journeys and thereby reduce the impact of motorised transport, particularly through the reduction of CO_2 emissions. This is not to minimise the other health, spatial and environmental impacts of car use and the next section illustrates the extent to which reliance on cars has changed travel and land use patterns.

2.3 Car dependence; the implication for behaviour change to bike-rail integration

This section considers the nature of car ownership and use as a way of understanding how individuals might perceive the idea of behaviour change to bike-rail integration or reducing their level of car ownership (see also Chapter 4). It illustrates that making such a change is likely to be difficult in a car-dominated society as the perceived and real advantages of using a car are a considerable barrier: their speed; the freedom to make last minute decisions; the privacy relative to public transport; the feeling of control and the identity a particular car might confer and the rationale that, once you have invested in a vehicle, there is an economic and psychological incentive to use it (Jensen 1999, Steg 2004).

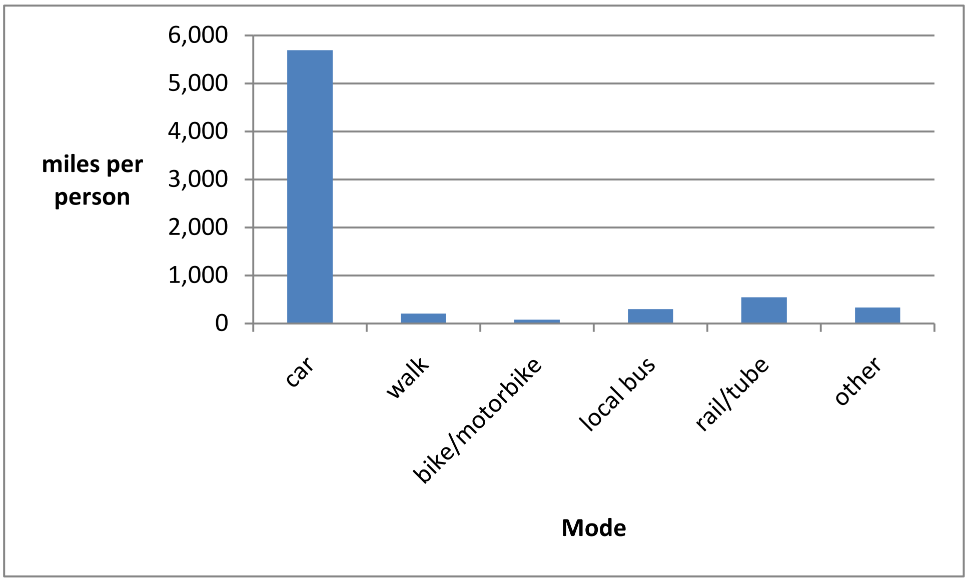
Some individuals have built their lives around cars and depend on them for regular and occasional journeys but, as is argued in a report for the RAC Foundation on car dependence: "Individually, people increase the use made of cars, tend to rely on them more, and over time pay less and less attention to other alternatives which are open to them. Socially, changes take place in land use and the provision of services which make car use more necessary and alternatives less attractive ... car dependence grows, rather than simply existing” (RAC 1995 p13). A follow up study for the RAC described a ‘ratchet effect’: over time, as individuals start using cars for trips where there are modal alternatives, they become locked into car use, as the transport alternatives are cut back due to reduced levels of use, and people become attracted to other, car-based, destinations (Lucas and Jones 2009).

Table 3 in Section 2.2 shows that the mean trip length of cycle journeys has increased by 41% between 1975 and 2006, which may be partly a function of the dispersal of activity but there may be other explanations; the decreasing use of the bicycle for short journeys or the commitment of the remaining cyclists (Parkin 2004). Hidden within these averages are likely to be very different individual travel patterns. The mean trip length for cars increased less, by 16% in the same period, but this still leaves nearly a quarter of car journeys in the UK of less than 2 miles and over half of all journeys made by car are less than 5 miles (CfiT 2007a), distances for which walking and cycling could substitute.

The dispersed patterns of car movements make them difficult to substitute with a financially viable public transport system. Wootton suggests that whilst there is still strong movement to and from town centres which can be served by public transport, most urban movement, he suggests as much as 90 per cent, is across town, and this can only be met by flexible personal transport (Wootton 1999). Cycling on its own, or in combination with bus or rail, could in theory fulfil some of these journeys. A study of UK towns selected for a Government programme to demonstrate the application of sustainable travel policies (the Sustainable Travel Demonstration Towns), estimated that cycling was a viable alternative for 31 per cent of car trips within the towns, a greater potential than for walking or public transport (Cycling England, 2007).

The dominance of car travel in the UK cannot be overstated and is shown starkly in Chart 4 below. Table 3 and Chart 4 also illustrate that, even if the level of bike-rail integration increases substantially, its share of total travel will still be relatively small and its direct contribution to a reduction in car trips and CO_2 emissions will be small. It has been estimated that increasing the share of cycling in the UK to levels closer to those of other Northern European countries could yield emissions savings in the UK of around 2 MtC (7.34 $MtCO_2$) per year (approximately 6 per cent of road transport emissions) if pure mode switching was taken into account (UKERC 2009). However, it is the possible indirect effect of enabling a car-free lifestyle or preventing the acquisition of a second car that may over time have a greater effect.

Chart 4 Average distance travelled by mode in 2006

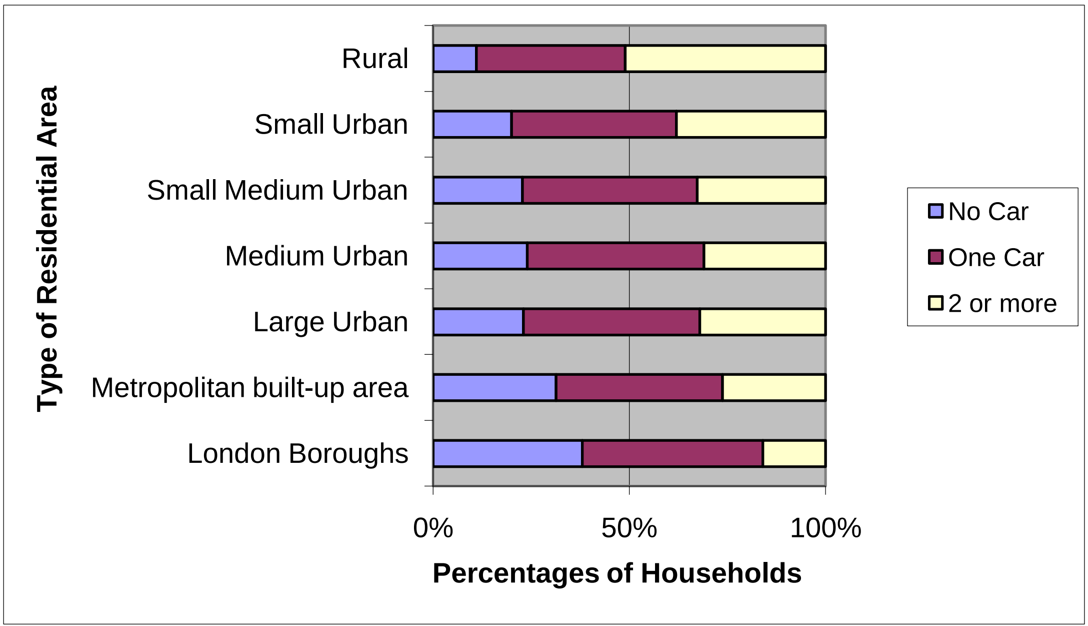


Source Transport Trends DfT 2009b

Households with a car on average undertake 41 per cent more trips and travel two and half times further than households without a car (Clark, Lyons and Chatterjee 2009) and this is in part likely to be a reflection of the location of the households. Chart 5 below shows that access to a car in households in Great Britain depends on where you live, so for example 38 per cent of households in London do not have access to a car, compared with 11 per cent in a rural area. Overall the proportion of households without access to a car has fallen from 38 per cent in 1985/1986 to 25 per cent in 2006.

Chart 5 below shows that car ownership is lower within densely populated urban areas where shorter distances need to be travelled, making walking and cycling a reasonable choice. Also, public transport is more available. There are disincentives to car ownership and use, for example, the difficulty of finding a car parking space and congestion. Other factors such as income will also influence car ownership and use so, for example, middle and higher income groups have higher levels of car use wherever they live (RAC 1995).

Chart 5 Car ownership by household in Great Britain 2006



Source National Travel Survey DfT 2006b

The likelihood of adopting a new behaviour such as bike-rail integration will depend on the location of the traveller and it may also depend on his or her level of income. The car has enabled the dispersal of activity but this has disadvantaged certain groups within society. Those on lower incomes who do not have access to a car may be socially excluded and not be able to access essential services (ODPM 2003). For example, out-of-town shopping centre provision increased four-fold between 1986 and 1997 whilst the number of small shops fell by 40 per cent in the same period.

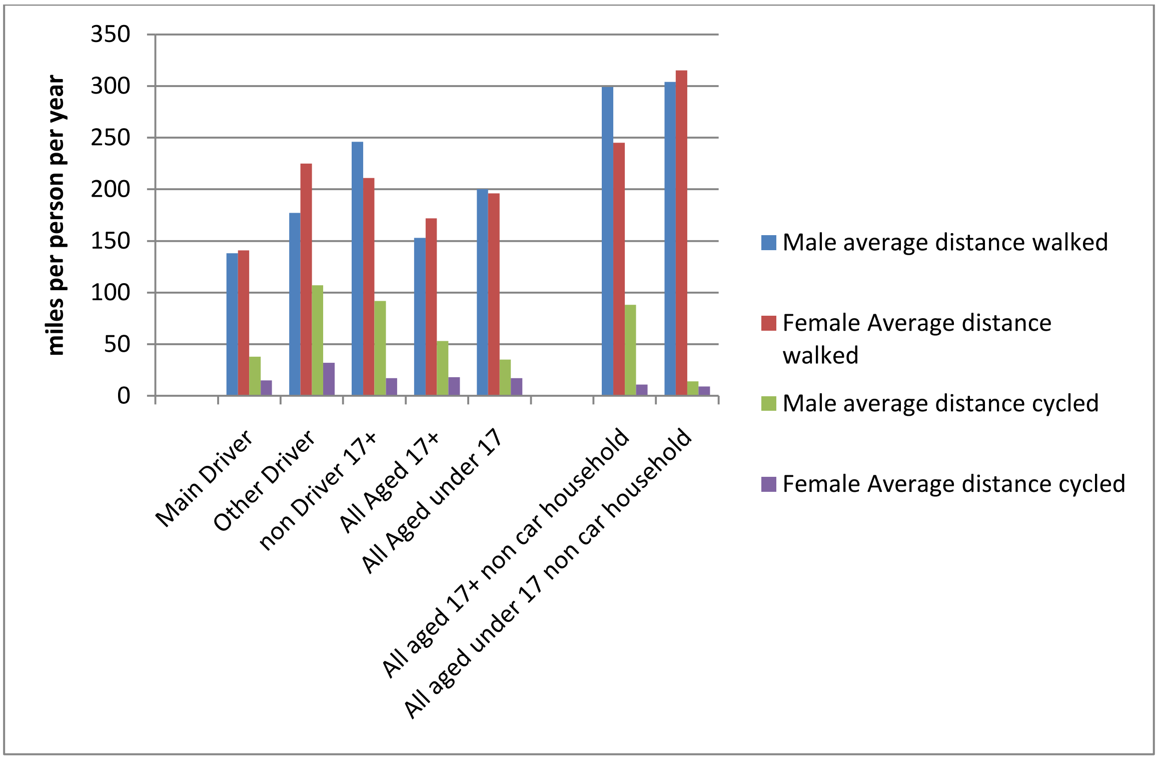
Over time car traffic has been mainly driven by growth in car ownership (DfT 2009b), though if a household with one car were to get a second car, the overall distance driven by members of the household might increase but would not necessarily double. Therefore the total distance driven would be shared out between more cars, resulting in a shorter distance per car. The proportion of households with access to one car has remained stable over the last 27 years, at around 45 per cent (DfT 2008a): growth has been in the proportion of households with two or three cars, which has increased from 13 per cent to 26 per cent in the same period.

It could be argued that a two person household with two cars has a surplus of car availability whereas if they had one car between them, it would be a deficit (Clarke et al.

2009). The significance of this for this research will be made clearer in Chapter 4 but with surplus access there is no catalyst for an individual to seek or consider alternatives like cycling or bike-rail integration. Without sole access to a car, individuals within a household may have to negotiate who uses the car on a certain day for a particular journey and thus other household members will have to investigate alternatives.

The extent to which the ownership and use of a car influences the distance an individual walks or cycles is shown in Chart 6 below.

Chart 6 Distance walked and cycled by car availability: 2002/03



Source DfT 2005b – Table 2.11

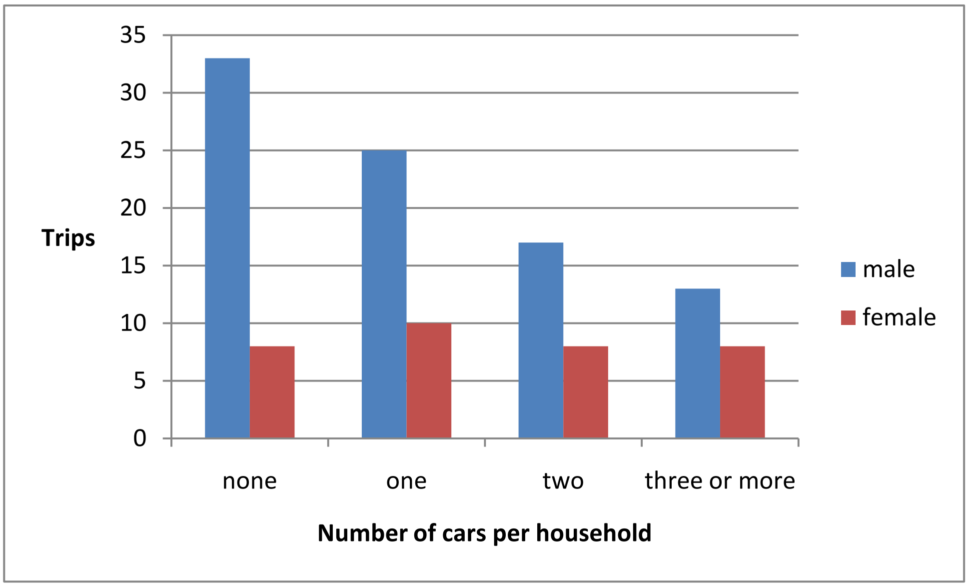
As can be seen in Chart 6, being the main driver in a household reduces the distance walked and cycled relative to other members in car owning households and considerably compared to non-car owning households. Car ownership is one of many factors that will influence the use of other modes and as can be seen in Chart 3, gender will also influence the extent to which an individual walks or cycles. The data on which this table is based are taken from the National Travel Survey and include the stage mode[6] so includes the walking

[6] A trip may include several stages, so for a trip by rail there could be a cycling to the station stage, a rail stage, and a walking stage to the final destination.

and cycling that takes place as part of a multi-modal journey.

As can be seen in Chart 7, among males, trip rates by bicycle decrease as household car ownership increases whereas there is no such correlation for females.

Chart 7 Cycle Trips by Car Ownership: 2002-2005



Source DfT 2007d

Frequent cyclists (those that cycle three times or more per week) are less likely to travel to work by car or van as shown in Table 4 below but they are as likely to travel by rail. Only eight per cent of people in two-plus car owning households travel at least once a week by rail, compared to 17 per cent of people in non-car owning households (Lucas and Jones 2009).

In the UK, employees in households with one car were more likely to cycle to work than those in households without a car (Parkin 2004). It is only at the level of two cars or more that the propensity to cycle is reduced (Parkin, Ryley & Jones 2007) and it has been suggested that some households may be treating cycling as 'a second car'. In other words, the opportunity to combine cycling with rail can fulfil a greater range of journeys which could prevent a car or second car being purchased or allow a household to reduce its car ownership.

Table 4 Travel to work by mode choice: frequent cyclists relative to all individuals

	All Individuals Percentage	**Frequent Cyclists 3X or more per week Percentage**
Car/van driver	61	28
Car/van passenger	8	5
Bicycle	3	48
Bus	8	3
Rail (surface)	5	5
Walk	11	8
Other modes	5	3
All modes	100	100

Source Ross DfT 2008

The process of increasing car ownership and use in the UK has built a highly-motorized society where car ownership is the norm. "The main reasons why cycling is not more common are the cultural and physical dominance of the car, its availability and convenience" was the conclusion of extensive qualitative research on attitudes to cycling and it also made clear that for non-cyclists, choosing to cycle involves extended decision making (Davies, Halliday, Mayes and Pocock 1997). Cars are highly visible and their use has not only eroded the physical space for walking and cycling but also the social space, to the point where cycling has been marginalised to such an extent that it may not even be considered in decision making.

In practice, car dependence, as mentioned earlier, is a process over time, so for example, even if levels of car ownership are reduced, evidence suggests that it is not followed by an equal but opposite reduction in driver trips relative to increasing car ownership (Clarke 2009). This relates to the idea of motility capital (Flamm and Kaufmann 2004): that if an individual exhibits car dependence, the loss of a car is unlikely to immediately result in the same amount of travel without a car. It will take an investment of time to explore new alternatives, develop new travel patterns and build motility capital.

The expectation of replacing a car journey through the adoption of two new modes is perhaps less achievable than substituting a car access journey to the rail network with a bicycle. This could lead to the adoption of more cycling for other journeys. Car club membership perhaps offers an interim stage to move away from personal car ownership. Cervero, Golub and Nee (2007) suggest that car club members in the San Francisco Bay area became more judicious and selective over time when deciding whether to drive, take public transport, walk, bike or forgo a trip. The mean vehicle miles travelled and fuel consumption of members decreased faster than those of non-members and this was a result of a combination of shifts to other modes including cycling, shorter trip distances and higher car occupancy in private cars as well as the car club cars (Cervero, Golub and Nee 2007). This suggests that the process of having to ‘share’ a car and the higher marginal cost per trip stimulates the discovery of the alternatives and a period of experimenting with the possibilities of different travel behaviour including bike-rail integration.

Aggregate figures for increasing car ownership mask the underlying changes: Dargay and Hanly (2007), in their analysis of the British Household Panel Survey, found that the largest proportion of car ownership changes were in respect of two car status in both directions with 4.2 per cent of households acquiring a second car and 3.8 per cent disposing of a second car. This shows that at any given time there are a number of households who may be reducing their car ownership and therefore may be more susceptible to experimenting with alternatives such as cycling or bike-rail integration.

Time of day, gradient, physical ability and whether there are accompanying passengers will all affect whether car journeys could be made by bicycle. The report on car dependence (RAC 1995) provided new clarity around conceptions of car dependence, that only some car trips are clearly necessary or essential, drivers having little or no choice about whether, when, where and how to make the trips other than by car. These trips might be complex trips with several destinations, a journey at night or the need to transport heavy shopping or luggage. Such trips are highly car dependent (for those with access to cars) but there are many others that may not have to be made by car and for which there are alternatives but it is also a question of how individuals see the alternatives, and whether they are even willing to consider alternatives. There is a distribution of car dependence, with the research for the RAC suggesting that around between 10 and 30 percent of trips are ‘unambiguously and strongly dependent on car use’.

A later study using in-depth interviews to explain car use for short journeys by car (under 5 miles), covering 1624 trips, found that respondents saw no alternative for 22 per cent of these trips, so car drivers perceived alternatives for 78 per cent of the trips (Mackett 2003). Walk and bus were perceived as the most popular alternatives, each at about 31 per cent of the trips. Cycling was seen as an alternative for only about seven per cent of the trips. Heavy things to carry and giving lifts were the two most frequently cited reasons for car use. Gender, age and spatial location (rural or urban) also affected the reasons people gave for their car use and this suggests that the possibility of replacing car trips may vary according to gender, age and spatial location. In research, respondents may articulate that cycling is an alternative for seven per cent of trips but whether they would actually cycle those trips is a very different matter (La Pierre 1934).

High levels of car ownership in a society do not necessarily preclude cycling or bike-rail integration. Germany has a much higher level of car ownership than the UK (566 cars per 1000 inhabitants in Germany as opposed to 471 in the UK - Eurostat 2009), but the bike share of trips in Germany is almost ten times higher in Germany than in the UK. Pucher and Buehler (2009) argue that this difference can be explained by German restrictions on the car while improving the alternatives - public transport, cycling and walking. In addition, the availability of alternatives has made restrictive car policies politically feasible (Pucher and Buehler 2009). This supports the argument put forward in the next section that both 'carrots' and 'sticks' will have to be part of any package to change behaviour towards bike-rail integration.

There is an ongoing debate as to whether urban 'intensification' or higher density development will automatically result in lower car use and there are questions as to whether there is a self-selection process by which means those who wish to be less car dependent move to more densely populated neighbourhoods (Melia 2009). In other words, individuals who use rail may specifically choose to live within walking and cycling of a railway station.

There is heterogeneity found in individuals' responsiveness to built environment factors, suggesting that, if car use is facilitated at the same time as walking and cycling, potentially demand could be increased for all travel rather than just walking or cycling replacing car journeys (Guo, Bhat & Copperman 2007). Krizek (2006) also warns against removing one factor, land use planning, out of a complex web of household decision making around where to live, which is related to lifestyles, preference and long-term versus short-term decisions. He found clustering the population by lifestyle showed that there were some groups whose decisions were independent of land use planning and largely a reflection of the cost of housing, quality of schools and their preferences for consumer goods acquired via car trips. Some lifestyle groups might respond to urban design levers alone but others would not.

A number of factors have been identified in this section that will need to be considered in the design of any interventions to promote bike-rail integration. Even with more fuel efficient cars, the trends of higher car ownership and increased mileage could cancel out the savings. Fuel efficiency does not address the health or spatial impacts of the car. Sole access to a car can prevent serious consideration of alternatives. Nonetheless within the UK population there are households reducing their car ownership who are likely to have a greater propensity to seek alternatives. In the short term the promotion of cycling and bike-rail integration could enable people to reduce the number of car journeys they make, but in the longer term may be a factor leading to a reduction in the number of cars per household or even the prevention of the acquisition of a car.

The next section shows how this growing awareness of the negative impacts of car dependence has been translated in a shift in UK transport policy to changing behaviour towards less travel as well as to more sustainable modes. An understanding of this policy context is important in determining the optimum design of interventions to promote bike-rail integration.

2.4 A shift in UK transport policy

The rise in car ownership and use described in the previous section took place within a transport policy that predicted the growth in traffic and provided for it by building new road infrastructure. Growth was accommodated rather than managed. There is a relationship between transport and land use planning which has itself been partially responsible for creating demand. Predicting an increase in traffic required the building of new roads and the new available space stimulated further demand. Similarly, with car parking as Shoup points out, land use planners in the United States based their minimum parking requirements on observed parking at a given site at peak time (Shoup 1999). Future developments then had to supply equivalent parking and this availability of free parking stimulated further demand for car travel. Transport planners then designed the transportation system on the basis of observed peak demand.

The subsequent increase in car use became unsustainable, “cars have many external costs, but the external cost of parking in cities may be greater than all the other external costs combined” (Shoup 1999). Car parking in cities removes space which could be used for other purposes and has an impact on the quality of life and the public realm which in turn affects the desirability of walking and cycling.

The Road Traffic Reduction Act in 1997 was the theoretical, if not practical, turning point in UK transport policy. A year later ‘A New Deal for Transport: Better for Everyone’ was published acknowledging that it was not possible to ‘build our way’ out of congestion (DETR 1998): ‘predict and provide’ was officially dead. The new emphasis was to be on an integrated transport policy, so better integration within and between transport modes but also with other policy areas including health, environment and education, and demand management. At the same time, to address the issue of dispersal and lower density development described in the previous section, the UK Government issued new planning policy guidance (PPG) from the mid 1990s such as PPG 13 and PPG 3 (Buchan 2008).

This new emphasis has been picked up by politicians. The former UK Prime Minister Tony Blair stated in the forward of the Future of Transport White Paper “Our strategy takes a balanced approach. Where it makes economic sense, and is realistic environmentally, we will provide additional transport capacity ... but we also recognise that we cannot simply build our way out of the problems we face. It would be environmentally irresponsible – and would not work. So we must make our existing transport networks work more efficiently and in a more environmentally friendly way” (DfT 2004a).

As discussed in Section 2.2 there is a constant tension between what makes ‘economic sense’ as mentioned in Tony Blair’s quote and what might be sustainable in an environmental or health sense. Many reports, including the Eddington study (2006) and the Stern Review (2006) have explored these issues. In October 2007, ‘Towards a Sustainable Transport System TaSTS’ (DfT 2007d) set out the Government’s approach to strategic transport planning for 2014 and beyond in the light of the recommendations of these reports. A year later ‘Delivering a Sustainable Transport System’ *(*DfT 2008c*)* was published with the following aims:

- to support national economic competitiveness and growth, by delivering reliable and efficient transport networks
- to reduce transport’s emissions of carbon dioxide and other greenhouse gases, with the desired outcome of tackling climate change
- to contribute to better safety, security and health and longer life-expectancy by reducing the risk of death, injury or illness arising from transport, and by promoting

travel modes that are beneficial to health

- to promote greater equality of opportunity for all citizens, with the desired outcome of achieving a fairer society

- to improve quality of life for transport users and non-transport users, and to promote a healthy natural environment

These two documents were both consultation documents setting a general direction for the overarching national transport policy but did not give clear priorities to resolve the continuing tension between economic growth and sustainability which raises the question as to what extent these aims will be achieved or delivered.

It is interesting to note that cycling is only mentioned specifically under the third goal to contribute to better health and longer life-expectancy through reducing the risk of death, injury or illness arising from transport, and promoting travel modes that are beneficial to health. The emphasis is on cycling for its wider benefits for health and the environment rather than its transport role which potentially could marginalise it within transport planning.

The mechanism for delivery of this policy shift is the local transport plan (LTP), a comprehensive transport strategy for each area designed to ensure that the different elements are co-ordinated to reach the desired objectives. In order to facilitate behaviour change towards more sustainable options, local transport plans need to include a combination of measures including 'carrots' e.g. better bus services or cycle lanes to incentivise more sustainable travel and 'sticks' e.g. parking charges or the reduction of road capacity to discourage car use to 'empower' individuals to change their travel behaviour. Transport plans incorporate hard transport measures or 'infrastructure' as well as 'soft transport policy measures' or smarter choices (DfT 2005a).

Smarter choices currently include

- workplace, school travel and residential plans
- personalised or individualised travel planning
- travel awareness campaigns and public transport information and marketing
- car clubs and car sharing schemes
- teleworking, teleconferencing and home shopping.

The national transport policy shift towards demand management has required a new set of skills within transport planning to move beyond the provision of infrastructure to design interventions to engage individuals in a number of different ways. As will be discussed in Chapter 4 and 5, soft measures are designed to prompt individuals to deliberate and make more sustainable travel choices including cycling and bike-rail integration.

Local transport plans work at a local authority level and within the overall plan there will be measures that work at a smaller scale, for example, a travel plan at a workplace or school and within these plans there will also be a combination of different measures with the objective of stimulating behaviour change. A travel plan is defined as:

"A strategy for managing the travel generated by your organisation, with the aim of reducing its environmental impact. Travel plans typically combine measures to support walking, cycling, public transport and car sharing. These are reinforced with promotion and incentives and the management of workplace parking. Travel plans also include action to reduce the need to travel, such as telecommuting. They can focus on both commute and business travel." (DfT 2007e)

Travel plans are essentially 'social marketing' exercises (discussed in Chapter 5) and are one of the few mechanisms currently available to combine measures that can address the practical, social and psychological barriers in a coherent strategy to promote behaviour change. Bike-rail integration is one of the sustainable options that could be promoted within any type of travel plan. The next section outlines current national policy that specifically relates to the promotion of bike-rail integration including the development of a new type of travel plan, a station travel plan (STP) (DfT 2007b).

2.5 The policy context for the promotion of bike-rail integration

Despite the potential benefits of bike-rail integration outlined in the previous sections, the current level of cycling and rail use is very low as shown in Section 2.2 Table 3 and Section 2.3 Chart 4. The promotion of bike-rail integration has received limited attention in national transport policy documents though it would come under the broad heading of 'better integrated transport' as in 'A new Deal for Transport' (DETR 1998).

In 2004, the Countryside Agency in conjunction with the Department for Transport (DfT) published "Bike and Rail: A good practice guide" (2004) which stated that the DfT "sees an increase in Bike and Rail journeys as being an important element in the new strategy (2004 White Paper 'The Future of Transport') to increase numbers both of short trips by bike and of longer journeys involving Bike and Rail".

This was followed by cycling policy advice and guidance published by the Strategic Rail Authority (SRA) (2004) for Train Operating Companies (TOCs) which was the result of consultation with users and stakeholders. This document provided advice on a range of activities which could help to better integrate bike and rail journeys including information, the carriage of bikes on trains, cycle parking, access to stations, cycle hire and cycle centres. When the SRA was subsequently replaced by direct government policy making through DfT Rail, this document was formally adopted as government policy and set out the following objectives;

1. Increase the number of rail journeys that involve the use of a cycle.
2. Allow TOCs discretion to determine appropriate facilities for carriage of cycles on trains, taking into account the trade-offs specific to their particular passenger market.
3. To support the National Cycling Strategy and the Government's forward Transport plan.
4. Ensure that clear information is available to cyclists regarding the provisions, facilities and restrictions that will impact on their bike-rail journey.
5. To pursue production of a 'Best Practice Guide', in conjunction with ATOC, that will aid TOCs, Network Rail, local authorities and others when planning and implementing cycle facilities.

Few resources went alongside this policy other than £0.5 million invested by the DfT for cycle parking facilities at around 200 stations. There was a lack of knowledge of how existing cycle parking was being used, each TOC decided how they would invest their share and it is not clear on what basis decisions as to the positioning of the new cycle parking facilities were made. So, for example, some TOCs put a small amount of parking at each station rather than ascertaining at which stations there was likely to be a demand for such facilities.

In the UK the 'permanent way' infrastructure some of the larger railway stations are the responsibility of Network Rail, whilst the running of the trains and smaller stations is the responsibility of the individual TOCs who are contracted by government to provide a certain level of service through a franchise agreement. This fragmented structure makes the implementation of a national policy to promote bike-rail integration problematic, as currently each TOC has its own cycling policy and attitude to cycle facilities. This generic advice on bike-rail integration, in isolation from other aspects of rail policy and without binding franchise clauses, identification of specific resources, an effective means of achieving a coherent approach across the rail sector or targets with progress monitoring, means that delivery has been slow.

Currently, as mentioned in the introduction of this thesis, only two per cent of rail passengers in the UK arrive at stations by bicycle. Table 5 below shows that the commonest access mode to the rail network is walking but there are still 20 per cent of passengers that arrive by car or are dropped off by car and taxi. This will vary depending on the station, with some stations having a lower percentage, and others a considerably higher percentage.

Table 5 Main access mode to origin stations for certain journey purposes

Mode of Access %	**Commuting**	**Business**	**Leisure**	**Total %**
Walked	58	41	50	54
Bus/coach	10	7	12	10
Car (parked at or near the station)	9	14	8	10
Car (dropped off by someone)	6	8	9	7
Motorcycle	0	0	0	0
Bicycle	2	1	1	2
Taxi/minicab	1	8	5	3
Underground/Light Rail/Metros/Trams	14	19	12	14
Other	0	0	1	0

Source: ATOC personal communication using DfT National Rail Travel Survey 2007a

The market potential for railway services depends to a considerable extent on the quality of the total journey from residence to place of activity and vice versa (Rietveld 2000). However, the rail industry has in the past concentrated on the journey on the rail network itself rather than the access journey to the rail network, despite this leg of the journey having been identified as a barrier to rail travel (Passenger Focus 2007).

The Government's white paper "Delivering a Sustainable Railway" (DfT 2007b) has recognised that for the rail user and the potential rail user, the journey to and from the station is as important as the journey on the rail network itself. As aspects of improving access to the rail network including bicycle access fall outside the jurisdiction of the TOCs, any intervention to improve access to and from the rail network will require the cooperation of other institutions beyond the station forecourt.

As a result of the white paper, a Cycle Rail Task Force was set up and responsibility of overseeing the implementation of 24 pilot STPs was delegated to the Association of Train Operating Companies (ATOC 2009) to develop a best practice guide. The STP is proposed as the mechanism by which a co-ordinated plan can be delivered through a partnership of organisations including the TOC, Network Rail, local authority, bus operator, taxi company and surrounding institutions including educational establishments and local employers. The purpose is to promote sustainable access modes and to encourage more people to use rail to reduce CO_2 emissions. The provision of cycle parking is a first step to promote bike-rail integration but improved cycle access, cycle routes, signing, mapping and road traffic management will also be necessary.

The increasing demand for rail transport, a 40 per cent growth in rail passenger traffic over the last ten years (DfT 2007b), has led to access problems, particularly a lack of car parking. Improving bicycle access could provide a solution for the mismatch in demand and supply at railway station car parks. An independent review for the Minister of Transport has proposed doubling cycle access at individual stations over the next five years, with a national target of 5 per cent of passengers cycling to stations, and creating 5,000 new cycle parking spaces each year (Green & Hall 2009).

Rail passenger growth has led to demands for increased car parking at stations (Passenger Focus 2007) which potentially runs counter to the whole sustainability agenda. The Great Western Route Utilisation report, which covers rail routes within the South West, highlighted the shortage of station car parking capacity with 18 per cent of station car parks at 100 per cent capacity and a further 41 per cent with over 75 per cent utilisation (Network Rail 2009). The report suggested that this will suppress future demand for rail.

In the context of the 'A New Deal for Transport: Better for Everyone' (DETR 1998) with the aim of making best use of existing resources, increasing car parking at stations should be a last resort, yet the white paper (DfT 2007b) suggests that improving car parking provision at stations should be a part of a station travel plan package. The argument for increasing car parking is that it would prevent the possible outcomes of a lack of parking i.e more kiss and ride, potentially creating twice the number of car trips or encouraging rail users to drive further to another station with available parking or discouraging rail use all together (Passenger Focus 2007).

The counter argument is that ‘sticks’ are an important part of ensuring the benefits of promoting more sustainable access and unless a method is found to discourage those who live within walking or cycling distance of a station from using the car parks, providing more parking at stations is likely to encourage more car access. It is costly to provide parking and the provision of parking is likely to stimulate demand for car access as mentioned in the previous section (Shoup 1999) and could be counterproductive. Cycle parking is considerably cheaper than car parking space, one estimate suggests a double decker cycle rack costs about £300 (taking two bikes) and a new single car parking space about £6,000 on flat land or about £10,000 if the new space is made about existing parking using double decking (Green & Hall 2009).

At the end of this research project in September 2009 the DfT announced a significant investment of £14m in a package of measures to transform facilities for cyclists at rail stations, to encourage ‘healthier, greener travel’ (DfT 2009c). This included the funding of 'Cycle Hubs' at 10 major rail stations and 10,000 extra cycle parking spaces across the country. The new cycle hubs will include extra cycle storage facilities, repair services, hire schemes and improved cycle access to and from the stations.

2.6 Summary and conclusion

The previous sections have shown the impact of motorized transport, the dominance of car travel and its influence on the use of other modes and the shift in national transport policy and the current policy context relevant to the promotion of bike-rail integration. It has shown the role that bike-rail integration could play in unwinding car dependence and the potential benefits to the individual, society and the rail industry. Behaviour change towards more sustainable modes is embedded in the current UK transport policy and though bike-rail integration has rarely been explicitly mentioned except very recently it is a logical element in an integrated transport system. More importantly, in theory at least, it can extend the range of cycling to a point where owning a car becomes less necessary. The next chapter will consider in more detail how bike-rail integration can be promoted in practice drawing on experience from other Northern European countries.

Chapter 3 Promotion of bike-rail integration: opportunities and constraints

3.1 Introduction

A lack of cycling experience is likely to be a barrier to bike-rail integration and this chapter explores the potential opportunities and constraints for the promotion of bike-rail integration, building on the overarching context set out in Chapter 2.

As a greater proportion of the UK population, over half of adults, will have had experience of rail travel in a given year (DfT 2007f and 2009b) in contrast to approximately 30 per cent having had experience of cycling (DfT 2006b), the first section of this chapter starts with an overview of the current status of cycling in the UK. This is followed by a section that explores the experience of promoting cycling in other European countries, highlighting the different policies that have been adopted and their potential applicability to the UK. There appears to be a relationship between cycling levels and bike-rail integration levels across international comparisons (Martens 2007) so that any increase in cycling rates in the UK is likely to result in an increase in bike-rail integration.

An assumption is made that to introduce an individual to two new modes simultaneously will be more difficult than to introduce one new mode. So for example, there are a large number of rail users who could be introduced to cycling for the first time. Of those who use rail frequently (3 or more times a week), 69 per cent cycle less than once a year or never (Ross 2008). Equally 44 per cent of frequent cyclists (3 or more times a week) use rail less than once a year or never (Ross 2008).

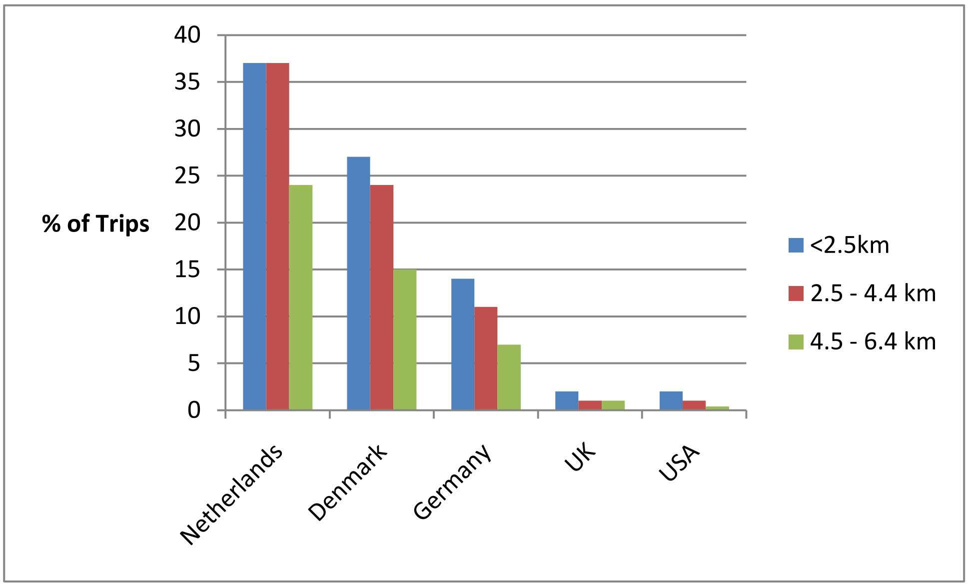
The chapter continues with a section reviewing the experience of promoting cycling in the UK. This lays the groundwork to build the argument that will be further developed in the following two chapters, that any intervention to change behaviour towards bike-rail integration will have to be part of a wider package of measures that include some kind of restriction or disincentive to car use but also measures that start to build a cycling culture and change the image of cycling relative to the dominant car culture.

The final two sections outline what is known about the existing practice of bike-rail integration in the UK and elsewhere, the opportunities and factors that are likely to influence its uptake. There is a particular emphasis on the provision of secure cycle parking as it is argued that this is the minimum first step to promote bike-rail integration by removing a practical barrier. The social and psychological barriers are discussed in Chapter 4 and literature that relates more specifically to the interventions trialled in this research are discussed in Chapter 8.

3.2 Cycling in the UK

Only one percent of all trips in the UK are cycled and two per cent of all trips of less than 3km in the UK (DfT 2007g). This is low compared with other northern European states with similar or higher living standards. In contrast Pucher[7] and Buehler (2008) identify that in the Netherlands 37 per cent of trips shorter than 2.5 km are made by bicycle, 27 per cent in Denmark, 14 per cent in Germany whilst the US situation is similar to the UK as shown in Chart 8.

Chart 8 Bicycling share of short trips (2000-2005)



Source Pucher and Buehler 2008

In the Netherlands, with the highest levels of cycling in the western world (Chart 6 above), the cycle share of all access trips to railway stations is also high and varies between 10-45 per cent at the 22 railway stations in the Amsterdam region (Stadsregio 2007). Nederlande Spoorwegen (NS) the national Dutch Railway Company annual report states that nearly 40 per cent of all their passengers cycle to the station (NS 2008).

[7] Pucher and Dijkstra 2003 found that even in the largely mountainous country of Switzerland, urban cycling rates on average accounted for 10% of trips.

Though aggregate cycling levels in the UK are low, people who do cycle, make on average 5 trips a week by bicycle and travel 13 miles in a week, as shown in Table 6. Cycling accounts for a fifth (22%) of all trips by cyclists, which suggests that getting a person to cycle has the potential to significantly change his/her overall behaviour (DfT2007g).

There is a large group, 69 per cent of the population, which cycles less than once a year or never. Some members of this group are more likely to take up cycling than others, and this will be influenced by their access to a car, as pointed out in Section 2.3, and the types of journeys they need to make.

Table 6 Frequency of bicycle use

3 or more times a week	8%
Once or twice a week	7%
Less than once a week but more than once or twice a month	3%
Once or twice a month	5%
Less than once a month but more than once or twice a year	4%
Once or twice a year	4%
Less than once a year or never	69%

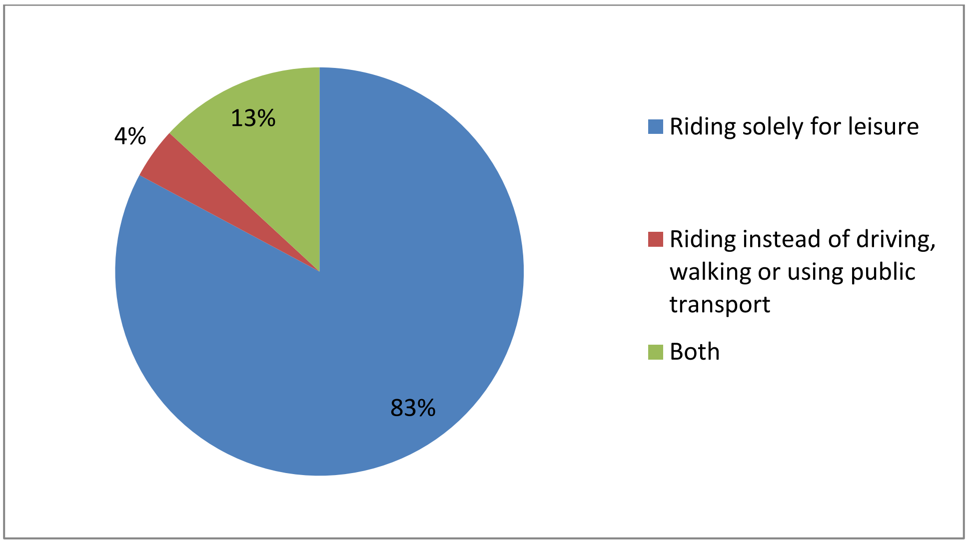
Source Table 5.6a NTS 2006 (DfTb)

Similarly, within the population there is a spectrum of cycle use: from those who cycle for virtually all their trips through to those who use their bicycles rarely and perhaps only for leisure purposes**.** For example, in a 2002 survey of members, one of the UK motoring associations - the AA - found that 93 per cent of motorists can cycle, but 59 per cent do not. Of the 34 per cent of members who do cycle, 13 per cent only cycle for leisure and 21 per cent cycle for utility (Lawson 2002). Amongst those motorists who do cycle, 39 per cent are leisure cyclists only, but more than half stated that they “may start to make” utility journeys.

Hence, there are many people in the UK who own and use bicycles, but for many cycling is perceived as a leisure activity rather than a mode of transport. A more recent study by the

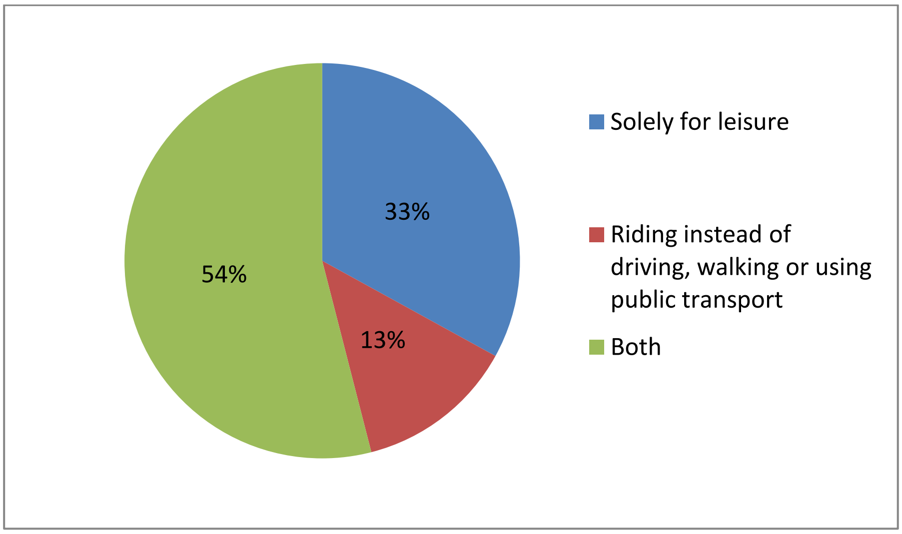
Institute of Advanced Motorists (2009) supports this view, finding from a survey of over 700 motorists that just under half owned a bicycle as well as used it (45%). They were categorised according to the amount they reported using their bicycles and, within the larger group (26%) who rode occasionally, the vast majority rode solely for leisure (83%), as seen in Chart 9.

Chart 9 Occasional cyclists (representing 26% of motoring cyclists N=710)



This contrasted with the smaller group (19%) who rode regularly, the majority of whom rode for both utility and leisure, see Chart 10 on the next page. Both surveys relied on self-report, so the numbers who say they cycle regularly may not be as great as suggested, but it does give an indication of the large pool of individuals who do cycle, but only for leisure. It may be that a relatively short utility journey to the railway station could be a 'transition' point towards more utility cycling, particularly in congested urban environments with limited station car parking space or prohibitive parking charges which could both act as a catalyst for behaviour change. There has been little research as to the extent to which the influencing factors for leisure, utility or the movement amongst different groups vary (Xing, Handy and Mokhtarian 2010).

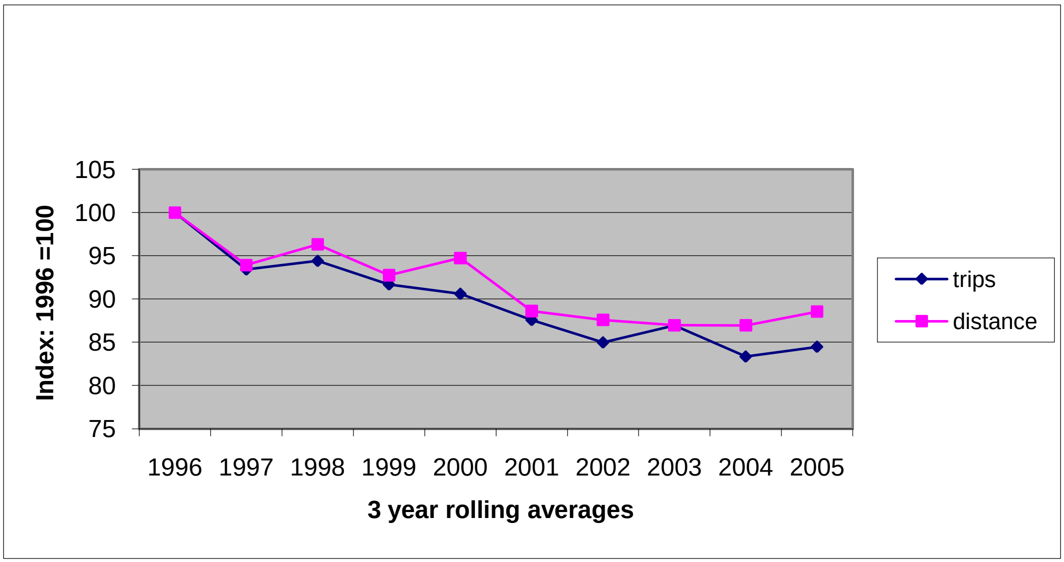
Chart 10 Regular cyclists (representing 19% of motoring cyclists N=710)



The low levels of cycling in the UK occur despite considerable institution-led initiatives, including across government departments, to promote cycling, namely; *The National Cycling Strategy* (DfT, 1996); *Walking and Cycling: an Action Plan* (DfT 2004b); *Cycling and Health: a Strategy for 2005-2008* (Cycling England 2005). The first of these, *The National Cycling Strategy*, had a target of doubling the number of cycling trips by the end of 2002 and doubling it again by 2012. Prior to the year 2000 it became clear that this target would not be achieved and the strategy was revised in The Ten Year Transport Plan for England (DETR 2000) re-basing the data to 2000 and setting a target of tripling cycling by 2010. Chart 11 below shows the downward trajectory of cycling trips and distance cycled.

The DfT acknowledges that the figures from the two main sources of information, the National Travel Survey (NTS) and road traffic estimates have not always agreed, partly as a result of the small numbers of people cycling and therefore recorded in the NTS or by traffic counts (DfT 2009d). It is interesting to note that, in parallel with the decline of cycling on the road network, there has been an increasing number of cycle trips recorded on the National Cycle Network, reaching 338 million trips in 2006, of which it has been estimated 27 per cent were by individuals who could have used a car but chose not to (Sustrans 2006b). It is not known to what extent there is redistribution: i.e. the reduction in cycling levels on the multi-purpose roads being directly a result of existing cyclists switching to off-road routes.

Chart 11 Trends in number of cycle trips and distance cycled per person per year: 1996-2005



Source DfT 2007g data source NTS 2006

The majority of adults in the UK agree that everyone should be encouraged to cycle to help their health (87%), help the environment (79%) and to ease congestion (73%) (DfT 2007g). Thirty-seven per cent of adults agree that 'Many of the short journeys I now make by car I could just as easily cycle, if I had a bike' (Op. Cit.). However, there is a mismatch between what individuals will say they will do in survey and what they actually do in practice. As Section 2.3 pointed out, car dependence has had an impact on the distance required for some journeys and this in turn will affect whether or not an individual can cycle. As Parkin (2004) showed, electoral wards with a higher proportion of workers needing to travel between 2 km and 5 km showed a higher level of cycling to work. The journey to work census data also reveals regional and district differences in cycling levels, so for example Cambridge district has the highest cycle mode share for journeys to work at 28 per cent in 2001 and, as Parkin (2004) suggests, this could be related to a number of factors including climate, topography, infrastructure and socio-economic factors. There are many other social and psychological barriers that will be discussed in more detail in Chapter 4.

One important factor is likely to be what could broadly be described as ‘cycling conditions’ on the road network: volume of traffic, speed, safety and road surface. There is a considerable and controversial literature on the efficacy of different cycle route facilities, off road facilities versus on road facilities, which are related to the perception of safety and which will be discussed in Section 4.4.1.

A review of transport interventions promoting safe cycling and walking (Ogilvie, Egan, Hamilton and Petticrew 2006) was ‘inconclusive on the effectiveness of engineering measures – such as creating or improving cycle routes, constructing bypasses, traffic calming, or combinations of these – in achieving a shift from car use to walking and cycling’. The review goes on to point out the confounding variables, an individual’s access to a car or their attitude; if they are highly motivated to walk, they would choose to do so regardless of whether an area is attractive for walking. The review concluded that there was not enough research of sufficient quality that could specify the types of interventions that would increase walking and cycling or their safety. The likelihood is that the level of cycling is a function of many influencing factors as will be discussed in Chapter 4.

The next section explores the possible explanations for the different cycling levels across Northern Europe (shown in Chart 8) and within different countries as a way of gaining insight into the influencing factors which might be important in the promotion of bike-rail integration.

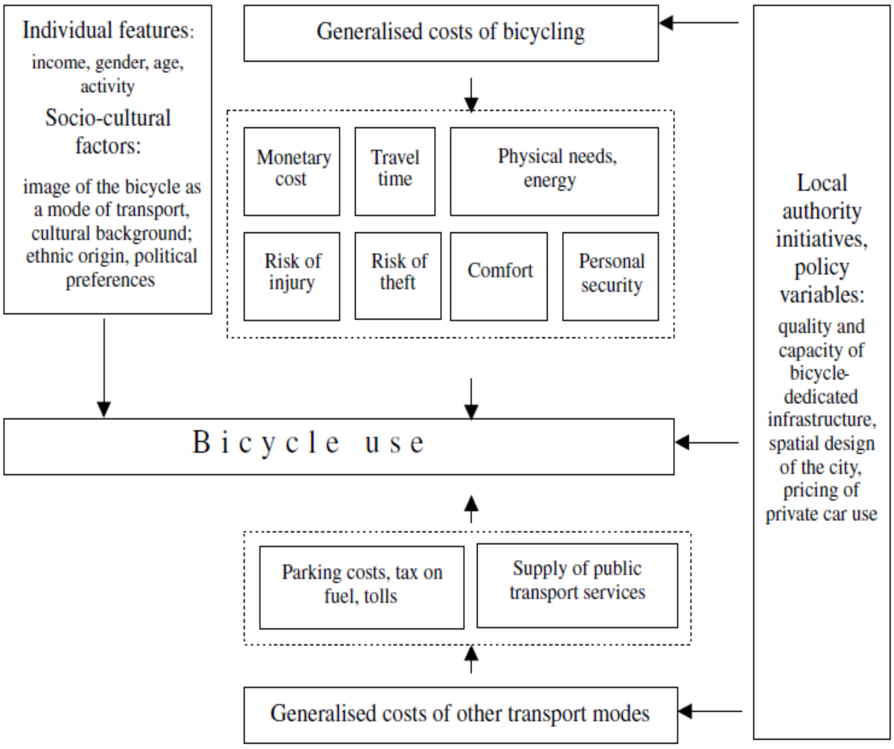
3.3 Cycling in other northern European countries

In Denmark and the Netherlands where cycling levels are high (see Chart 8) cycling is seen as a mainstream choice. There is a positive cultural attitude towards cycling and since the 1970s their programmes of infrastructure development and transport planning have contributed to the highest cycling levels (CfiT 2007a).

As was noted in the previous section, different areas in the UK have varying levels of cycling for the journey to work (Parkin 2004), and there are similar variations in the Netherlands. The percentage of journeys by bicycle varies between municipalities and a study in 2005 looked at 44 influencing factors to try to explain these differences (Fietsberaad 2006). Traffic, spatial-economic, demographic, cultural and geographic factors explained 73% of the variance in bicycle use and about a third of the variance was explained by what is defined as ‘integral traffic policy’. ‘Integral’ is used in the sense of a cycling policy which includes political commitment to planned implementation and assessment in an overall policy framework that restricts car use or at least does not favour car use (Fietsberaad 2006).

Rietveld and Daniel (2004) also considered the different factors influencing the levels of cycling across municipalities in The Netherlands and produced a general framework for factors explaining bicycle use (Figure 1). They found that most of the difference between municipalities in The Netherlands is explained by physical aspects such as topography and city size as well as the composition of the population; the proportion of young people or particular ethnic groups.

Figure 1 Framework for factors explaining bicycle use



Source Rietveld and Daniel 2004

Other work in the Netherlands (Fietsberaad 2009) has shown that in cities (Amsterdam, Eindhoven, Enschede and Copenhagen) with a high bicycle share of trips (defined as more than 30%) bicycle traffic continued to be considered important, despite the increase in car use that had taken place, and the cyclist was accepted as a ‘normal’ traffic participant with equal rights. It is also argued that the lack of development of a public transport system had contributed to these high cycling levels. This is in contrast to cities with a lower bicycle share, below 10 per cent, that had car-orientated traffic policies, the realisation of large-scale car infrastructure, suburbanisation and, overall, a negative view of cycling.

In Belgium, it has been shown that regional towns have higher bicycle use than in larger cities (Vandenblucke, Thomas, deGeus, Degraeuwe, Torfs, Meeusen & Int Panis 2009) which is possibly explained by the high quality of public transport in those cities and the shorter distances which enable walking. There is also a clear cut north-south division in cycling rates within Belgium that suggests that the different regional policies towards cycling have had an effect and that the cycling culture in the Flemish region reinforces the willingness to invest in cycling, another illustration of the interacting factors that influence cycling levels as shown in Figure 1.

These studies show that there are a number of factors influencing cycling levels – cultural, demographic, settlement size, availability of alternatives and the policy context. A recent international review of infrastructure, programmes and policies to increase bicycling (Pucher, Dill and Handy 2010) found that the most compelling evidence came from communities that have implemented a fully integrated package of measures to increase cycling rather than single interventions and that a comprehensive approach produces a much greater impact on cycling than individual measures.

In theory in the UK, a mechanism exists for delivery of the national policy shift outlined in Section 2.4 and it is the local transport plan (LTP). It is through an LTP that an 'integrated package of measures for cycling' could be implemented as part of a comprehensive transport strategy which might also include restrictions on car use. On a smaller scale the delivery mechanism could be a travel plan. The next section looks at the experience of trying to promote cycling in the UK within this framework.

3.4 Experience of promoting cycling in the UK

Each of the 122 local transport authorities in the UK (including six Passenger Transport Authorities) are required by law to produce an LTP which incorporates a costed programme of improvements for the five years ahead as a way of joining up the various transport policy initiatives and other policy areas. National policy changed (as outlined in Section 2.4) the first round (2001-06) of LTPs, and the second (2006-11) had the overall objective of demand management, making better use of existing resources and changing travel behaviour. The consultation document on the third round of local transport plans post 2011(DfT 2008d) encourages local authorities to develop strategies and implementation plans that take significant steps towards mitigating climate change, by encouraging the development of sustainable transport systems, facilitating behaviour change and reducing the need to travel. There is a subtle shift towards local authorities being "accountable to their communities rather than to the DfT for both the quality of the transport strategies prepared and for ensuring effective delivery". This process of community engagement is most likely to happen at the LTP level in partnership with neighbouring authorities and other organisations to deliver more strategic outcomes. So, in the case of the promotion of bike-rail integration, the engagement of the TOCs will be important.

Though LTPs in the UK are designed to integrate transport policy, cycling has often been low down the priority list, an optional extra, rather than central to transport planning. Cycle access to railway stations has also been largely ignored by decisions makers in the rail industry as section 2.5 pointed out. In the period 2001/02 to 2005/06, delivery through local transport plans fell short of the expected cycling targets and outcomes: a 2007 report found that only 25 per cent of local authorities were considered to be 'on track' to achieve core cycling targets in 2005/06, well below the progress made against other transport targets (Cycling England 2008).

LTPs incorporate both hard transport measures or 'infrastructure' as well as 'soft transport policy measures'. In the case of cycling, the 'infrastructure' might be on-road and off-road routes, advanced stop lines and the soft policy measures including travel plans aim to prompt individuals to consider cycling and use the facilities provided. Below is a list drawn and modified from the Essential Guide to Travel Planning (DfT 20087e), of the types of measures that might be incorporated in a travel plan to promote cycling:

- provide safe, secure and covered cycle parking, provide 'pool bikes' or 'hire bikes', cycle maintenance sessions
- provide lockers, changing/drying facilities and showers
- offer financial incentives such as interest-free bicycle loans, discounts for bicycle purchase and preferential cycle insurance rates
- provide a cycle mileage allowance to enable financial reimbursement for staff cycling on company business
- Initiatives to establish bike user groups to create a social environment that is conducive to individuals taking up cycling, addressing not just the practical but the social and psychological barriers
- promote and publicise cycling
- improve cycle links to the site in collaboration with the local authority
- restrict car access and reduce the availability of parking or increase the cost of parking
- provide a puncture repair service, provision of a 'spares box' for cyclists

As within a LTP there are both incentives to bicycle and disincentives to car use through restrictions and these could be adapted for use in stations to promote bike-rail integration. One difficulty is that the skills needed to establish a bike user group or a publicity exercise around cycling are very different from the civil engineering skills required to build cycle routes or station management skills. A review of the second round of Local Transport Plans found that only 26.8 per cent of plans were rated as having significant reference to 'smarter choices' as a whole. So, only a quarter of local authorities had changed their priorities away from the more traditional 'hard' measures – those relating to transport infrastructure (DfT 2007h).

The shift in policy towards behaviour change, as outlined in Section 2.4, requires motivational and marketing skills but this may not be reflected in the skill sets available within transport planning departments which could be partly responsible for the slow progress at the operational level of introducing ‘smarter choices’ such as travel plans.

A lack of a cycling culture in the UK is itself a barrier. A cycling culture generates public support for cycling which in turn puts pressure on the politicians to invest in cycling. Without it there is less willingness to invest in cycling as was shown in the different cultures within Belgium (Vandenblucke 2009). As there are fewer cyclists generally in the UK, there is less likelihood that the decision makers themselves are cyclists[8]. As cyclists are rare in the population as a whole, the ‘norm’ experience for local councillors and officers is travelling in cars - usually as a driver - and therefore they are possibly less inclined to invest in cycling and particularly if it might also impact on ease of car access. This is often reflected in the lack of power that cycling or pedestrian officers wield within a local authority transport team in the UK. The perceptions of residents, elected members, officers and organisations will all influence the level of support for cycling (Gatersleben and Uzzell 2003). The same applies within the rail industry, if those within management positions or frontline staff do not themselves cycle, their support for prioritising improving facilities to promote bike-rail integration is less likely.

If funding is indicative of commitment or political will, it is difficult to present the overall spending on cycling in the UK as the investment is spread across budgets and many schemes which tackle road safety within LTPs - speed limits, road maintenance, crossings, advanced stop lines and signage - also assist cycling. In the government report ‘A Sustainable Future for Cycling’ it is estimated that from 2001/02 to 2005/06 £175.6 million was spent in England (outside London), on LTP projects supporting cycling such as cycle lanes and cycle parking (DfT 2008e). There are also cycling and walking projects funded through the UK national lottery including £20 million in revenue funding for the Active Travel consortium programme (to promote walking and cycling) and the recent £50 million for Sustrans’ Connect 2 project.

The implementation of cycle schemes is often carried out in a piecemeal fashion, delivered at local authority level or as part of a national scheme like the National Cycle Network associated with ‘third sector’ bodies like Sustrans. In terms of progress, national government points to the new cycle routes completed − 6,000 km of new cycle routes between 2001–02

[8] This is changing with Boris Johnson the Mayor of London and David Cameron the Leader of the Opposition in 2009 as known cyclists

and 2003–04 (DfT 2004a). This does not give any indication of the quality of these facilities, whether they are part of an overall joined up cycle network or whether they are being used. As Jones (2008) points out, even if individuals want to use these off road routes, users perceive that they will have to cycle on their local roads to get to them, which acts as a barrier. A similar perception probably exists for cycle access to railway stations.

After a review of the slow progress of the delivery of the National Cycle Strategy (DfT 2005c) Cycling England was created in 2005 with a budget of £5 million, as a new national body to work with local authorities to devise better ways of improving facilities and increasing the number of people cycling. In recognition of the wider benefits of increased levels of cycling, Cycling England's Board includes representatives from local authorities, key cycling bodies, transport and health specialists. It is also supported across government departments, including by the Department of Health, which has contributed to the overall financial support. Cycling England's budget increased to £20 million in 2008-2009, £60 million in 2009-2010 and £60 million in 2010-2011. This money is being directed towards Cycling Demonstration Towns (CDTs)[9], links to school, cycle parking, "bikeability" (the new national standard cycling training programme) and cycling-to-school champions. No part of this funding is specifically directed towards combining cycling with rail but if more people are encouraged to cycle, this may lead to more bike-rail integration.

The analysis and synthesis of evidence on the effects of investment in the six CDTs is cautiously optimistic, showing a 27 per cent increase in cycling levels across the towns using data from automatic cycling counts (Sloman L., Cavill., Cope A., Muller, L., and Kenney, A. 2009). The study points out many of the difficulties in 'measuring' the impact of such investment but a number of different data sources were used, including a comparison with towns which did not receive the funding and data that enabled the study, to ensure that individuals were not replacing one physical activity with another, but actually increasing their physical activity with cycling.

This type of study is necessary as has been argued by Cycling England (2008) because the lack of political will to deliver measures to increase cycling relative to more traditional transport investments has partly stemmed from the difficulty of valuing the benefits of cycle investment. This problem has also been recognised by ATOC who has commissioned a model to determine the cost-benefit of the provision of cycle parking at railway stations, both

[9] Cycling Demonstration Towns are given funding by Cycling England, matched by the local authority to a level of about £16 per citizen, with the idea that concentrating financial efforts on a number of different initiatives will achieve an increase in cycling.

for the rail operators themselves but also society as a whole (ATOC unpublished[10]).

Cycling England (2008) commissioned the economic consultants SQW to value the benefits of cycling itself, and their calculation suggested that the average benefit per additional cyclist in the UK is £590 per year by taking into account a number of factors: health benefits, value of avoided loss of life, National Health Service savings, productivity gains, pollution, congestion and ambience. The methodologies developed by the DfT to evaluate transport investments generally have rarely been applied to cycling investment, though this is changing. Using the DfT methodology Sustrans showed that the cost benefit ratios of cycling investments are high relative to other transport investments (Sustrans 2006).

However, there still remains a lack of clarity about the returns on investment for cycling projects, which acts as a barrier to further investment. Krizek (2006) reviewed and interpreted existing literature on estimating the economic benefit of cycling and bicycle facilities; his main finding was that studies in different locations use varied data and methodologies to arrive at widely differing conclusions. In other words, there is a considerable amount of work needed to develop a robust appraisal framework for direct investment.

John Whitelegg (2007), the sustainable transport adviser for the Lancaster Cycling Demonstration Town Project Steering Committee, highlighted the problem of trying to promote cycling within a conventional transport and traffic ideology that has been stuck in what he calls 'the car-centred 1960s worldview'. In Lancaster the consultant's brief for devising a strategy to promote cycling was effectively constrained because the plan should not impact traffic capacity or adversely affect other modes. As was pointed out in the previous section, it was the acceptance that providing for cycling would impact other modes that was crucial in European cities with high cycling levels. In addition, Whitelegg (2007) pointed to the lack of political leadership and the very negative media around cycling and cyclists in Lancaster. This was not counterbalanced by visible support from the Council leaders or other institutions, the Universities, NHS or police. Efforts were rendered less effective in the face of this negative publicity in which cyclists were portrayed as anti-social or a nuisance.

Even if smarter choice initiatives are implemented successfully, Metz (2008) cautions that the benefits need to be 'locked in' with car restrictions, otherwise those who change their

[10] ATOC has commissioned research to produce a cost benefit analysis tool for cycle parking at stations. A model was produced by Steer Davies and Gleave in 2009 but at the time of writing it was not available.

behaviour away from car use to cycling will be releasing road space for suppressed demand. It is often this crucial part of the package that is not implemented because car restriction in the UK is politically highly sensitive. At both the national and local level, what is ultimately delivered often depends on politics. As Banister argues, the real barrier to implementation of sustainable transport policies (which includes cycling) is public acceptability and therefore politically acceptability, and there is a need to gain public confidence through their active involvement (Banister 2008).

As has been mentioned, ‘community engagement’ is emphasised in the third LTP round and some local authorities, notably London, have recognised that the nature of politics and its interaction with the media points to the need to create broad public support for cycling. In the preparation of the London Cycling Action Plan (TfL 2004), Transport for London reviewed the policies and measures implemented in ten cities that had higher cycling levels across Europe, including Nottingham. Their analysis showed that each city used a combination of measures tailored to suit their needs, but there were several common features:

- a cycling plan supported by a sustainable transport strategy
- coherent and attractive cycle route networks
- sufficient and secure cycle parking facilities
- traffic and speed reduction initiatives
- broad public support for cycling
- high profile, innovative projects such as city bikes, bike stations, bike bridges and flagship routes
- an integrated marketing strategy

London’s plan incorporates these elements; not just providing infrastructure but also programmes to promote cycling in general. Since 2003, the volume of cycling trips has been increasing at a substantial rate: on average 17 per cent a year (TfL 2008). There are other successes in the UK, where a particular commitment to cycling has led to an increase. In just two years, between 2004 and 2006, the cycling levels increased by 79 per cent (DfT 2007i) in Darlington, one of the Sustainable Transport Demonstration towns (see also Section 5.4).

It is too early to estimate whether the few successes in increasing cycling have had a spill-over effect into increasing the levels of bike-rail integration in those areas. As was pointed out in Section 2.3, car dependence has resulted in trip generation that goes beyond the conventional ‘in and out of town’ journeys to a much more dispersed pattern, and multiple household car ownership affects how individuals perceive alternatives. Therefore, as Buchan (2008) argues, it is only by providing a total package of modal options, including cycling, that a reduction in car ownership in the longer term might be possible.

Buchan (2008) uses the example of London where households of a particular structure and income have lower levels of car ownership than comparable households elsewhere. He argues that in practice, this means an individual has a range of modal options and has the possibility to choose the one that is fit for the particular journey. In other words, if an individual can obtain their daily needs through walking and cycling in their local neighbourhood, then perhaps the one daily journey to work or the occasional journey to visit friends and family beyond their immediate neighbourhood could be fulfilled by public transport, bike-rail integration or the use of a car through a car club. The availability of different alternatives depending on the requirements of a journey might make car ownership less attractive, and only then is there a possibility of unwinding car dependence.

Against this background, the combination of cycling with rail can be seen as an important element of that package of different options that enables fewer car journeys in the short term and perhaps a reduction in car ownership in the long term. The promotion of cycling and an increase in cycling levels and ‘cyclists’ within the population is an important pre-requisite for the promotion of bike-rail integration. The next section considers the different possible methods of bike-rail integration with a review of experience in the UK and elsewhere and makes the case for the provision of more and secure cycle parking as a first step in facilitating in bike-rail integration.

3.5 The existing practice of bike-rail integration

Little is known about the demographics or the motivation of those who are already bike-rail integrating or the extent of the different methods adopted. There are several possible ways of combining cycling with rail, which are listed below:

- cycling and parking at the origin station
- parking a bicycle at the egress station and cycling from the rail network
- using and maintaining two bicycles, one at each end
- hiring a bicycle for the access or onward journey

- cycling to the station and taking the bike on the train, whether fixed frame or folding bike

- cycling the journey one way and returning with the bike on the train or the reverse

The most seamless bike-rail integration journey is likely to be cycling at either end of a railway journey and taking a fixed frame bicycle or a folding bicycle on the train. As was explained in Chapter 1, a decision was made early on in this research that increasing the capacity for fixed framed bicycle carriage would be a very long term proposition in the current UK context and therefore the concentration would be on interventions that could be implemented relatively quickly. However, the exploratory phase of this research project was designed to explore all forms of bike-rail integration as it was considered important to understand the relationship between the different methods, the extent of experimentation and the motivation in order to make decisions about providing new facilities.

Fixed frame bicycle carriage as opposed to folding bicycles is a particularly difficult issue at peak times on many parts of the UK rail network when space for passengers on many trains is limited, as is space for cycle carriage. Folding bicycles are treated as luggage, for which there is reasonable provision of space on most trains, though some would argue that increasingly, even luggage space is too limited. This situation varies from area to area which means that the solution for one area may not provide the solution elsewhere. In some parts of the country and at some times of day, allowing more bicycles on underused trains could attract new users.

As explained in Section 2.5, the fragmented nature of the rail industry means that TOCs have different cycle policies and booking systems which may be a deterrent for those contemplating bike-rail integration. In the South West, the location of this research, the number of bicycles that can be carried depends on the particular rolling stock. Most trains have an official limit of two bicycles though as the decision is at the discretion of the train operator, in practice, on some trains many more are carried. The older high speed rolling stock, for example, have 6 spaces for bicycles on each train.

Apart from switching from a fixed frame bicycle to a folding bicycle, another option is to park a bicycle at either end of the journey depending on the requirements of that leg of the journey. An individual could have a bicycle at the access end only, the egress end only or two bicycles, one at each end. Another option is to have rental or public bikes available at stations (see Chapter 8). A recent initiative at Waterloo Station provides Brompton folding bikes free to annual season tickets holders with a charging system for others (South West

Trains 2009).

The policy framework for bike-rail integration outlined in Section 2.5 shows that in the UK, cycle parking facilities were considered as the first step in promoting bike-rail integration. Currently, about 45 per cent of over 2,500 railway stations in the UK do not have cycle parking according to ATOC's estimates and the total number of cycle parking spaces is in the region of 22,000 (Green and Hall 2009).

Martens (2007) has argued that, even in the Netherlands with safe cycle routes and a cycling culture, the provision and placement of secure cycle parking was important in attracting cyclists to the rail network. He believes that access trips to rail by modes such as car and bus are often sufficiently poor on a routine basis that the barriers for changing behaviour towards cycle access to the station may be substantially lower than for trips in general. If this is also the case in the UK, the provision of cycle parking is the simplest and most obvious intervention and the next section gives important background for the exploratory phase of this research, which includes an investigation into how existing cycle parking is being used at the two research sites.

3.5.1 The provision of cycle parking

As was mentioned in Section 3.4, the lack of clarity about the returns on investment to promote cycling also applies to investment in facilities that would promote bike-rail integration. Pucher et al. (2010), in an international review, could not find any studies that adequately measured the impact of providing cycle parking or addressed the direction of causality – the extent to which providing cycle parking had increased cycling or whether increased cycling demand had led to more investment in cycle parking. In 2005 the Transit Cooperative Research Program (2005) in the United States published an overview of experience amongst transit operators across the United States with the integration of bicycles and transit (which included buses as well as trains). In their conclusion they stated that "few transit agencies collect data about bicyclists' trip characteristics or bicycle parking use" and go on to say that what is needed is concrete evidence of the effect of bicycle services on transit ridership.

There are limited hard data in the UK partly the result of the rarity of cyclists which makes collecting sufficient sample sizes difficult. Investment in cycle facilities, parking and lockers is considered relatively marginal and consequently the outcome of the installation is rarely measured nor how quickly the facilities are used, by whom and whether they are new rail users or existing rail users. This is the crucial piece of evidence needed to make the case for investment in facilities to promote bike-rail integration.

As was pointed out in Section 2.5, the Department of Transport provided limited funds for investment in parking facilities at railway stations and a monitoring exercise in the late 1990s in Hampshire found that the use of the new parking facilities installed across stations was very inconsistent, suggesting that there was no measurement of potential demand before the parking was installed. The conclusion of the monitoring exercise was that 'the results provide evidence that installing well located, covered and secure cycle parking facilities helps generate increased cycle access to rail interchanges' (TfL 2004c). As cycle facilities are a relatively small investment it may be that predicting demand is not worthwhile, but there are clearly some stations located in areas with higher levels of cycling that might be prioritised.

A programme of installing cycle parking at stations across the UK's Great Eastern railway franchise area was followed by a doubling in arrivals at stations by bike (Cyclists Touring Club 2003). A more recent evaluation of providing new cycle parking facilities at Surbiton Station used a questionnaire to 119 cyclists and 304 non-cyclists and found that the availability of cycle parking had encouraged more people to cycle to the station (TfL 2004b). A quarter of those using the new facility stated that they had started cycling to the station when the new parking was introduced and nearly one in five said they now cycled to the station more often. One in ten had replaced a car journey with cycling. Typically cyclists also used other modes of transport to reach Surbiton Station. They were likely to walk to the station, particularly if the journey was less than a mile. Around a third would also sometimes take the bus and/or drive a car. Around half sometimes caught a lift in a car to get to the station. This suggests that for some, cycle access was one option among several, and that it was an active choice to cycle.

At the station level, there can be conflicts within the overall governance structure of the rail industry as mentioned in Section 2.5 so for example, if the removal of car parking space is required to increase cycle parking space, this can mean the removal of a revenue stream to the train operator who leases the station. ATOC suggests that improvements to cycle parking are generally dependent on conditions being built into a TOC's franchise agreement and Network Rail cites several barriers, space limitations, security issues (theft and terrorism), the number of parties involved and the complex land ownership, access, signage and listed buildings to be challenges to improving cycle parking at stations (Greater London Authority 2009). Lingwood (2009) uses the example of Bedford Station where multiple operators use the station and increased passenger revenue is shared between the operators, whereas car parking revenue goes to the station leaseholder. There is likely to be a relationship between the availability of car parking and demand for rail services but Lingwood argues that there may be an overestimation of the importance of car parking customers. The customers who had parked at Bedford Station made up 19 per cent of the passengers who used the station, yet 83 per cent of the station area space was devoted to them. These arguments were used to convince First Capital Connect to increase the cycle parking from 270 spaces to 360, and a weekly survey has shown a 20 per cent increase in cycles parked during 2008 (Lingwood 2009).

In countries with high levels of bike-rail integration, providing sufficient cycle parking is a considerable challenge. A typical Dutch intercity station would store about 4,000 bicycles (Green & Hall 2009). Insufficient cycle parking can result in random parking which causes problems for the local authority. In Groningen where 60 per cent of journeys are made by bicycle it has not been possible to keep up with demand. A guarded underground cycle parking facility at the railway station was built, initially to provide 3,000 spaces but the demand was so high that it now accommodates 4,650 bikes but random parking is continuing (van Huissenden 2009). Groningen's high cycling levels have put pressure on public space generally "In point of fact, this is why bicycle parking poses a threat to the ardent wish on the part of the political parties to witness a further rise in bicycle use in the city of Groningen" (van Huissenden 2009).

Similar problems have been experienced in Japan where, as early as the 1970s, the demand for bicycle parking in station squares outstripped designated capacity, leading to what was described as a "bicycle pollution problem" (Replogle 1992). This continues to be a problem in Japan where cycling has remained important with around 20-30 per cent of trips by bicycle and some streets so narrow that cars cannot penetrate (Enoch & Nakamura 2008). Rail also has a greater modal share in Japan with the ratio of rail transport to car transportation in terms of passenger kms being 27 per cent compared to a six per cent railway/metro share in the UK. In some areas rail is very important, for example 95 per cent of commuting trips into central Tokyo are by train (Enoch & Nakamura 2008). Tokyo's Kasai Station recently built an underground robotic cycle parking facility with a capacity of 9,400 bicycles and a cost to the user of less than a pound a day (Engadget 2009).

In some cases the user pays, though there is usually some form of subsidy. Some have a secure and sheltered parking facility that also serves as a cycling centre with bike hire, repairs, travel advice and the possibility of shipping your bicycle to another station. A number of different station parking models exist across Europe (Pucher and Buehler 2009). In Belgium, a network of 'Fietspunt' are being developed, manned cycle parking areas that are run as social enterprises (SCNB Holding 2009). In North Rhine Westphalia in Germany there are about 62 bicycle stations or 'Radstation' ranging in capacity for a few hundred bicycles up to the station at Munster with space for 3,300. The majority (80%) are run by not-for-profit organisations or advocacy groups but 20 per cent are run by a commercial operation (Velocity 2009). Station cycle hubs are owned and operated by each Swiss City as an extension of their integrated transport policies. Zurich Velostation is just one example, in a modern underground car park with capacity for 560 bicycles (Green and Hall 2009). The bicycle owner has the choice to pay about 20p a day or £72 pounds a year to use an area that is manned.

The provision of cycle parking removes a practical barrier but as Chapters 4 and 5 will show, on its own it is unlikely to result in an increased incidence of bike-rail integration. The lack of scrutiny of the provision, management and use of cycle parking at railway stations in the UK provided an opportunity for the exploratory phase of this research to fill a knowledge gap and investigate how the existing cycle parking at the two research locations was being used to inform future investments. The next section considers at other factors that are likely to influence the choice of cycle access over other modes.

3.5.2 Factors to consider in the design of an intervention to promote bike-rail integration

As has been mentioned in Section 2.3, distance is likely to influence the choice of mode. The longer it takes to get to a railway station the less likely it is that an individual will travel by rail (DfT 2007i); 18 per cent of those living within a 6 minute walk of their nearest railway station in the UK travelled by train at least once a week compared with eight per cent of those living 14-26 minutes away and two per cent of those living 44 minutes or more away. In the distance band 14-26 minutes, the number of people using rail was less than half those living nearer the station but a bicycle would allow the journey time to be equivalent and therefore has the potential to raise this percentage.

In their analysis of multimodal trips in the Netherlands (including bus trips as well as rail), Krygsman and Dijst (2001) found that the majority are accessed by walking and cycling (80%) and that for walkers 98 per cent do so over distances shorter than 2.5 km and for cyclists it is less than 5 km (86%). Martens (2007) pointed out that 29 per cent of individuals access the rail network by bicycle in the Netherlands but only six per cent leave the rail network by bicycle. Krygsman and Dijst (2001) argue that it is the egress distance that might be a particular barrier because the egress options are more limited and most rail passengers will rely on walking (slower) or public transport (waiting time and fare) which will add to the overall journey time. The possibility of leaving the rail network by bicycle is available only if a passenger can take their bicycle on the train, or they own and keep a second bicycle at their destination station or there is the possibility of hiring a bicycle (see Chapter 8 for discussion of bike hire).

Krygsman, Dijst and Arentze (2004) concluded that, as might be expected, increased distance from a railway station in The Netherlands significantly reduces the propensity to use rail, but also that this decay effect is very much a function of the different access or egress modes being more sensitive to distance. The assessment was made by calculating 'interconnectivity ratios' based on the proportion the total trip time (not including wait time) that was constituted by access and egress time. Notably, the bicycle-rail-bicycle trips had ratios in the 0.2-0.5 range: a spread of values lower than those of other types of intermodal chains.

As was outlined at the end of Section 3.4, the choices that individuals will make will depend on the overall transport context: what other options are available. Revealed choice data from The Netherlands showed that, in 47 per cent of cases, passengers did not use their nearest stations, so there were other factors influencing that decision. The propensity to use cycling as an access mode was found to be highest from origins located between 1.1 and 4.2 km from stations. Notably, however, the accepted cycling distance reduced where the frequency of available public transport as an alternative was higher, suggesting that many travellers have more than one access option and do make modal choices[11] (Debrezion, Pels & Rietveld, 2008).

In the light of the discussion in Section 2.3, car availability might be expected to influence the choice of bike-rail integration. Using the 1998 Dutch National Travel Survey, Krygsman and Dijst (2001) found that car availability, and specifically the ownership of a personal car, was the most important variable influencing the use of multimodal transportation, but the density of the neighbourhood also had an influence. Full-time employed people were more likely to use multimodal transportation together with those with higher incomes. In contrast, in

[11] In the 1990s in The Netherlands a free public transport pass was given to students. This resulted in the modal share of bus/tram/metro increasing substantially but through attracting those who had previously walked or cycled rather than through modal shift from car (Rietveld 2000)

examining the experiences of access mode choice in The Netherlands, Germany and the UK, Martens (2004) found that car availability hardly influenced decisions to bike-rail integrate. In other words, there were many other factors at play in the decision to bike-rail integrate, as will be discussed in Chapter 4.

One explanatory factor suggested by Givoni and Rietveld (2007) for the stability of the modal share of cars accessing Dutch stations over a ten-year period, despite increasing car ownership, is the limited station car parking facilities which could be 'forcing' some rail travellers with cars available to use other access modes. This supports the idea of 'sticks' assisting in behaviour change.

A study in the UK, working in a context where alternatives to the car are (or are perceived to be) less available, has also pointed to limited car parking capacity as a factor in the context of limiting future growth in rail patronage (Passenger Focus 2007). This may be the case but an alternative strategy would be to make better use of existing capacity and try to encourage those with an alternative to use it. Station users at Grays station located in the unitary authority of Thurrock in the East of England were asked what they would do, if, in future, parking at or near the station became difficult and 27 per cent responded that they would walk (Passenger Focus 2007).This suggests that their choice of access mode was not a function of distance and illustrates that the existing access management regime in some places is making car access relatively easy and that there are no 'sticks' to encourage individuals to seek alternatives such as cycle access.

Givoni and Rietveld (2007) identified access mode factors as a contributor to the overall satisfaction of travelling by rail having analysed the Dutch Railways' satisfaction survey gathered in 2005. However, this was not the case for travellers using a bicycle. Hence, even if they are confronted with low-quality parking, they do not incorporate this in their overall valuation of the trip. It is not clear why this might be the case, but perhaps it is a function of passenger expectation and the benefits of bike-rail integration are considered to outweigh the quality of facilities. A later study (Debrezion, Pels & Rietveld, 2008) found that rail service quality, in particular the frequency of service, was the most important factor in station attraction and the quality of station access facilities were confirmed as the secondary factor.

In addition to these factors there are social and psychological barriers to choosing bike-rail integration and these will be discussed in the next Chapter.

3.6 Summary and conclusion

This chapter has shown that implementing the policy change outlined in Chapter 2 has been slow in practice and gives the necessary background and context for the design of interventions to promote bike-rail integration. The overall lack of success in promoting cycling in the UK could act as a barrier to the promotion of bike-rail integration, though Martens has argued, the barriers for changing behaviour towards cycle access to the station may be substantially lower than for cycling trips in general as there are 'sticks', the lack of car parking and the congestion around stations makes other access modes more attractive.

Figure 1 showed that a number of factors are likely to influence the levels of cycling and the experience of promoting cycling outside the UK suggests that a co-ordinated plan of different measures to address those factors rather than single interventions is important. This plan needs political backing within an overall policy framework that restricts car use or at least does not favour car use. It is argued that a virtuous circle can be created: higher levels of cycling in the population create more public and political support for investment in cycling. There are some areas in the UK that have succeeded in raising cycling levels, notably in London where there was both traffic restraint, a prioritisation of cycling and increased investment. Similarly, the CDTs are also experiencing an increase in cycling.

As was pointed out in Section 2.4 a combination of measures including 'carrots' and 'sticks' is most likely to bring about behaviour change so, though cycle parking or bike-hire provision at stations could encourage more bike-rail integration, this is less likely to be the case if the car alternative is not restricted in some way. STPs mentioned in Section 2.5 offer a governance structure that could in theory bring together a number of such measures into a coherent package to influence the many different interacting factors that govern the decision to bike-rail integrate.

One of the consequences of the low levels of cycling and bike-rail integration in the UK (with the exception of some areas e.g Cambridge) is that those in positions of power are less likely to have had direct experience of cycling or bike-rail integration. As a result, projects to promote cycling or cycle access tend to be given a low priority, exacerbated by the lack of right skills within transport planning departments or the rail industry particularly in relation to 'soft measures'. This is compounded by a lack of a clear evidence base for the return on cycling investment.

This lack of evidence has created the opportunity for this research to investigate the ways that individuals are already combining cycling with rail and how existing facilities are being used. The next chapter looks at how behaviour change theory forms the foundation for the design of the two trial interventions within this research project.

Chapter 4 Behaviour change and decision making

4.1 Introduction

The previous chapters have situated bike-rail integration within the sustainable development framework and the overall transport policy context, outlining the role it could play replacing car journeys. The present chapter draws on existing research literature and theory around travel decision making to conceptualise the influencing factors and the likely attractors and barriers to cycling and bike-rail integration and how this might inform interventions to promote this travel behaviour.

In the more traditional view of transport planning the individual is assumed to act rationally but this chapter argues that, in order to fully understand travel behaviour choices a different approach needs to be taken. The individual has to be seen as a more complicated being, one prone to make decisions for irrational and emotional reasons. It argues that an individual's cognitive processes, attitudes, habits, life stage, personal characteristics and their social, cultural and transport context are all important in travel decision making. A combination of these factors contributes to a decision and different factors will be salient according to a particular journey's requirements.

Literature around cycling predominates as:

- Cycling is at present a marginal activity and transport mode in the UK as has been outlined in the previous chapter. Existing attempts at increasing the levels of cycling have had mixed results; this means that the social and cultural issues discussed in this chapter may be of particular importance and therefore of interest to this research project.

- More adults will have had experience of rail travel than cycling as a mode of travel (Section 3.1).

- Insights around the cycling literature apply to travel decision making in general and as mentioned in Section 3.2, the level of cycling in a country appears to be related to the level of cycle access to the rail network; therefore, if more individuals change their behaviour towards more cycling it may lead to a greater uptake of bike-rail integration (Martens 2004).

Theories that have relevance to this research and the design of interventions for changing travel behaviour are Prospect Theory (Tversky and Kahneman 1981); Theory of Planned Behaviour (Azjen 1991); Social Norm Theory (Cialdini, Kallgren and Raymond 1991) and Social Identity Theory (Tajfel 1981).

It will be argued that travel decision making is complex and the insights from the literature and theory are a helpful way of conceptualising how the many influencing factors interact and how an individual's cognitive processes will affect their response to those factors. A conceptual model has been developed from this review and is outlined in Chapter 5 showing how this theory can be used in practice.

The literature explored highlights the importance of social and cultural processes and shows the extent to which the assumption that decisions are made on the basis of instrumental benefits alone is flawed and therefore the provision of infrastructure alone is unlikely to change behaviour. Effective interventions to change travel behaviour will need to be designed to address both the social and psychological barriers as well as the practical barriers.

4.2 Transport context and rational decision making

The aim of this research is to help individuals to make different choices, switch from car use to bike-rail integration, and this section uses the literature and theory around cognitive processes to see to what extent they present a barrier to behaviour change.

Prospect Theory, (Tversky and Kahneman 1981) and the work of Thaler and Sunstein (2008), which has been outlined in their book "Nudge: Improving decisions about health, wealth and happiness", are used to show how the presentation of the idea of behaviour change is important and even the placement of facilities can act as a cue for deliberation about the possibility of taking some kind of action.

The traditional assumption in transport planning is that the individual has access to full information, and his or her perceptions of the potential cost and benefit of a particular behaviour are based in reality. The core principle is that behaviour is the product of deliberate, rational decision making, reflected in the name of one of the most widely used theories, The Theory of Planned Behaviour (TPB) (Ajzen 1991). In fact it may be based on an incomplete version of reality or bounded rationality (Kahneman 2003). Emotional responses to different transport alternatives may carry more weight in the decision than cost or time and individuals may have little actual knowledge or experience of the alternatives.

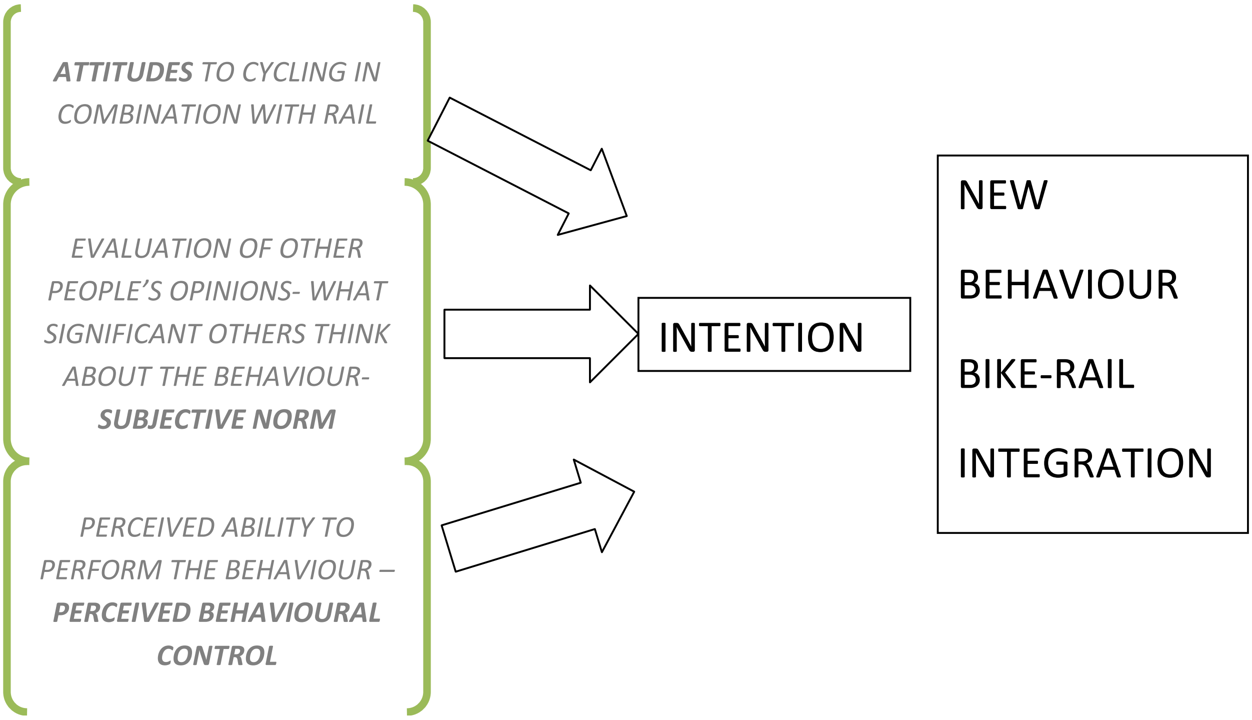
This makes measuring why an individual makes a particular transport choice more difficult and has implications for the selection of the target audience for any intervention and will be discussed in more detail in Chapter 5.

Attitudes are shown to be an important factor in perception of alternatives and much of the focus in the transport literature has assumed that a change in attitude is a prerequisite for a change in behaviour. This section argues that attitudes are one of many factors, they present practical problems as they are difficult to measure and there is no clear evidence that a change in attitude leads to a change in behaviour. In fact, the relationship may work in the opposite direction so that providing individuals with the opportunity to trial and experience a behaviour like cycling might change their attitudes.

4.2.1 Rational decision making

Ajzen's Theory of Planned Behaviour (TPB) is a good place to start in terms of understanding the antecedents of behaviour and it has been used extensively in transport studies. It postulates that it is intention that is the central determinant of behaviour and that this is influenced by an individual's attitude to that behaviour which is in turn is dependent on their belief and evaluation of the expected outcome (Ajzen 1991).

Figure 2 Theory of Planned Behaviour (TPB) (adapted from Ajzen's TPB 1991)



A person’s belief about what others think (subjective norm) and their belief in their ability to engage in the behaviour (perceived behavioural control) will also influence their intention as shown in Figure 2 above. So, according to the TPB, in the case of bike-rail integration, if an individual has a positive attitude towards bike-rail integrating, their friends think it is a good idea and they own a bicycle which they are confident to ride and live within cycling distance of a railway station, they are more likely to have an intention to bike-rail integrate.

The assumption behind the TPB is that the behaviour is reasoned, controlled and planned. This fits in with the traditional view of transport studies focussing on individual travel behaviour, very often in the context of the journey to work, looking at the competition between modes with highly quantitative and theoretical research and the development of models which are then used to predict future travel behaviour.

Transport is considered a derived demand, without inherent utility and it is assumed that individuals make rational decisions on the basis of perfect information. The TPB does take some account of the argument that social context (subjective norm) will affect transport choice, but there are many other influences outside this model which will also influence travel choice. An individual’s decisions may not be selfish, their preferences might change over time and their choice depends on their judgement of the probabilities of whether something will happen or not. An individual could be too busy to even consider a choice or might not perceive that they personally have that choice. They may have a habitual travel pattern and ignore information about alternatives that they do not see as relevant to them (Garling 1998).

As can been seen in Figure 2, attitudes are an important component in this model and are dealt with in more detail in Section 4.2.5. A useful aspect of this model is the idea that there are several contributing elements to the intention to perform a behaviour in a certain way and therefore interventions that try to address all three simultaneously are likely to be more successful. Beliefs are precursors of attitudes and in this model attitudes are only one determinant of behaviour. The question then becomes: If an individual was given the opportunity to trial a behaviour like cycling and therefore discovered they could cycle for a specific journey, would perceived behavioural control on its own be enough to change their behaviour? The TPB suggests that a change in attitude and the subjective norm are also necessary.

This theory has been applied in a number of different ways but on average, across many studies, 27% of the variance in self-reported behaviour and 39% of the variance in self-reported intention has been explained by the TPB (Armitage and Conner 2001). These figures become even lower when objective measures of intention or behaviour are used. In other words, it cannot give a complete explanation of behaviour so there are other factors influencing the decision.

4.2.2 The framing of decision making – the choice architecture

There is a considerable body of research in psychology that confirms that people rarely engage in a rational consideration of the pros and cons of each action but often rely on mental short cuts or 'rules of thumb' to save time. These mental short cuts are known as 'heuristics' and Tversky and Kahneman (1974) identified three – anchoring, availability and representativeness.

'Anchoring' shows that choices can be influenced by prompting the initial thought process in a certain direction, so that the way that information is 'framed' influences how an individual will respond. "The frame that a decision maker adopts is controlled partly by the formulation of the problem and partly by norms, habits and the personal characteristics of the decision maker." (Tversky and Kahneman 1981). Tversky and Kahneman developed Prospect Theory where outcomes are expressed in terms of gains or losses from a neutral reference point and the response to losses is more extreme than the response to gains. Variations of the reference point can determine whether a given outcome is evaluated as a gain or a loss.

Avineri (2009) illustrates how the format in which information is presented does matter and uses the example of two commuting choices – driving or cycling.

Figure 3 Framing two commuting choices

1. **commuting by car: 25 minutes**
   cycle-commuting: 20 minutes
2. **commuting by car: 25 minutes**
   cycle-commuting: you will save 5 minutes on your journey
3. **cycle-commuting: 20 minutes**
   commuting by car: your journey will take you 5 minutes longer

As individuals are more sensitive to losses, Avineri argues that they are likely to find the cycling option more attractive in Option 3. This type of knowledge could be used to change an individual’s perception of whether they make a gain or a loss of journey time by changing the reference point of journey time thereby encouraging a certain choice (Avineri 2009).

An individual assessing the likelihood of risk depends on their ability to recall events – the ‘Availability’ heuristic. An image of an aeroplane crash is more readily available or recalled from memory (from massive media coverage) than a more everyday car crash and therefore individuals are more nervous about flying than driving *(This may not be the case if someone has had direct experience of a car crash)*. Misperceptions can result from the availability heuristic so that incidents of alcohol abuse, someone being very ill rather than behaving normally on a university campus are more easily recalled. The result is that individuals tend to believe or have the perception that drinking too much is more common than it actually is.

Another example was the sudden surge in cycle commuting in London after the July 2005 bombing; pictures of the blast aftermath were so powerful and were retained in the memory so that individuals overestimated the likelihood of it happening again. The media is less likely to publish or show the image of a cyclist being knocked down or injured which is actually a more frequent occurrence (Wall 2006 p243). This type of misperception can be used within an intervention to alter behaviour and an example is given in the following chapter.

Thaler and Sunstein (2008) argue that these “nudges” or cues are everywhere and they form a choice architecture (the context or framing of choices) which is pervasive and unavoidable. This architecture is often there by default rather than by design which is probably the case in terms of the choice architecture in which bike-rail integration is taking place. This understanding provides the opportunity to include features, for example, in the design of a STP which might stimulate different choices. There are subtle cues already, bicycle parking may be tucked into an unwanted and unvisited section of a railway station and the message is that it is unimportant. A very visible, well designed parking facility at the front entrance of a railway station gives a very different message.

An individual’s perception of the choice and how that choice is framed are crucial factors in determining which choice will be made. Thaler and Sunstein (2008) argue that it is false to assume that almost all people, almost all of the time, make choices that are in their best interest, and it might be reasonable to suggest that it depends on the context and whether the person has experience in that context. So, for example, the perception of bike-rail integration will vary according to the level of experience with either mode or both. An experienced bike-rail integrator is likely to have a very different perception to someone who has never tried either mode. Individuals accumulate 'motility capital', a stock of experiences that will be a factor in determining their travel choice (Flamm and Kaufmann 2004).

4.2.3 Habit

It is not that price signals (the more conventional territory of transport planning) are not important but that other factors may be as important, so for example Thaler and Sustein (2008) argue that humans have an inbuilt 'status quo' bias or suffer from plain inertia. In other words, habit means a person does something automatically without certain cognitive processes and will not be influenced by rational arguments (Gärling and Axhausen 2003). They may not even perceive that information is relevant to them, so for example, in a study that considered the role of information acquisition concerning travel mode choices Verplanken, Arrts & Van Knipperberg (1997) found that those with a strong habit acquired less information and gave evidence of less elaborate choice strategies.

The previous section focussed on presenting the alternative choice in a frame that makes cycling or bike-rail integration more attractive. Some researchers believe that an alternative approach is to decrease the negative features of the alternative or remove the 'resistance' (Knowles and Riner 2007). Knowles and Riner suggest that different brain structures and neurotransmitters operate depending on whether a strategy is designed to make a choice more attractive or to tackle resistance. Habit or inertia, is one form of resistance which can be disrupted so that new information can be heard or considered (Knowles and Riner 2007).

The stimulation of awareness and deliberation are a first step to effecting behaviour change. Bamberg, Rolle & Weber (2003) found that in new decision contexts former car users show a strong behavioural reaction to even small relatively inexpensive interventions, and future travel mode choice was not affected by past use or habit. In other words, the intervention lent support to the idea that the individual had deliberated on whether to take up the offer rather than automatically choosing to drive. So, though habit is a barrier, it can be overcome.

This knowledge can be used to inform the design of interventions to prompt deliberation rather than allowing individuals to automatically choose to drive through habit. A rise in the level of consciousness of behaviour can occur when an individual faces a key life event like moving house. Stanbridge (2007) found that there was a travel habit weakening associated with a home move. Further work found that those who had recently moved and were environmentally concerned used their car less frequently for commuting to work compared to those with low environmental concern and those who had not moved but were environmentally concerned (Verplanken, Aarts &van Knipperberg 1997) (Verplanken, Walker, Davis & Jurasek 2008). Certain times during the life course may offer greater opportunity to prompt deliberation and other factors including attitude may influence the choice.

4.2.4 Information and the perception of alternatives

A review of 15 years of literature looking at travel information as an instrument to change car drivers' travel choices concluded that the expectation of the influence of information provision on travel choices may in general be mildly optimistic (Chorus, Molin & van Wee 2006). Even if individuals do take note of information, the information that is provided may not have a meaning, as for example it is difficult to evaluate even instrumental benefits without experience. Car users tend to overestimate public transport travel times (Fujii et al., 2001) and this was confirmed in a more recent study of car drivers and rail users travelling into Amsterdam (Van Exel & Rietveld 2009). Car drivers consistently overestimated the travel time on public transport and the authors suggest that there is considerable scope for improving the image of public transport amongst car users.

The implicit suggestion here is that if they had a more positive view of public transport, stimulated by information, they might make a different choice. This may be optimistic as, as they themselves concede, it was possible that individuals had overestimated the public transport time in order to justify their car use in some way[12] (Festinger 1957). The authors argue that what their study shows is that it is very important to distinguish between actual and perceived choice-sets. As was shown in Figure 3 Section 4.2.2 how information is presented and received is not straightforward.

Negative attitudes might be formed on the basis of isolated negative public transport experience (Gardner & Abraham, 2007) but this experience may permanently change the choice set an individual would consider. Gardner and Abrahams (2008) conducted a meta-analysis across a number of studies looking at the psychological correlates of car use and tentatively suggest that interventions need to focus on the perceived unattractiveness of alternative options and improve drivers' perceptions of their control over using non-car modes. As the previous two chapters show there is the potential for cycling and bike-rail integration to fulfil many existing car journeys but the current image of cycling in the UK may be an important psychological barrier to an increase in bike-rail integration (Section 4.4).

[12] Festinger (1957) proposed that if there was a conflict between an individual's behaviour i.e. their car driving and their beliefs, values and perceptions they could either change their behaviour or change their attitudes.

Stradling (2002) has also emphasised the importance of psychological barriers to choosing alternatives to the car: the sense of autonomy that a car confers, the sense of personal identity and independence with feelings of control. Current car commuters saw public transport as involving interchange which required additional physical and emotional resource - walking, waiting, carrying luggage, finding comfortable seating, the cognitive effort of getting information and route planning, and the uncertainty of the connections and personal vulnerability (unmanned railway stations).

Hagman (2003) looked at how individuals presented their responses to questions about the advantages and disadvantages of car use and puts forward that the ‘knowledge’ to answer these questions is constructed in different ways so that people talk from direct experience when it comes to advantages of the car (even though this ‘experience’ has been partly formulated through advertising and marketing). Disadvantages, such as the cost of car repairs, are also related to direct experience but others such as the environmental impact of car use are more related to the public discourse and therefore open to interpretation and negotiation. Guiver (2007) used discourse analysis to see how people talked about bus and car travel and found that not only did respondents use different criteria to evaluate each mode, they talked about them differently depending on whether they were a user or a non-user. In other words, the perception of a travel mode is partly socially constructed.

How individuals feel about their commute to work, their affective appraisals may be important in terms of promoting alternatives. So, for example, Steg (2004) found that the more positively the affective experience of driving was rated, the more often the car was used. Gatersleben and Uzzell (2007) compared the affective appraisals of the daily commute of walkers, cyclists, car and public transport users in a survey amongst university employees and found that each transport mode elicits a different affective appraisal by the users. Car commuters found their journey stressful as did public transport users, who also suffered from boredom. Walking and cycling journeys were found to be more relaxing and exciting. If those who cycle to work rate their experience more positively than those who are driving then perhaps if interventions gave car drivers the opportunity to try cycling, the experience could change their attitudes or perception of cycling relative to the car.

The importance of framing information within an intervention has been highlighted and research suggests that it would be important to focus on the affective benefits of bike-rail integration as well as the instrumental benefits. Even if someone is willing to look again at alternatives, the message they receive may not match the intention of the intervention. So, for example, Beale and Bonsall (2006) in their work on marketing in the bus industry, found that marketing material encouraged bus use among existing habitual bus users, people positively disposed towards the bus and females, but caused a significant decrease among males, previously infrequent bus users and people negatively disposed towards bus travel. The same message was received very differently by potential users groups depending on their prior experience. It showed that individuals might not even notice information if they do not feel it is pertinent to them and it may also depend on their attitudes as discussed in the next section.

4.2.5 Attitudes – how important?

In the transport literature, there is considerable emphasis on attitudes and the extent to which they can either indicate a propensity to change behaviour or are a necessary prerequisite for behaviour change. So, for example, if an individual has a positive attitude towards cycling they might be more likely to consider cycling to the station. The difficulty is that attitudes are difficult to define and measure and are closely related to values, moral and social norms and perceived behavioural control (the belief in the ability to perform behaviour).

An attitude is a 'hypothetical construct that represents an individual's like or dislike for an item and refers to a relatively stable evaluative response' (Eagly and Chaiken, 1993). An individual can have an attitude about another person or thing e.g. a transport mode, it can be positive, negative or neutral and it emerges from an individual's beliefs and feelings.

It is not always clear that the same construct or 'attitude' is being measured across different research studies. In a review of research evidence on public attitudes to transport, a broader interpretation of attitude was taken than that defined by Eagly and Chaiken (1993), which encompassed beliefs, perceptions, satisfaction, expectations, acceptability, values and norms (Lyons, Goodwin, Hanly, Dudley, Chatterjee, Anable, Wiltshire and Susilo 2008). "There is very strong evidence that the differences in the wording of questions has a material effect on the apparent resulting distribution of attitudes: this result has been long known in principle, though it has surprised us in some cases how big the effect is" (Lyons et al. 2008). The review also raised the question of the difference between attitudes measured at a point in time and the dynamics of how those attitudes may change over time. As was discussed in Section 2.3 in relation to the level of car ownership, the aggregate increase in car ownership each year masked a slightly larger number of households increasing their car ownership (8.2%) than decreasing it (7.6%). The equivalent figures are not known for changes in attitudes at the individual level.

Attitudes are likely to have some influence on travel choice but a questionnaire to ascertain an individual's attitude is by definition a snapshot, and how a question is answered today may not be the same as tomorrow, in a week or a month's time. It may depend on the individual's mood and their context. As Festinger (1957) concluded, individuals often changed their attitude rather than their behaviour.

"Regardless of theoretical framework applied, information and attitudes are consistently shown to rarely lead directly to behaviour" was the conclusion of a review of public attitudes to climate change and transport conducted for the Department for Transport (Anable, Lane & Kelay 2006). Another review looked at the evidence on consumer behaviour and behavioural change which found that some behaviour is not mediated by either attitude or intention and suggested that the relationship is the other way around: actually changing behaviour changed attitudes (Jackson 2005): changing attitudes might not be the most effective way of changing behaviour and getting a person to try cycling could change attitudes towards cycling if the individual had a positive experience (see Section 5.3 trialability).

In a qualitative attitude study on cycling, attitudes were found to be multi-layered, often involving rationalisations and misperceptions, and linked to life stage (see next section) and the influence of the car (Davies et al. 1997). The researchers suggest that within the UK population there are generally positive attitudes to cycling, particularly during childhood, but cycling is still seen as a minority activity. Attitudes of government and institutions are seen as favouring the car, giving inferior status to the bicycle and this in turn influences the attitude and behaviour of individuals (as discussed in Section 3.4). Davies et al. (1997) concluded that the main reason cycling is not more common in the UK is the cultural and physical dominance of the car, its availability and convenience.

Attitudes are one factor among many that will influence travel decisions and as the following sections will point out, attitudes depend and interact with other factors including life stage and personal characteristics – age, gender, fitness, income.

4.3 Life stage and personal characteristics

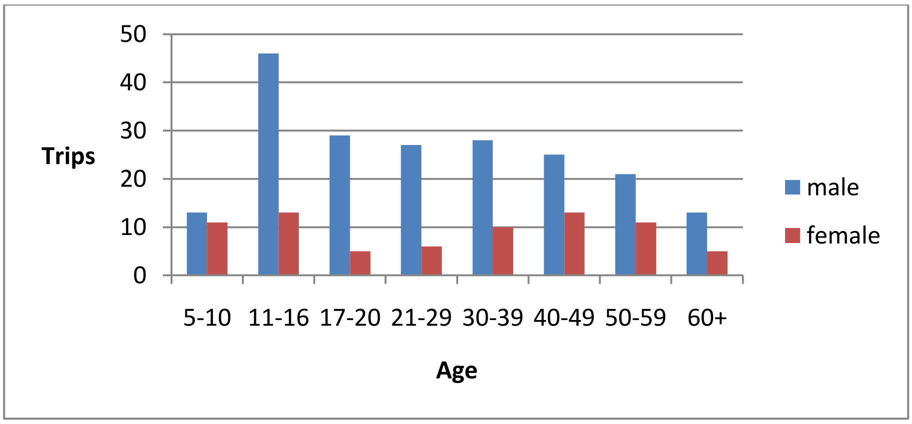
An individual's life stage and personal characteristics can be more easily used to identify groups that are more likely to change their behaviour than a categorisation by attitude. As was pointed out in section 2.3, car ownership and use within a household will influence the level of deliberation and consideration of alternatives. Life course will interact with different levels of access to a car, with other travel options opening and closing. A study using the

German socioeconomic panel showed that four key life events have a strong impact on car ownership growth: a change in the number of adults in a household, a change of location, a change in income and the birth of a first child (Prillwitz, Harms & Lanzendorf 2006).

Davies et al. (1997) showed how attitudes to cycling changed through the life stages with different situations and challenges arising at each life stage. The life stage of having children has been found to effect individual travel behaviour, so that households with children are particularly car dependent and though they may own bicycles they tend not to use them and favour leisure cycling trips (Ryley 2006). Young families consider cycling with pre-school children impractical but once they get to a certain age it is an opportunity for a family activity. As children leave home, their parents have more leisure time and rediscover cycling (Ryley 2006). The data is preliminary but the largest changes in cycling behaviour found in the CDTs appear to have come from the 'middle' (post 35) and 'older' age groups (below 74) (Sloman et al. 2009).

Most children are introduced to cycling at an early age. At adolescence boys and girls start to have different views with girls becoming resistant to cycling and boys continuing to cycle but beginning to aspire to own a car (Finch and Morgan 1985). Hence, although across all age groups males make more cycle trips on average than females in the UK (DfT 2007g) this is particularly true in the age group between 17 and 20 where males make more than five times more trips than females as can be seen in Chart 12 below. Boys between 11 and 16 have the highest trip rate but men between 30 and 49 cycled the greatest distance (DfT 2007g).

Chart 12 Cycle trips per person per year, by sex and age: 2002-2005



Source DfT 2007g

This contrasts with The Netherlands where a larger cycling population broadly reflects the age composition as well as the gender split of the total population (Smith 2005). In Greater London, where the amount of cycling is increasing, the figures show that this has also been accompanied by an increase in the proportion of females within the cycling population (Smith 2005). The more mainstream cycling becomes, the more cyclist demographics reflect the population as a whole (Pucher and Buehler 2008). In the following section 4.4 this will be discussed in more detail but the image of cycling within a culture will have an influence on whether an individual will consider it as an option. Finch and Morgan (1985) found that the bicycle in the UK is considered too humble; for girls it is not sophisticated or feminine and for boys reaching adulthood the car has more status. Overton (2009) found that it was very difficult to get girls to participate in her Recycle-a-Bicycle scheme, and the older they get the more difficult it becomes. She came to the conclusion that those who showed up tended to have the self confidence to go against the accepted norm of behaviour or they perceived a social benefit. In terms of the choice of rail, there is little difference in terms of gender, female travellers were only slightly less common than males with 46% being female and 54% being male (DfT 2007a).

In Section 3.5.2 distance was highlighted as a factor to consider in an intervention to promote bike-rail integration. As has been discussed it will be the perceived distance as much as the actual distance that will influence the choice. In a study looking at employer travel plans, only 4% of the 2065 employees surveyed across three companies cycled regularly and 86% never cycled (Dickinson, Kingham, Copsey and Pearlman Hougie 2003). It is interesting to note that even though distance criteria were met more often for women than men, women were much less likely to cycle, and non-cycling women were much less positive about cycling than men. This was the outcome of complex trip characteristics - the need to make shopping trips and transporting children - and personal security issues (Dickinson et al. 2003).

Distance is just one consideration and the organisation skills required for cycling are underestimated, as was illustrated by the considerable time spent in focus group discussions around cycling on the issue of how to carry and pack items to carry (Bonham and Koth 2010).

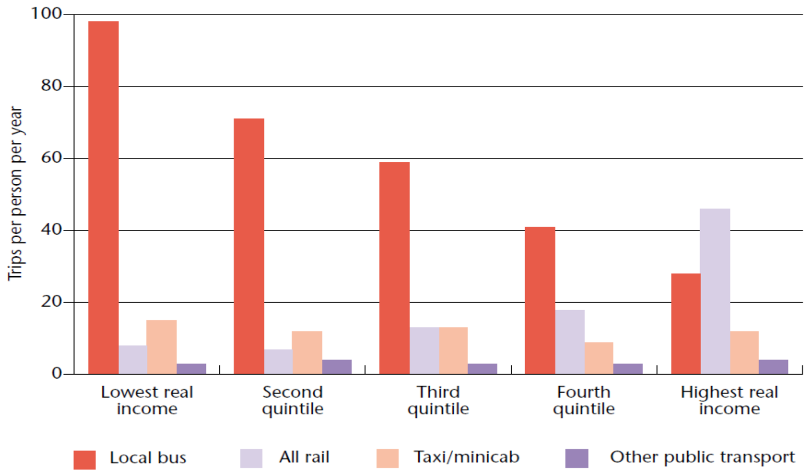
Pooley,Turnbull and Adams (2005 p125) have looked at travelling to work since the 1940s and found that whereas men and women gave roughly the same reasons for cycling, their reasons for not cycling were rather different. Men were more concerned about the lack of a secure place to leave their bicycle and cited laziness, the weather and the need to look smart for work, whereas women most often said they did not cycle because they were afraid of cycling in urban traffic and were more likely to mention the need to undertake other tasks after work – shopping and collecting children.

This research is mainly interested in adult travel behaviour but experience as a child will influence adult travel choices and Haustein, Klockner, Blobaum (2009) argue that transport studies need to take into account the socialisation of mobility, the way in which individuals learn skills, knowledge, values and motives. Individuals gather ‘motility capital’ through experience (Flamm and Kaufmann 2004). Orsini and O’Brien (2006) interviewed six 16-year olds in British Columbia - the age at which it is possible to get a driver’s licence - but these teenagers continued to cycle to school. They had cycled since around the age of 10 because it afforded independence, fun, speed and time efficiency. Their parents resisted habitual chauffeuring and modelled bicycle use for recreation and transportation. The teenage respondents had continued cycling because those early motivators continued and they were stronger than the negative peer pressure. The researchers suggested that one way to promote cycling amongst this age group would be to target the friends of the cyclists. At the individual level there were rational benefits to cycling but had they not had direct experience of the benefits and the parental role models, the negative peer pressure towards cycling might have changed their decision. This illustrates the interaction between the social context – their friends and family, the life stage, the image of cycling and the actual benefits. It could be argued that in this case, experience of the benefits of cycling resulted in a positive attitude to cycling which acted against the negative peer pressure, another indication that trialling a behaviour, experiencing the benefits, could change attitudes.

Personal fitness may affect whether an individual will consider cycling or taking public transport which will require some walking. A study in New Zealand looked at activity levels of a national representative sample of nearly 8,000 adults and whether they perceived it was possible to substitute short car journeys with cycling, when the weather was fine and with no baggage (Badland & Schofield 2006). Overall, 21 per cent strongly agreed that they could and those who already engaged in physical activity were at least 20 per cent more likely to perceive replacing car journeys than sedentary respondents. They found that cycling was a less acceptable form of transport than walking.

Level of income has an influence on travel behaviour as shown in Chart 13 below.

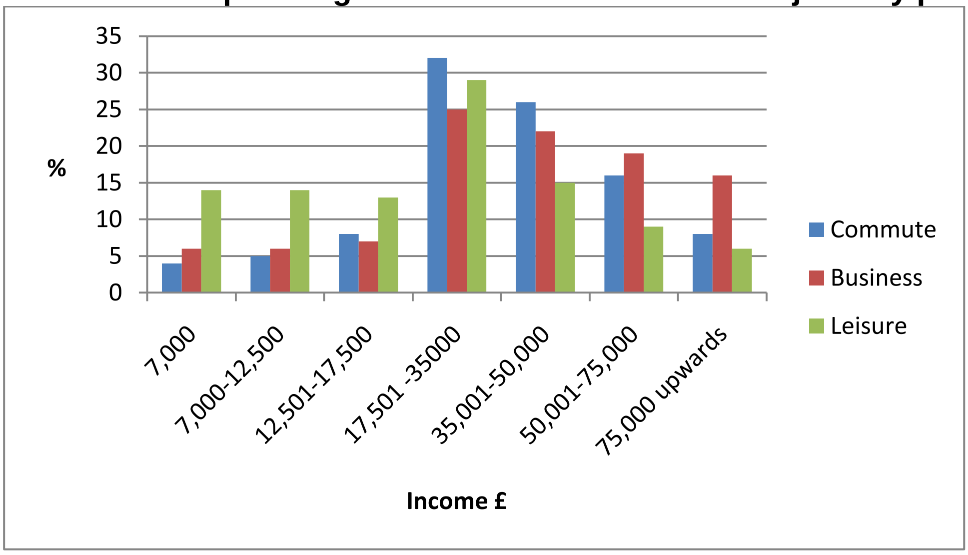
Chart 13 Public transport trips per person per year by household income



Source National Travel Survey 1998/2000 Diagram from ODPM 2003 p23

Those with the highest real income make the most trips per person per year by rail. The level of income for the National Rail Travel Survey was categorised by placing rail travellers according to different income bands and 68% of rail travellers were found to fall within a middle range between £17,501 and £75,000. However, the income profile varies according to journey purpose as shown in Chart 14 so for leisure journeys 40 per cent of rail travellers are below £17,501. Leisure travellers were found to be less likely to have a car than any other group of passengers, and 30 per cent of these have no access to a car. Overall, one in five rail passengers came from households with no access to a car or van (DfT 2007a).

Chart 14 Rail passengers income bands relative to journey purpose



Source National Rail Travel Survey 2007 (excluding London Area data)

In the case of cycling, higher incomes are associated with more cycling, those in the highest income quintile cycle further (49 miles per year) compared with 29 miles per person in the lowest quintile (DfT 2007g). As was pointed out in section 3.2, these average figures mask different behaviour amongst cyclists, so for example, those cycling further may be the group who cycle mainly for leisure or those who cycle regularly.

One of the few studies that has considered the use of bicycle parking at transit stations in America, in Miami-Dade County, found that 85 per cent of the users were male and half were between the ages of 40 and 59. Cyclists who used the facilities tended to have either a low income (35% less than $20,000 a year) or high incomes (21% earning more than $70,000). The reasons these two groups gave for using the facility were different, those with low incomes did not have a car or needed to save money and those with higher incomes were cycling for environmental and fitness reasons (TCRP 2005). This suggests that different income groups might respond to different approaches to change their travel behaviour.

This section has outlined how the age, gender, income, physical fitness might affect travel decision making and has shown that at different stages of life, individuals are more or less likely to respond to the idea of cycling. It highlights the importance of taking into account these factors in designing an intervention, as what might appeal to one gender or income group may not be interesting to another. As was shown by Orsini and O'Brien (2006), teenagers who continued cycling were influenced by their experience and their social context. The importance of the social and cultural context will be explored in more detail in the next section.

4.4 Social and cultural context

Most adults in the UK drive and it is therefore a highly visible behaviour - the descriptive norm. Cycling in the UK is a marginal activity (Section 3.2) and therefore the whole concept of social norms may be particularly important for promoting both cycling and bike-rail integration. This marginality also has implications for public support, and therefore political support, to promote further cycling and bike-rail integration, as was pointed out in Section 3.4.

Cialdini, Kallgren and Raymond (1991) suggest that there is an information processing advantage and a decisional shortcut when one is choosing how to behave in a given situation. So, for example, if the majority of population cycled or combined cycling with rail it would be less of a decision to join them.

It is not easy to define a social norm as it is constantly changing and interacting with an individual's own norms of behaviour. Cialdini (1991) defined three types of social norms:

- the descriptive norm, which guide's one behaviour via the perception of how most others would behave;
- social norms of the injunctive kind, which guide one's behaviour via the perception of how most others would approve/disapprove of one's own conduct;
- personal norms, which guide one's behaviour via the perception of how one would approve/disapprove of one's own conduct.

The salience of each of these norms will depend on the situation; at any given time an individual's action is likely to conform to the norm that is currently most salient even if the other norms dictate contrary conduct. They concluded that "norms can be demonstrated to affect human action systematically and powerfully" (Cialdini et al. 1991).

The strongest predictor of energy conservation (measured by the amount of energy they consumed) was the belief that other people were conserving energy, despite the fact that it was rated as the least important motivating factor by the same individuals themselves (Nolan, Schultz, Cialdini, Goldstein and Griskevicius 2009). The design of this intervention made it clear that either people are not aware of the extent to which they are susceptible to social influence or they are unwilling to admit it in a questionnaire (see also difficulties in measuring attitudes Section 4.2.5). Some kind of rationalisation is going on, in the same way that people may be unwilling to admit in certain circumstances that they love driving their cars or that they are influenced by other people.

Individuals want to conform to the norm as it is inextricably linked to their sense of identity, self-presentation and image. "Given the importance of others' perceptions in social interaction, we should not be surprised that people keep an eye on how others regard them , from time to time, try to control the impression people have of them" (Leary & Kowalski 1990). Individuals manage the impression they are creating and how they present themselves, a process of controlling how they are perceived by other people.

A car or a bicycle is part of an individual's self presentation (Steg 2004) and norms not only specify how people should act but also the nature of the public images they should and should not convey in particular situations. Norms that are relevant to the impressions people should convey of themselves are self-presentational norms. Some are prescriptive, so you look solemn at a funeral, others are restrictive so there are a number of types of behaviour that would be appropriate within certain limits (Leary 1996).

This self-presentation is bound up with a person's identity and their social identity. Social Identity Theory (Tajfel 1981) first sought to differentiate between those elements of self-identity derived from individual personality traits and interpersonal relationships (personal identity) and those elements derived from belonging to a particular group (social identity). Each individual is seen to have a repertoire of identities open to them (social and personal); each identity informing the individual who he or she is and is not, and what this identity entails. Different identities are salient at different times and will vary according to the social context, so, for example, in some social situations an individual might not want to admit to being a cyclist or a rail user if he or she judges those around might have a negative perception of those behaviours.

"Where we travel, how we travel, who we travel with, what we travel for and how often we travel all impinge on the constructions of the self and on identity with people and places. For instance, daily commuting by train brings you into contact with a community of people with shared travel experiences" (Pooley et al. 2005 p 4).

Underlying Tajfel's Social Identity Theory is the idea that understanding our own social group depends upon seeing it in contrast to other social groups, because we can only understand the characteristics of our own group when we compare it to others. In the context of cycling, people identify with being a cyclist or they do not want to be identified as a cyclist on the basis of their perception of the group 'cyclists'.

One individual's view of the characteristics of another group may not be accurate but built through interactions and conversations within their own group. Non-cyclists do not have any direct experience of cycling so they form their opinions from conversations with others and observation. In the case of cycling, Haddad's study found cyclists and non-cyclists hold different views not only about the cycling activity itself but also the characteristics and motivations of cyclists. Cyclists have a much more varied view of cyclists than non-cyclists, they perceive themselves as a number of different cyclist types; functional, enjoyment and die-hard cyclist (Haddad 2005) (Gatersleben & Haddad 2010).

Haddad found that the extent to which respondents could identify with being a cyclist (e.g. the feeling that cycling is an important part of who they are) was positively related to their intentions to cycle. The image of cycling is likely to be important, if its image does not match an individual's aspirations then perhaps they are unwilling to be identified as 'cyclists'. Finch and Morgan (1985) concluded that the image of cycling is as important as dangers and physical adjustment in whether people would consider cycling.

"Given the dominance of car use in our society and lack of experience of alternatives, it is highly likely that our social representations of transport alternatives are drawn more from social discourse and media presentation of government options than from direct experience" (Dickinson and Dickinson 2006). The media has an influence on the image of cycling and very often there is correspondence in the newspapers about the fact that cyclists ride on pavements, break the law and do not warn pedestrians with their bells. Whitelegg (2007) (see also Section 3.4) felt this made interventions in the cycling demonstration town of Lancaster less effective. For non-cyclists this image may then be reinforced by people's direct experience of cyclists, someone in their way on the road when they are driving or someone intimidating them as a pedestrian. It may also be the case that rail passengers who do not combine cycling with rail have a negative image of cycling in general formed partly by media exposure but perhaps reinforced by the observation of cyclists at railway stations or an incident they experienced or observed, such as trying to access a toilet on a train blocked by the storage of bicycles, or being knocked by a bicycle being carried on or off a train.

4.4.1 The perception of the safety of cycling

Many cyclists wear helmets in the UK, which may signal to people observing that it is a dangerous activity (the wearing of cycling helmets is less common in cultures where cycling is perceived to be a normal activity i.e. The Netherlands and Germany). The apparent necessity for cycle paths may add to this perception (Franklin 1999). Joffe (2003) argues that the response to risk is a highly social, emotive and symbolic entity: "The mass media play a major role as do interpersonal interactions, whereby existing representations that circulate in a given culture are communicated between people and enter their explanations of new events. The social representations that emerge are relatively consensual understandings of phenomena, particular to specific social networks."

"People make their transport decisions in the light of the social reality in which they live. Social representations theory is interested in why and how society creates that social reality" (Dickinson & Dickinson 2006). It is this that influences behaviour rather than the objective reality of buses, cycling and walking that many people know little about; this is particularly true in the case of cycling where only a small percentage of the population have direct experience. Taken together, these points indicate that there is a social representation of cycling as dangerous in the UK, which may perpetuate its lack of growth.

Within the words ‘safer cycling conditions’ and ‘cycling infrastructure’ is a considerable and hotly debated literature around the extent to which the existence and quality of cycle routes - on road versus off road - is a barrier or incentive to cycling (Parkin 2004 Chapter 2). The issues discussed relate to ‘where’ the infrastructure is situated, the volume of traffic and driver behaviour, and this is in turn related to the cultural context. “Even timid, risk-averse, and safety conscious individuals (in The Netherlands, Germany and Denmark) can be found cycling, unlike the many millions of Americans and Britons who are terrified by the mere thought of getting on a bike” (Pucher and Buehler 2008). This is partly a function of ‘actual’ risk as opposed to ‘perceived risk’ but different definitions of injuries and methodologies of data collection make comparing safety across countries difficult, but taking fatality and injury rates it is safer to cycle in The Netherlands and Denmark than in the UK and the USA (Pucher and Buehler 2008).

Wardlaw (2002) would agree that the absolute risks for cyclists are lowest in The Netherlands and Denmark but he also argues that the belief that British cyclists face high actual risks is not sustained by the evidence; the actual risks are very low in everyday terms. He is not convinced that the answer is to segregate cyclists to improve safety and points out that it often results in a reduction in convenience and priority. In his opinion the road network offers the optimum combination of safety and convenience and making cycling safer, he argues, requires making it more popular due to the safety-in-numbers effect.

The initial experience of cycling on a road may be frightening but confidence builds, so the process of conversion might take a while. The perception of risk will vary according to experience and be consistent with gender differences to risk aversion, female commuter cyclists were found to prefer using routes with the maximum separation from motorized traffic and therefore these routes may be particularly important for increasing the cycling of women (Garrad, Rose & Lo 2008).

4.4.2 The image of cycling and the lack of a cycling culture

Fincham (2007) explores the ‘image’ of bicycle messengers as people willing to take risks and this image is positively exploited by messengers to consolidate a very particular ‘subculture’ or ‘lifestyle’. Their social and self-identities are self-reinforcing but for the person who just wants to cycle from A to B this particular image may contribute to an overall image of cycling as a dangerous activity indulged in by irresponsible people. Then the question for anyone considering cycling becomes: Do I want to be identified with that group?

"How do others view cyclists as they pass by? Anybody who rides a bicycle for practical everyday journeys in the UK – and in much of the developed world – is assumed by others to have certain personal characteristics. At best, they are brave, fit and somewhat unconventional in taking on such a risk; at worst they are foolish, inconsiderate and even selfish in the hazard they are believed to pose to others" (Skinner and Rosen 2007 p83). Skinner and Rosen argue that if your aim is to get people out of their cars and onto bicycles, you have to go beyond the 'rational choice' model of transport behaviour and unpick the ways in which cars – far more than bicycles and other modes of transport – form part of the identities of individuals, organisations and indeed the wider culture.

Parkin suggests that "the choice to cycle is perhaps closely allied to issues of perhaps difficult-to-define 'culture' and also related to people's desire to conform to perceived social norms" (Parkin, Ryley and Jones 2007). Cross-cultural comparisons show that the cultural context even has an influence on an individual's response to their physical context, so whether an individual perceives the weather as an issue is partly cultural. In the UK weather is often cited as a barrier to cycling but in other countries the snow clearance of cycleways is an important issue. So for example, in Sweden there were those who cycled in winter and others who did not: for some, temperature, precipitation and road condition were an issue and therefore they only cycled in the summer (Bergstrom & Magnusson 2003). Others, for whom exercise was a prime motivator, continued to cycle in the winter and therefore the issue of snow clearance was important to them.

The influence of culture and social norms are important but individuals' responses to a given situation will vary. As an example, individuals will respond in different ways to physical conditions within the same cultural context. Some individuals will cycle in the rain and over long distances and are willing to overcome physical barriers while others will not (Gatersleben 2002) (Gatersleben and Appleton 2007). This may also be related to the journey purpose in that individuals may be less likely to battle with the weather if it is for recreational purposes or if they have an alternative transport option.

4.5 The interaction of influencing factors

For ease of understanding, the previous sections have tried to isolate different factors influencing the decision to cycle and bike-rail integrate. The different levels of cycling within a country and between countries are a reflection of very complex interactions taking place at a number of levels – the individual, interpersonal and community level. The response of individuals to the same physical conditions, social and cultural context will vary.

Parkin (2008) found the physical condition of the highway, rainfall and temperature each had an effect on the proportion of people who cycle to work in the UK and the most significant physical variable was hilliness. The perception of hilliness will also be important in influencing the decision to cycle; this may or may not be related to the actual experience of cycling up an incline, but the experience will also be related to an individual's level of fitness. A very steep hill might be perceived as less of a barrier once a cyclist becomes fitter.

Past interventions have perhaps not taken sufficient account of the complexity of decision making and have placed too much emphasis on the physical barriers and provision of infrastructure. As was pointed out in Section 3.2 a review of these measures to promote cycling and walking was inconclusive (Ogilvie et al. 2006). Jones (2008) concluded from his investigation into the impact of the provision of a section of the National Cycle Network (NCN) in Stafford (a medium sized town in the English Midlands) that traffic-free cycle routes alone will not encourage a shift from the car to cycling for everyday travel purposes. He concluded that a wider co-ordinated, multi-faceted approach that combined social marketing and addressed the social and psychological barriers outlined in this section, along with the physical measures, was most likely be more effective.

4.6 The relevance for the design of interventions

This chapter has outlined the complexity of travel decision making. Under simple rational decision making models, if an individual was presented with the choice of a car, bus or cycling for a short urban journey, they would often choose to cycle because it would be the cheapest and quickest way. This chapter has shown that it is not that simple and has highlighted the importance of the social and cultural context in determining an individual's travel choice.

The provision of specific cycling infrastructure may contribute to encouraging individuals to start cycling, likewise facilities such as cycle parking for the promotion of bike-rail integration, but other social and cultural changes will be necessary. The identity of a cyclist or the norm of cycling or bike-rail integration may not be attractive as viewed from the outside. This may act as a barrier to engage people to take notice of any intervention aimed at encouraging more people to become bike-rail integrators.

An individual with certain characteristics and attitudes will find themselves in a particular physical and transport context, which in the short term cannot be changed without a major reorganisation of their life. Individuals may react differently to that context. In the longer term, critical life events like moving location can break habits and increase deliberation about different travel options in a new transport context and lead to a change in travel behaviour. Equally changes in land use and transport planning could also precipitate changes but it is likely to be a relatively slow process.

The next chapter takes this exploration of the literature a stage further and develops a conceptual model as a tool to design the elements within an intervention to ‘nudge’ individuals towards cycling and bike-rail integration. This model is used to design and test the feasibility of the two interventions in Chapter 8.

Chapter 5 Social marketing and social diffusion – theory into practice

5.1 Introduction

This is a crucial chapter in terms of making the transition from the exploratory research phase of this project to the action research phase. It explains how the theory and evidence from literature discussed in Chapter 4 can inform the design of interventions. It puts the fifth question of this research project - How can emergent 'soft engineering' techniques in transport planning be successfully/effectively applied to promote bike-rail integration? – into its theoretical context alongside experience in other fields.

The complexity of travel decision making outlined in Chapter 4 suggests that effective interventions will need to go beyond the provision of infrastructure and information to address some of the social and cultural barriers. Travel planning is a way of joining up a number of complementary measures that can work in a coherent fashion to elicit behaviour change. Travel plans are likely to play an important part in the translation of the national transport policy shift into practice at a local level (see Section 2.4).

This chapter demonstrates how this might work in practice and argues that the different forms of travel planning are essentially social marketing interventions. The concept of ecological models is introduced to explain the social marketing approach which aims to address travel behaviour at many levels - the individual, the interpersonal and the community level. This is incorporated into the conceptual model within this thesis.

A crucial aspect of social marketing is the idea of identifying specific subgroups or segments in the population which can be targeted with an intervention. The aim is to find the groups that are most likely to be predisposed to changing their behaviour but also to understand the type of messages that might motivate them to change their behaviour. So, for example, one group might be encouraged to cycle to improve fitness while another to improve journey time. As was discussed in Section 4.2.4, a car driver might interpret bus marketing information in a different way from an existing bus user as a way of justifying existing choices.

The Theory of Planned Behaviour (Ajzen 1991) and the Transtheoretical Model of Health Behaviour Change (Prochaska & Velicer 1997) have both been used to identify or segment the population into target groups, but this chapter, in Section 5.4.1, argues that in the case of bike-rail integration, the lack of any existing promotional programmes in the UK (as outlined in Chapter 3) makes more sophisticated segmentation exercises redundant. There are existing 'segments' or groups that could be relatively easily identifed e.g. cyclists who do not use rail or rail users (e.g. season ticket holders) who currently do not cycle or access rail by bicycle who could be targeted with materials to try bike-rail integrating in the first instance. The first four research questions in the exploratory phase of this research are designed to help identify the likely characteristics of the groups, as well as the potential messages and facilities that might make bike-rail integration a more attractive option.

In this chapter it is argued that even if relatively small numbers of individuals are attracted to try bike-rail integration, if these small numbers find the experience of benefit, this type of behaviour could spread through the population by social diffusion as suggested by the Theory of Social Learning (Bandura 1977) and Diffusion Theory (Rogers 2003). The result could be an amplification of the impact of any intervention and the creation of a virtuous circle.

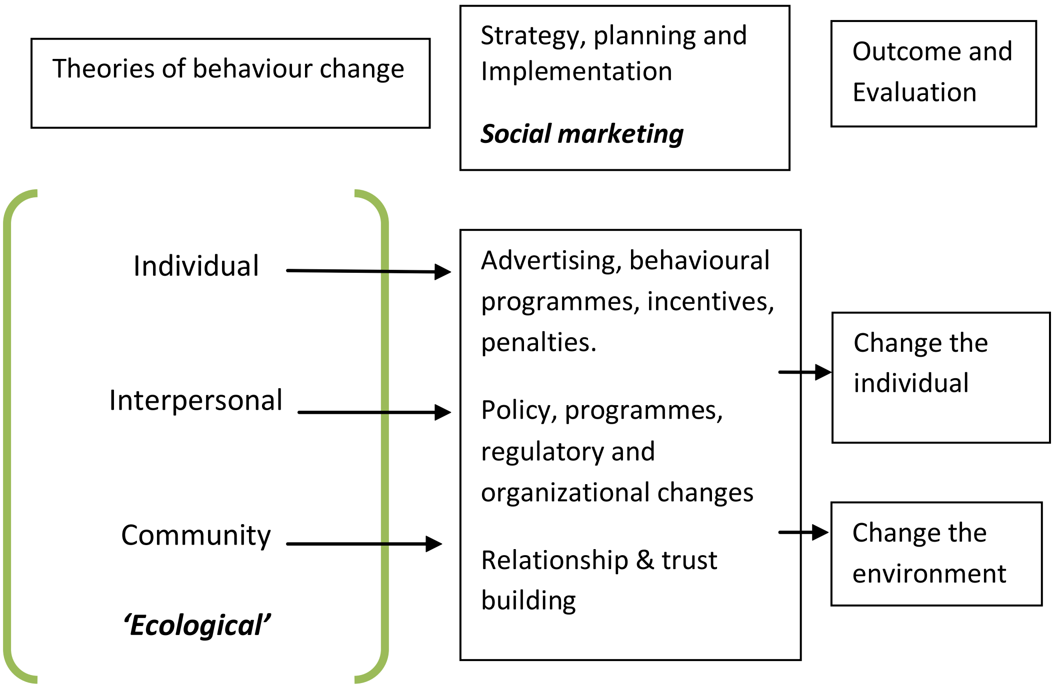
5.2 Social marketing

Halpern & Bates (2004) argue that the most compelling explanations of behaviour change are through ecological models, because they treat behavioural systems as complex ecologies with multiple influences working in competing directions (as has been outlined in Chapter 4). Ecological Models bring together theories that look at behaviour at the individual level, the interpersonal level and the community or group level, these levels interact and overlap in a dynamic manner. Prospect Theory (Tversky and Kahneman 1981) and the Theory of Planned Behaviour (TPB)(Azjen 1991) work mainly at the individual level though the TPB includes the subjective norm which works at the interpersonal level. Likewise Social Norm Theory (Cialdini, Kallgren and Raymond 1991) and Social Identity Theory (Tajfel 1981) work both at the interpersonal and community level. Ecological models can be used to underpin a social marketing exercise which aims to address barriers at all three levels.

Social marketing is '*the systematic application of marketing concepts and techniques, to achieve specific behavioural goals, for the social and public good' (*NSMC 2006).

The changed behaviour of the individuals and the changed environment interact as shown in Figure 4 below, and this establishes new social norms.

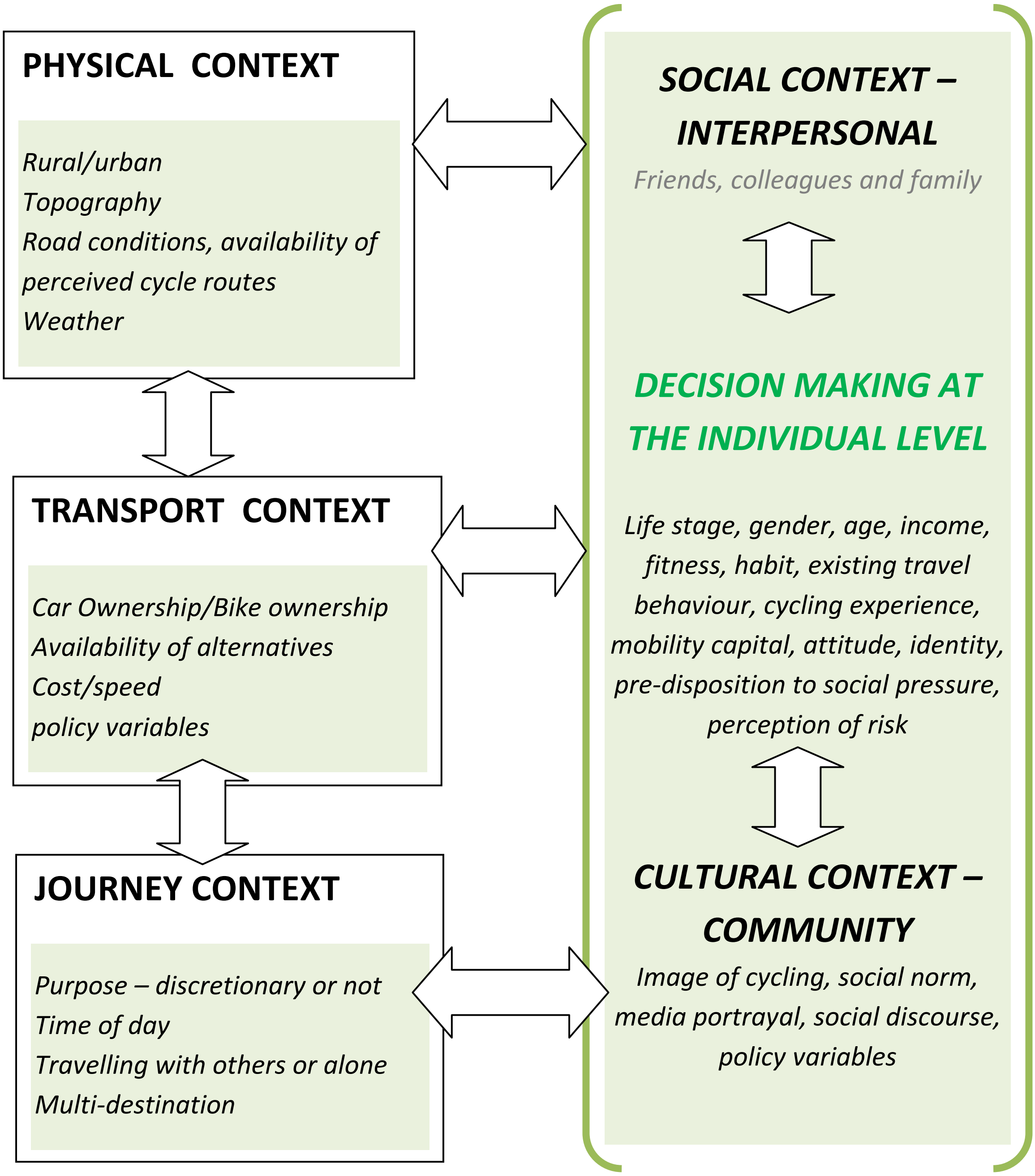
Figure 4 Social marketing – process



Source Halpern and Bates (2004)

To guide the current research project, Figure 5 below proposes a dynamic conceptual ecological model which draws on the literature discussed in Chapter 4, to inform the design of interventions based on social marketing, taking account of both practical and behavioural factors. The three levels outlined in the Halpern and Bates model in Figure 4 can be seen – the individual, the interpersonal and the community. The hypothetical individual represented in Figure 5, with particular attributes, experience and identity is firmly situated and inextricably linked to his or her social and cultural context. Individuals with their particular attributes – life stage, gender, age, income, fitness, existing travel behaviour (habit), motility capital, attitude, identity, pre-disposition to social pressure and perception of risk – will respond differently to the physical, transport and journey context that they find themselves in. Even individuals with similar attributes will not necessarily behaviour in the same way. As outlined in Chapter 4, the individual's cognitive processes have to be taken into account, the level of awareness of that option or past experience need to be considered which may influence how a travel option is 'framed. All three levels, the individual, social and cultural, in turn interact with the physical, transport and journey context. What Figure 5 represents is a complete dynamic system, with each element interacting with every other element in a multi-dimensional way though for legibility it has been simplified graphically, the two-way arrows indicating that each element within each box is connected to every other element within every other box, a complex web of interaction exists.

Figure 5 Dynamic conceptual ecological model for travel decision-making towards cycling and bike-rail integration (*in effect each element is connected to all others in a complex web of interaction*)



In the figure, each element within a box is connected to every other element within every other box but via other elements and boxes.

In practice, for example, there would be a direct interaction between an individual's fitness and their experience of their physical context. At the instrumental level, there will be a particular journey that needs to be made and the choice an individual makes will be influenced by the physical and transport context, which in turn interacts with the individual's own personal attributes.

In the same physical and transport context, one individual will make the same journey in a car and another on a bicycle as their levels of fitness or perception of danger may be different. Different interactions will have salience for the individual at different times in their lives, even times of day (perhaps not wishing to cycle at night) or the purpose of a journey. A day out may have different constraints from those of a journey to work. In the case of the teenagers interviewed by Orsini and O'Brien (2006) those that had positive previous experience of cycling were able to resist the peer pressure not to cycle.

Figure 5 contrasts with the more conventional rational decision making model in transport studies: the weighing up of different transport options in terms of their generalised costs. Rietveld and Daniel's model (2004) in Figure 1 Section 3.3 takes this approach, but as has been pointed in Chapter 4 this covers only part of the explanation for behaviour. In Figure 1, the policy variables and the individual characteristics are seen as feeding into this weighing process but Figure 5 gives more emphasis to the interplay between the different levels of influence – the individual, the interpersonal and the community level.

The Halpern and Bates model in Figure 4 takes the model one further step to strategies that could be adopted at each level to produce two outcomes – changes to the individual and to the environment in its broadest sense which will then themselves in turn interact. Before discussing the possible strategies and interventions for this research, the next section explains how this interaction might take place using the Diffusion of Innovation Model (Rogers 2003).

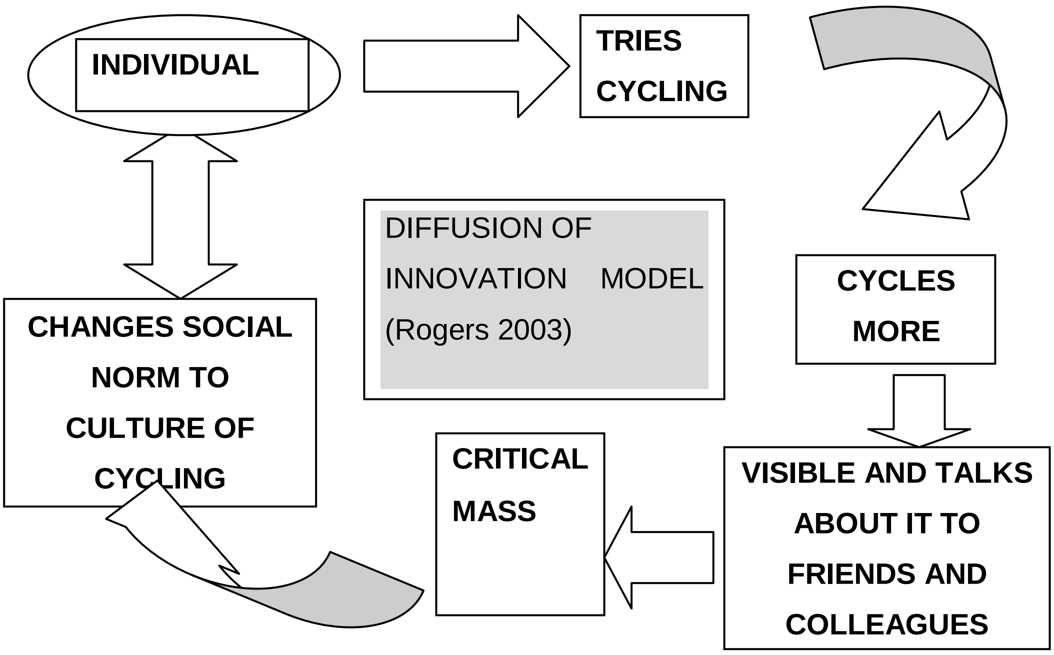
5.3 Social Learning and Social Diffusion Theory

In Sections 2.3 and 4.2.3 the dominance of the car was shown to make the choosing of alternatives more difficult and less visible. Section 4.4 showed that the image of cycling and an individual's attitude (Section 4.2.5) will also influence an individual's choice to bike-rail integrate. Hence the concept of getting people to try cycling as a way of changing their attitudes rather than the other way around was introduced. The practicalities of this - providing large numbers of people with a cycling experience or indeed re-introducing them to cycling - would be difficult. Bandura's social learning theory (Bandura 1977) proposes that new behaviours can be learnt by observing someone engaged in a behaviour and also seeing the outcome. This is how new ideas and social practices spread within society and if an idea seems 'new' to the individual it is in theoretical terms an innovation (Rogers 2003).

'An innovation is an idea, practice, or object that is perceived as new by an individual or other unit of adoption. It matters little, so far as human behaviour is concerned, whether or not an idea is objectively new as measured by the lapse of time since its first use or discovery. The perceived newness of the idea for the individual determines his or her reaction to it. If the idea seems new to the individual, it is an innovation' Rogers 1995 4th edition p11.

Cycling and bike-rail integration are both behaviours that are currently not very visible in the UK and for many people they would be seen as a very new mode of transport to them. According to Rogers' Diffusion of Innovations model, a new idea like bike-rail integration diffuses through a population by a social process as illustrated in the case of cycling in Figure 6 below.

Figure 6 Diffusion of Innovations Model adapted for cycling



An individual starts cycling or bike-rail integrating, derives benefit from this behaviour and enjoys it; it might make him or her feel fitter or more alert. This experience is discussed with friends, family and colleagues, encouraging them to try the behaviours. This creates a virtuous circle, as more and more people start to bike-rail integrate and, at a certain point, a level of ‘critical mass’ is reached and further diffusion becomes self-sustaining.

An important part of understanding Rogers’ model is the idea that diffusion is a special form of communication, in which messages are about an idea that is ‘new’ to one of the communicators in a social interaction and therefore there is some degree of uncertainty. Perceived behavioural control as defined in the TPB (Ajzen 1991 Section 4.2.1) encapsulates part of this: an individual’s perception of whether they can perform a certain behaviour such as cycling.

Within the Diffusion of Innovations Model it is proposed that there are different groups of individuals categorised according to their position in the social structure and their willingness to change or adopt a new idea. ‘Innovators’, for example, are those who are likely to launch the idea; ‘early adopters’ are those individuals who are more integrated in their local social system and ‘spread the word’. Not all individuals are equal in terms of their ability to influence others.

Over more than 50 years a considerable body of work has used this theory, starting with studies looking at the introduction of hybrid corn into American farms. Diffusion investigations have shown that most individuals evaluate an innovation using a combination of objective and subjective measures, but it is communication with those like themselves who have previously adopted the behaviour that is the decisive factor (Rogers 2003). The exception is for the first group - the innovators - for whom an objective evaluation is more important.

An innovation can apply to solar panels, dishwashers or a practice like cycling and the determining factor in the speed of its adoption is how the characteristics of an innovation are perceived by individuals (Rogers 2003 p15). What is interesting in the light of the discussion in Chapter 4 is that it is the ‘perceived’ relative advantage not the ‘objective’ advantage. Emotions, perceptions and the non-instrumental characteristics of cycling or bike-rail integrating are likely to be important factors in the choice. One of the conclusions of this body of work on the diffusion of innovations is that if an innovation has all of the following five categories it will be implemented more quickly:

- Relative Advantage
- Compatibility

- Complexity
- Trialability
- Observability

Cycling and bike-rail integration score well on each of these categories except perhaps compatibility. In congested urban environments, cycling can have a speed advantage over other modes. Cycling and bike-rail integration are observable, and this is particularly true in the station environment where the small minority of cyclists are concentrated in one place and become very visible. Complexity in this model refers to the degree to which the innovation is perceived to be difficult to understand or master. The act of cycling is relatively simple to learn and is an inexpensive transport mode, so it also has the advantage of trialability. Though the combination with rail does add to the overall complexity, cycling offers the opportunity of re-invention (Rogers 2003), it is flexible, and individuals who adopt cycling or bike-rail integration can 'customise' their method of using a bicycle to fit their situation and, for example, the distance that needs to be travelled. The use of any new mode of transport requires a learning process over time and in this case it will be finding suitable access routes, places to park, clothing and equipment to carry items.

Compatability in the Diffusion of Innovation model is perhaps the biggest stumbling block for bike-rail integration: an individual has to see cycling and bike-rail integration as consistent with their needs, existing values and past experiences. As was outlined in Chapter 4, the image of cycling and bike-rail integrating is perhaps not very positive and individuals may not see this behaviour as part of their identity. An intervention will need to try to address these issues.

As the conceptual model in Figure 5 makes clear, in addition to a social process of diffusion there will be other processes and interactions occurring simultaneously. So, for example, as cyclists at railways stations are a small but visible group it could mean that a small increase in bike-rail integration would become noticeable and a new descriptive norm created. At this point the outcome, the changes in behaviour and the changes in environment are interacting as in the Halpern and Bates model in Figure 4.

Notably then, "if a behaviour is highly conspicuous, it can be learned from public displays by people who are unacquainted with one another" (Bandura 1977p 51). At a certain point, the social interaction may be less important. "Even small incremental gains can have a significant effect on the total number using green modes and may help sustain a change in beliefs, attitudes and future intentions” Anable (2003).

If social influence, as is argued in Section 4.4, is important, then, in theory, interventions would only need to attract a few new users. If their new experience was positive, they themselves could become agents for change and influence others to take up bike-rail integration.

5.4 How can social marketing be applied to bike-rail integration in practice?

Underlying the Diffusion of Innovations Model (Rogers 2003) is the idea that providing information through the mass media is not enough to persuade someone to take up a new innovation; the key catalyst is social contact and dialogue. The deciding factor is face-to-face exchange, most effectively with peers. It is a social process. Individuals will want the basic facts through information channels but the key is that social interaction and social marketing use this idea to identify groups within the social structure who will be most susceptible to the idea and they will in turn convey the message to others.

Research in other fields has started to look at social diffusion in a slightly different way, in terms of the individual at the centre of a social network, so that the health and wellbeing of one person affects the health and wellbeing of others in their social network (Christakis and Fowler 2009). If you successfully treat one person for depression it can affect others in their social circle. When neighbours visibly recycle and/or feedback indicates that others in their street are recycling, there is a higher likelihood that non-recyclers will start to use the Kerbside Collection Scheme (Nigbur, Uzzell, Lyons and Muckle 2004). As already noted in Section 4.4, the energy conserving habits are influenced by those of neighbours: social influence was found to be the most important influencing factor (Nolan et al. 2008). The same could apply to cycling or bike-rail integration.

In essence, social marketing has taken the idea of using social processes to market a new product or behaviour. It has been applied for over 30 years in health behaviour change and is relatively new to travel behaviour change. It can be applied at the individual level (personal travel planning), at the institutional level (employer/school travel plan) or at an area-wide level, a community-based social marketing exercise (residential travel plan, station travel plan) and it could be argued that the CDTs are actually social marketing exercises.

Jackson (2005) argues that community-based social marketing can be more effective than individual-based social marketing, since changing behaviour is easier within a supportive community. This is what you would expect from the Diffusion of Innovations Model, in that part of the process will be through social interaction and this is enhanced by the fact that many people are discussing the same issue. In other words, an individual might hear the same message from different sources, thus reinforcing its influence. So, for example, in the preliminary evaluation of the CDTs there is a suggestion that the strong focus towards interventions on young children has also led to some influence on parents; greater increases in cycling were found amongst adults with children as against those without children (Sloman et al. 2009). It was acknowledged that larger sample sizes will be needed to confirm this finding. However, given the discussion in Chapter 4, it would seem reasonable to suggest that if an individual gets a message from several different sources there is a greater likelihood of response. So, for example, if an individual receives a message promoting cycling to work (employer travel plan) and then a week later their child comes home having enjoyed a cycle training activity at school, their neighbour has always cycled to work and there are visible promotions in the community itself, the individual is likely to be more receptive.

The UK government has concentrated more than the usual level funding in a number of demonstration towns and cities allowing a package of measures to change behaviour to be implemented. The Sustainable Transport Demonstration Towns are part of a 5 year project to demonstrate the effect of a sustained package of 'smarter choices' or soft measures (Section 2.4) coupled with infrastructure improvements. The justification is in relation to concentrating resources but equally they could be seen as community-based social marketing exercises (DfT 2007i) where social processes play an important part. The scale of the intervention, across a community, means that social influence and interaction could enhance the impact and at some point, a critical mass will be reached as shown in Figure 6. There are examples of other community wide social marketing exercises – the Nottingham Cycle Friendly Employers' project (Cleary, McClintock 2000) and an exercise to promote public transport use by King County's Metro Transit (KTMC) located on the Puget Sound in Washington State (Cooper 2006).

An employer travel plan tries to change behaviour at the individual level, institutional level (the company and other employees) and in the immediate environment (the practical barriers/incentives). New social norms are negotiated in groups and it is easier for individuals to change their behaviour if they have the support of their social group (DEFRA 2006). The changed behaviour of the individuals and the changed environment interact, gradually establishing new social norms as shown in the Halpern and Bates ecological model in Figure 4. As was pointed out in Section 4.4, the influence of social norms may be very important in the case of marginal activities like cycling and bike-rail integration.

The shared belief or norm around cycling is likely to be distorted but beliefs can be manipulated. The 'availability' heuristic discussed in section 4.2.2 and social norm theory in section 4.4 have been applied in social marketing campaigns to prevent high-risk drinking at Northern Illinois University Campus (Schneider 2005). Education-orientated programmes about the dangers of alcohol had not been successful and it was decided to apply social norm theory on the basis that the shared belief or norm was that everyone else was drinking more alcohol than they actually were and the tendency was to conform to this misperceived norm. These misperceptions are formed as a result of the availability heuristic, the memory of one drunk person is more vivid that that of a sober person. The intervention was to show information about actual drinking habits rather than those perceived using a media campaign; that was found to be highly effective and has been continued with every new intake of students.

In the case of cycling, the actual experience and benefits of cycling and the relative risks could be used as a way of dispelling misperceptions as part of a social marketing exercise to promote cycling or bike-rail integration. As was explained in section 4.4.2, the power of social norms and cultural norms can even influence an individual's perception of the weather and how it affects cycling. Goldstein and Cialdini (2007) have shown that a greater understanding of the descriptive and injunctive norm can be used in campaigns that prompt behaviour to reduce litter, energy consumption, alcohol and drug abuse.

In the same way, one unpleasant experience (rather than a pleasant experience) is what may be remembered and lead to a misperception that every rail journey is similar. As Gardner and Abrahams (2008) found, it was not so much the attitudes to cars that affected people's decisions but their attitudes to the alternatives (see Section 4.2.4). It may be the misperception of an alternative mode that is more of a barrier than the habit of using a car. This supports the idea that to offer the opportunity to experience an alternative is a way of removing misperceptions.

In the psychological literature there is a discussion as to whether an individual 'setting a goal', for example cycling twice a week to the station, helps overcome barriers to attaining that goal (Gollwitzer and Brandstatter 1997). If an individual has an intention to perform a certain behaviour in a given situational context – it is my intention to do y when I encounter x – this goal prompts a more automatic response as in habitual behaviour. These ideas have been translated into behaviour change programmes by asking participants to pledge that they will achieve certain goals.

In the UK, there are two main approaches to personal travel planning, Individualized Travel Marketing (ITM) pioneered by Werner Brog of SocialData in Munich and Steer Davies Gleave's Personal Travel Planning (PTP) (DfT 2007j). ITM starts with an initial travel survey to ascertain the travel behaviour of individuals, their perceptions about barriers; they are then segmented according to their existing behaviour and interest in alternative modes. Individuals are targeted differently depending on their answers and they themselves select the information they require. In PTP travel advisors have a conversation with individual householders and try to understand the particular problems they face, and seek to identify the appropriate resources and help for the participant. The idea is to provide people with relevant information, advice and support about travel options on the basis that many people have become habitual car users and are not aware of alternatives. As explored in the previous chapter, even if individuals are aware of the alternatives they may not have any experience of those alternatives and may therefore harbour misperceptions. These methods engage individuals in a dialogue, a social interaction, as opposed to just simply supplying information.

These techniques were applied in the UK, notably in the Sustainable Transport Demonstration Town of Darlington. The initial travel survey showed that nearly a third of car trips by Darlington residents are less than 3 km and two thirds were within the town with over half for shopping and leisure purposes. Those targeted over a two year period increased their walking (+29%) cycling (+79%) and public transport use (+14%) while reducing their car trips (-11%) (DfT 2007i). In two other demonstration towns within the two year period, cycling in Peterborough has increased 25% and in Worcester 36% (DfT 2008e). Car trips had also decreased amongst the general population within Darlington who were exposed to the general messages of more sustainable travel but not to the individualized travel marketing. Similar schemes have been run in Bristol by Sustrans (Socialdata 2004) and another scheme conducted in South Perth increased public transportation (+17%), cycling (+61%), walking (+35%) and car-as-passenger trips (+9%) (Thogerson 2006).

These types of interventions are still fairly new, and therefore the evidence for their efficacy is limited, but a systematic review of 22 studies (Ogilvie et al. 2004) looking at a range of interventions including physical measures to promote walking and cycling as an alternative to using cars concluded that the only interventions that appeared to be effective were those that engaged individuals in participative processes like individualised travel marketing. The researchers cautioned that a lot of the evidence was inconsistent, of low validity, based on single highly contextual studies, or non-existent, and the variations in walking and cycling between populations both within and between countries were greater than the effect size of the interventions considered in the review.

Though the evidence for the success of the various travel planning methodologies may not be completely convincing at this stage, in terms of the policy shift towards behaviour change, travel plans are to a large extent the only mechanism currently available to simultaneously tackle both the practical and the social and psychological barriers.

As was shown in the previous chapter, just providing infrastructure, e.g. a section of cycle path, was not enough to get people cycling; the idea of using it had to be marketed to the local population (Jones 2008). This links in with the idea that it is an individual's perception of how easily they can perform a behaviour described as perceived behavioural control in the TPB (Figure 2 Section 4.2.1) that counts; others might describe it as self-efficacy. An individual needs to understand what that new bicycle path allows them to accomplish.

The next section discusses a fundamental part of social marketing, the identification of specific subgroups or segments in the population which might be made up of individuals who have a greater propensity to change behaviour or might respond to different messages.

5.4.1 Identifying your target audience – segmentation?

As was pointed out clearly in Chapter 4, different individuals will respond differently to the same message. One individual might be encouraged to cycle to improve their fitness, another might be more interested in the potential time saving. There is a considerable range of segmentation methods from the very simple - identifying demographic characteristics to the more sophisticated exercises, characterising individuals according to values, attitudes and behaviours currently undertaken.

In Sections 2.5 and 3.5 it was shown that the specific promotion of bike-rail integration has not been widespread in the UK and therefore it is argued here that there may be obvious target groups who have not been approached with the idea of bike-rail integration and that the more sophisticated segmentation exercises may not be necessary.

There is some evidence that some of the theoretical models used for segmentation in other fields may not be transferable to complex behaviours like travel. The Transtheoretical Model of Behaviour Change (Prochaska and Velicer 1997) was developed in health psychology and has been applied extensively in the health behaviour change field. It proposes that a change at the individual level is a process: individuals move through different stages from pre-contemplation, contemplation, preparation, action and maintenance. In the Diffusion of Innovation Model (Rogers 2003) each individual gets to the action stage at different times and adopts an innovation at different times in the diffusion process. Hence, individuals are categorised by the time it takes them to reach that stage and identified accordingly as ‘innovators’ ‘early adopters’, ‘early majority’, ‘later majority’ and ‘laggards’ (Rogers 2003).

These categories are based on abstractions, they are simply a device to explain what underlies behaviour change at the individual level, and as had been shown in Figure 5 the individual is part of a complex web of interactions between factors at several levels. Gatersleben & Appleton (2007) applied the Transtheoretical Model of Behaviour Change (Prochaska and Velicer 1997) to identify a group of people who were ‘prepared to cycle’, who were offered the use of a bicycle for a two-week trial to bike to work. Many who said they would participate then withdrew, an indication that what people say they will do in reply to a survey may not translate into what they will actually do (La Pierre 1934). Considerable upfront investment in the surveys proved to be fruitless and the researchers went on to recruit people through advertising to try cycling. This allowed individuals to self-select to trial the change in behaviour.

Davies, Gray, Gardner & Harland (2001) used the TPB (Azjen 1991) and the Transtheoretical Model of Behaviour Change (Prochaska & Velicer 1997) to identify potential cyclists in a sample of the UK population to get a better understanding of the attitudes, behaviour and motivations for cycling. They found that neither cyclists nor non-cyclists fit easily into a single category, but that they could be clustered into groups according to their attitudes, norms and control beliefs: ‘committed cyclists’, ‘regular cyclists’, ‘occasional cyclists’, ‘toe-dippers’, ‘the unthinking’, ‘the self-conscious’, ‘the unconvinced’, ‘no-needers’ and ‘youngish lads’. The findings of the study conducted by Davies et al. (2001) support the conceptual model in Figure 5 and show that the “decision to cycle is influenced by many practical and psychological factors”; also, the variation of response amongst individuals served to illustrate the difficulties of applying theory in practice. For example, the TPB worked for some groups, but for others it completely broke down, so ‘youngish lads’ appeared to have all the attitudes and control beliefs necessary to proceed to active cycling, yet lacked any intention to cycle. They also found no enormous attitude differences between ‘committed cyclists’, ‘regular cyclists’ and ‘the unthinking’.

As was pointed out in Section 4.2.5 it is very difficult to measure attitudes. There is also the problem of how individuals respond to surveys used to identify their propensity to change behaviour. So, if the purpose of a study is known, then respondents might answer in a socially desirable way and not admit to enjoying their cars and focus on the more instrumental benefits (Steg, Vlek & Slotegraaf 2001). Steg et al. found that the relative importance of affective and instrumental motives in transport choice depended on how they were measured. Within a group of respondents, it is difficult to ascertain who is giving a socially desirable answer. Many words that are used like ‘convenience’ ‘choice’ and ‘necessity’ have different meanings for different individuals: “What appears to be a question of choice to an observer may be perceived as a matter of necessity by the individual. Finding an objective way to make such distinctions may simply be impossible” (Handy, Weston and Mokhtarian 2005).

Another criticism of this type of segmentation approach is that it relies on observed, claimed or self-explained behaviour to identify different groups and that perhaps looking at motivations that bring about behaviour is a better approach. An alternative is to employ Maslow’s pyramid model (Maslow 1954) of needs to go beyond demographic segmentation (by race, sex, class, age, income, education), to a more motivation-based ‘psychographic’ segmentation. Again individuals may not fit neatly into one specific psychographic group and may exhibit different motivations in the presence of different people or circumstances, or at different times of their life, but the central idea is that a certain characteristic will predominate (Hounsham 2008).

A number of other studies (Anable 2003) (Davies et al. 2001) have applied behaviour change theories to segment the population but these segments were never targeted with an intervention. More recently, a large study was conducted for DEFRA to break down the UK population into different groups who were likely to respond to different messages to change a variety of behaviours (DEFRA 2006). This study looked at situational, social and psychological factors and it was shown that even once individuals had been grouped, some influencing factors were found to operate at different levels of intensity and consciousness across their sample and between the segments that they had identified.

This suggests that the considerable upfront investment in complex segmentation exercises may not be very effective and it is unrealistic for many local authorities or other organisations, including those involved in a station travel plan, to embark on a segmentation exercise at the level of complexity applied by DEFRA, particularly if there is a question mark as to the stability of the groups over time. Even after the investment in identifying the target groups, there is no guarantee that individuals will behave as they have said that they would (Gatersleben and Appleton 2005) and it is possible that offering opportunities to trial a new behaviour is a more cost effective way of changing behaviour. This allows individuals to self-select and, through the experience of a new behaviour, might change their attitudes to it (see Section 4.2.5) and in turn introduce others to it through social diffusion. This is the premise on which the two interventions described in Chapter 8 are based.

5.4.2 Summary and relevance to this research project

This chapter has conceptualised the interactions between the individual, interpersonal and community level for travel decision making. It has suggested the efficacy of seeing the system as an interdependent whole. The question then becomes: How can a research intervention penetrate that system to change the equilibrium or current behaviour to move to a new equilibrium to accommodate a new behaviour? The evidence discussed in Chapter 4 and in this chapter point to interventions that include a package of measures which attempt to address more than one element in several of the boxes in Figure 5 at the different levels.

The exploratory phase of this research was designed to gain further understanding as to the characteristics, motivations, use of existing facilities and behaviour of existing bike-rail integrators. This is an important pre-requisite to designing an effective social marketing exercise, though it is acknowledged that not all potential ‘new users’ will have the same motivations or characteristics as existing bike-rail integrators. As has been argued, providing the opportunity to participate in a new behaviour, and allowing individuals to self-select rather than using complex segmentation, may enable a change in attitudes towards bike-rail integration. Diffusion theory suggests that even if only a small number of people respond to an intervention to promote cycling or bike-rail integration, if their experience is positive, they might influence other individuals to make this choice, creating a virtuous circle.

The following chapter outlines the overall research strategy and methodology used in this research.

Chapter 6 Overall research strategy and methodology

6.1 Introduction

Chapters 2 and 3 of this thesis have shown that there is a potential for higher cycling levels and bike-rail integration. The barriers and factors influencing the decision to cycle and bike-rail integrate have been outlined in Chapter 4 and the information combined in these three chapters is drawn together into an ecological model in Chapter 5 within the framework of social marketing. This model can be used to underpin the design of interventions and this chapter outlines in more detail the research questions set out in the introduction (Section 2.1) along with the overall research approach. A flow diagram shows how the different elements of this research fit into two distinct phases – an exploratory phase and an action research phase. The methodology of each element is then described.

Cycle access is currently very low, but the pressures of rail passenger growth and the shift towards promoting more sustainable travel options may lead to higher levels, which is desirable (as outlined in Section 2.2). However, growth will have considerable practical implications for the rail industry in terms of space both on trains and in and around stations. Gaps in knowledge have been indentified (Section 3.5) as to the demographics of existing bike-rail integrators, their motivations and the relative merits of the different forms of bike-rail integration. There is also a lack of knowledge about how existing facilities for cyclists are being used and about the benefits of investing in facilities to promote cycling and bike-rail integration, which presents a barrier to further investment (Sections 3.4 and 3.5.1).

The exploratory phase of this research project was designed to ascertain the demographics of existing bike-rail integrators in Bristol, their attitudes towards the different methods and their level of experimentation, their motivations, their cycling histories and their social context. Both primary qualitative and quantitative data were collected using a range of methods – observation, face-to-face surveys, semi-structured interviews, cycle parking and barrier counts. These different methods were used to build a comprehensive picture of bike-rail integrator behaviour and use of existing facilities. This information was supplemented with an internet survey on the First Great Western (FGW) booking website with a wider geographical spread. The survey was open to anyone considering booking a rail journey through the FGW site and hence captured information not only about bike-rail integrators outside Bristol but also about rail users who did not access the rail network by bicycle. Amongst other things the survey covered their propensity to consider bike-rail integration. The results of the exploratory phase are reported in Chapter 7.

Chapter 8 first outlines how some of the literature and theory reviewed in Chapters 4 and 5, along with conceptual model (Figure 5 Section 5.2) and data reported in Chapter 7 can be applied in practice using the Bristol Parkway Station Travel Plan as an illustration. These insights are applied in the design and implementation of two interventions to test their feasibility as methodologies to promote bike-rail integration. The reporting of the process of these interventions provides examples of how 'soft measures' can be put into practice and illustrates some of the barriers. The next section looks in more detail at the research questions outlined in Table 1 Chapter 1.

6.2 Research questions

This section expands on the purpose of the first four research questions that underpin the exploratory phase and the methods used (as was summarized in Table 1 Chapter 1)

1. **Who are the existing bike-rail integrators?**

   In view of the discussion in Chapter 4 this question aims to explore not just the demographics of existing bike-rail integrators but also their cycling histories and social contexts; what prompted them to start cycling? What do their families and friends think about their cycling (social influence)? How do they categorise themselves as cyclists? The face-to-face survey was used to gather this data along with semi-structured interviews to gain a better understanding of the social and cultural context. This type of information was considered important to determine the groups within the population who were already bike-rail integrating and the extent to which those in similar groups might be encouraged to adopt this behaviour in the future.

2. **In what types of behaviour do existing bike-rail integrators engage?**

   This question is oriented towards understanding the different types of bike-rail integration, the use of parking facilities, movements within stations and the difficulties and barriers encountered. The data was collected through face-to-face surveys, and parking and barrier counts, and was supplemented using a web survey from a wider geographical area.

3. **Why do these people engage in these behaviours?**

   This question aimed to understand the motivations behind bike-rail integration as a way of assessing the types of promotional messages that were likely to stimulate others to consider bike-rail integration. A face-to-face survey and semi-structured interviews provided the data. Respondents were also asked about their other cycling behaviour besides cycling to the station to try to understand to what extent their use of a bicycle for access was driven by necessity or was an extension of their existing cycling behaviour.

4. **Would existing rail users consider cycle access? Would existing bike-rail integrators consider bike hire?**

   As was outlined in Chapter 5, individuals already using one mode, cyclists or rail users, were considered potential target groups to start to bike-rail integrate as they would only need to adopt one new mode rather than two. The first question was incorporated in the web survey to rail users to find out to what extent it was possible for them to access rail by bicycle or indeed whether they had considered it. The second question was within the face-to-face survey of bike-rail integrators to ascertain the extent to which they would consider bike hire.

Questions 5 and 6 are a natural progression from these exploratory questions driven by the logic of the purpose of this research project – to inform the design of interventions to promote bike-rail integration.

5. **How can ‘soft measures’ be effectively applied to promote bike-rail integration?**

The two interventions noted at the end of Section 6.1 (development, design and implementation of Hourbike and the bike-rail intervention to attract those driving to the UWE campus) are designed to apply the conceptual model developed in Figure 5 Section 5.2 as well as drawing on the results of the exploratory phase. They provide examples of ‘soft measures’ in practice, and the process and outcomes provide valuable insights for the development of other interventions.

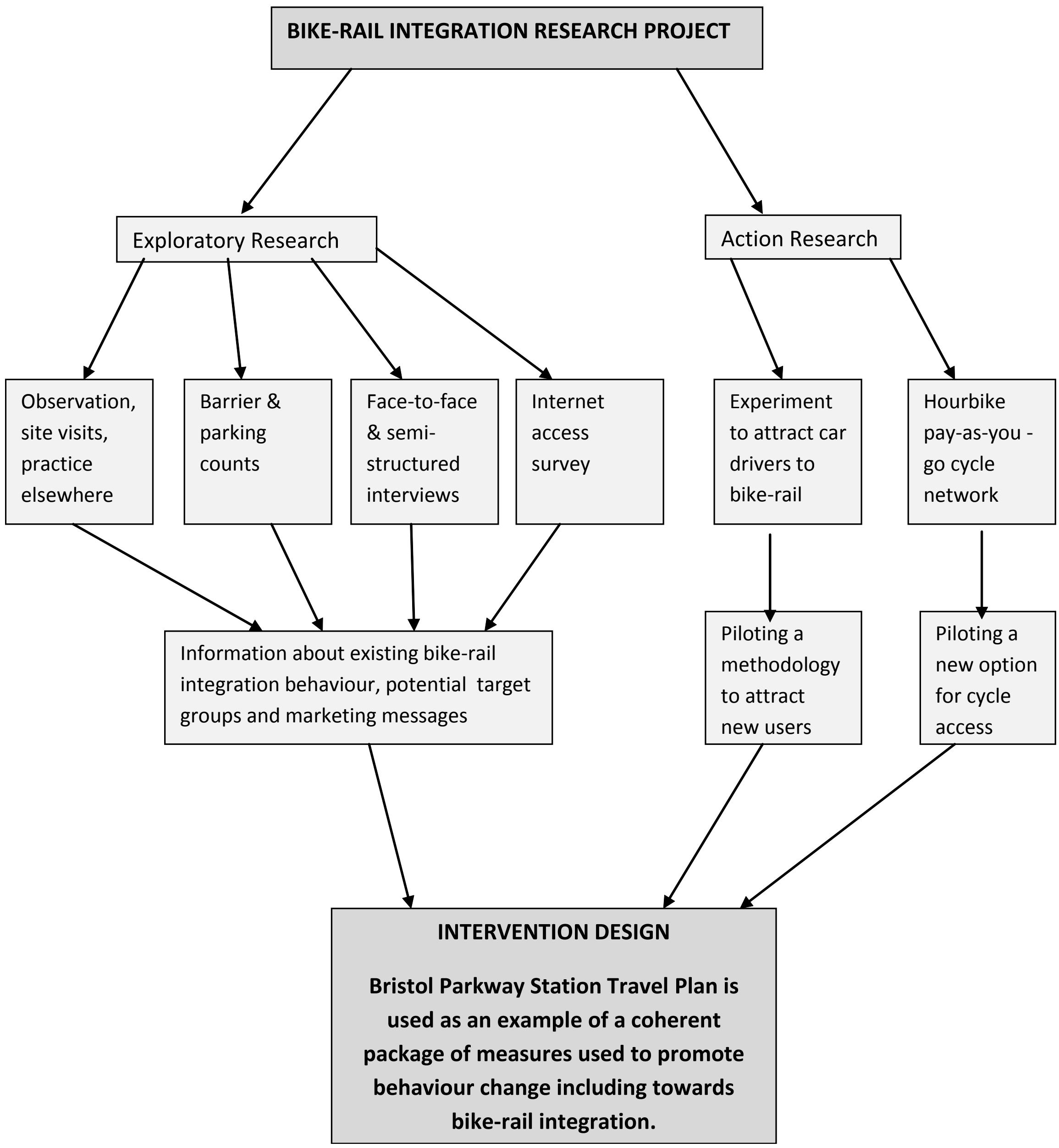
6. **What are some of the practical and organisational barriers to promoting bike-rail integration?**

All elements within this research go towards answering this question, a culmination of all the results of the exploratory phase – which provides information about how users engage with existing facilities – and the experience of implementing the two interventions and their outcomes.

6.3 Overall research strategy and approach

The previous section is summarised in the flow diagram in Figure 7 below showing how the elements within the two research phases fit together to provide information for the design of future interventions to promote bike-rail integration.

Figure 7 Overall research strategy



The underlying assumption within the traditional approach to transport studies outlined in Section 4.2.1 assumes that decisions are rational and predictable, so future travel behaviour in response to particular changes is fundamentally knowable. The reading of the literature for this research project and the development of the conceptual model in Chapter 5 around making the decision to cycle (Figure 5 Section 5.2) showed that perceptions, identity and social context are also important and has led the researcher to a research design that emphasises the social context of travel decision making. That is not to say that instrumental factors are not important, but that they are only one part of a complex picture.

In other words, the research is firmly in the socially-constructed world: what we know is accessed through human relationships which are historically and culturally situated (Gergen and Gergen 2008). It moves away from the idea that the individual is the fundamental atom of society and from a positivist research approach. Gergen et al. (2008) argue that there may be strong forestructures in place and these have to be acknowledged when the objective of this research project is to generate change in the existing situation.

As was discussed in Section 4.2.5, attitudes are difficult to measure, as are affective responses. The researcher does not consider a purely positivist approach to be useful nor the division between those who see the world as materially constructed and those that see it as socially constructed. She would 'categorise' herself as someone who can agree with both perspectives and believes that the choice of research method is more to do with the logic of the particular research question. In other words, a bicycle parking count is at the material and positivist end of the spectrum whereas a semi-structured interview to ascertain the social influences on an individual's decision to bike-rail integrate is at the socially constructed end and requires a more interpretative approach.

So, the researcher's stance on the diverse ontological and epistemological perspectives within the qualitative tradition is that of a pragmatist, acknowledging that qualitative and quantitative research methods are not necessarily contradictory but are rather complementary, in the sense they can been seen as different perspectives of the world, whether it is materially or socially constructed (Ritchie and Lewis 2003).

Mason does not think that the "process of identifying a methodological strategy should necessarily be about finding a philosophical label for your approach, so much as finding a coherent and consistent approach to answering your research question" (Mason 2002 p32).

"I find myself applying the label 'interpretive' to the logic of specific pieces of research rather than to researchers themselves or to any philosophical first-principles one might attribute to researchers. The interpretive/positivist distinction is a matter of practice rather than identity or worldview" (Soss 2008 p131) It fares poorly as a way to identify discrete and opposing classes of methods, schools of researchers, world-defining paradigms, or beliefs about the relevance of meaning. Yet in practice, a researcher's orientations toward meaning and interpretation – the *priorities* we place on them, the *assumptions* we make about them, the *roles* we assign them in our analysis – vary considerably across research projects (Op.Cit.).

The researcher does not believe that it is possible to be fully objective or neutral and accepts that this research project is dependent on her worldview and assumptions built through life experience but as long as this is acknowledged then biases can be minimized. Her reading and extraction from the literature will differ from that of another researcher faced with similar questions and therefore the researcher has framed the research in a particular way.

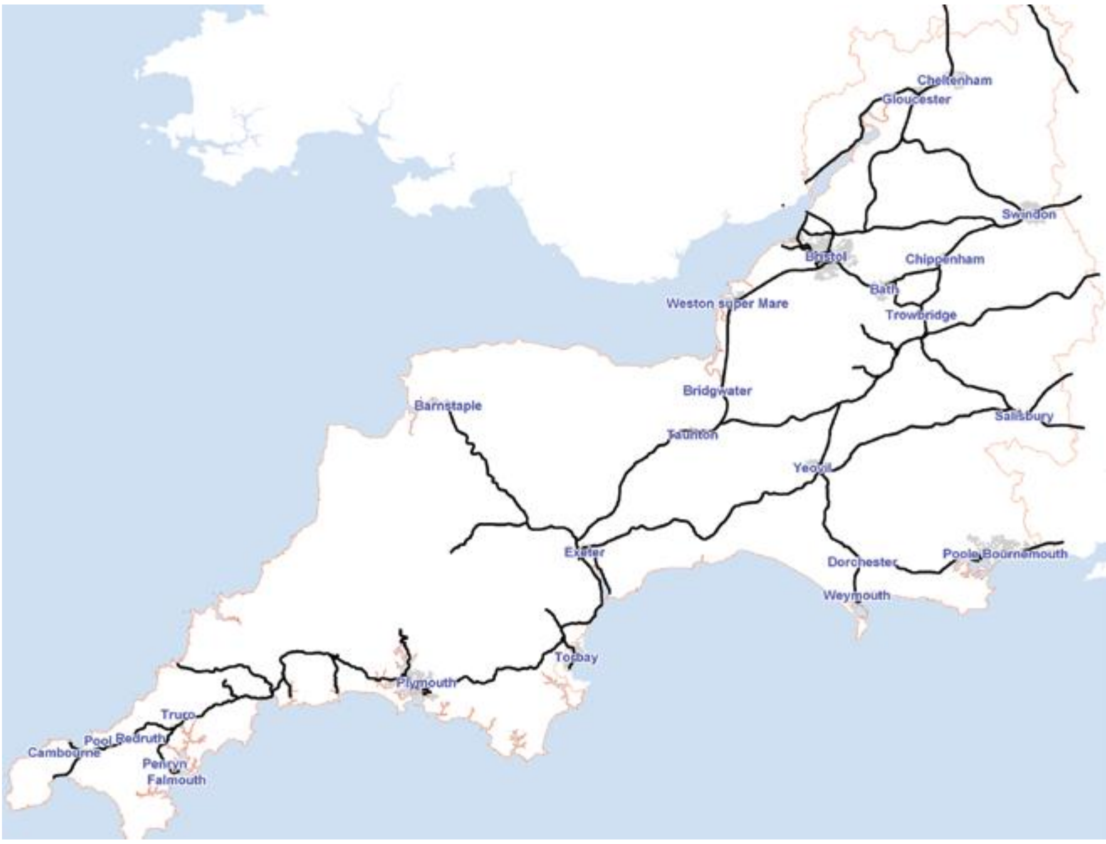
6.4 Location

As was explained in Chapter 1 the catalyst for this research was the observation that overcrowding on the rail line between Bath and Bristol was causing conflicts between those trying to access by bicycle and other rail passengers. Funding for the research was obtained from FGW and Great Western Research (GWR). A GWR Studentship is expected to contribute to knowledge that will assist regional development in the South West of England as well as knowledge exchange between academic institutions within the South West. Therefore the research itself took place in the South West.

The South West is the largest English region in geographical terms and has a population of 4.6 million, of which 30 per cent live in Bristol and the surrounding area, formerly Avon. At a strategic planning level these unitary authorities have formed the West of England partnership, making a sub-region. Bristol Temple Meads station is within the Bristol City Council boundary and Bristol Parkway within South Gloucestershire.

The South West rail network in Map 1 below includes the Great Western Main Line (GWML) west of Didcot, the West of England route west of Great Bedwyn (First Great Western Trains) part of the cross-country network south west of Birmingham (Arriva Cross Country) and the routes west of Bournemouth to Weymouth and west of Salisbury to Exeter (South West Trains – Stagecoach).

Map 1 Rail network in the South West



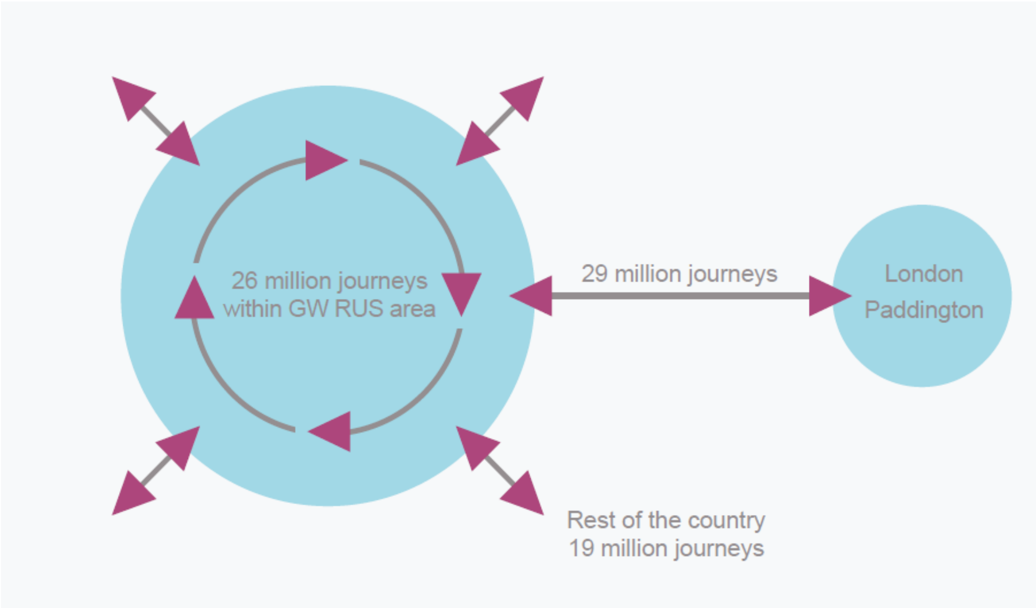
Source DfT 2007l

In the South West, 30 per cent of all rail journeys take place within the greater Bristol area. The busiest stations in the South West are Bristol Temple Meads and Bristol Parkway, Bath Spa, Bournemouth, Exeter St David's and Exeter Central, Swindon and Plymouth (DfTK).

As was explained in Chapter 4 and Figure 5 Section 5, decisions around bike-rail integration will be influenced by the physical, transport, social and cultural context and therefore it is important to understand something of the area in which this research took place. Though this context will differ from station to station on the UK rail network, many of the insights gained in Bristol will be relevant elsewhere. The internet survey also covered a geographical area beyond Bristol, as did the intervention to attract car drivers to bike-rail integration.

The total number of rail journeys made per annum to and from and within the South West has increased from 52 million in 1998 to approximately 74 million in 2007, equating to an average growth rate of 4% per annum (Network Rail 2009). For Bristol Temple Meads specifically, this has meant a jump from four million passenger journeys starting and ending their journey there in 1998, to 7 million by 2007. The distribution of the journeys is shown in Figure 8 on the next page.

Figure 8 Rail journeys in and out of the South West Region



Source Network Rail 2009

Despite this growth, the role of rail is relatively small as a share of total trips in the West of England Partnership area which includes Bristol. At present it accounts for about 1.6 per cent of trips to work, and two and a half per cent of all trips in the peak hours (West of England Partnership 2009). Its role is more important on the key strategic corridors with a mode share often exceeding ten per cent and rising above 15 per cent where car journey times are less competitive (West of England Partnership 2009).

The South West Multimodal Study (SWARMMS 2002) estimated that the rail share of trips between Bristol and London was about 10-12 per cent. For shorter local journeys this percentage is lower. The Greater Bristol Strategic Transport Study (GBSTS 2004) showed the breakdown of mode shares in 2003 during the morning peak (Table 7).

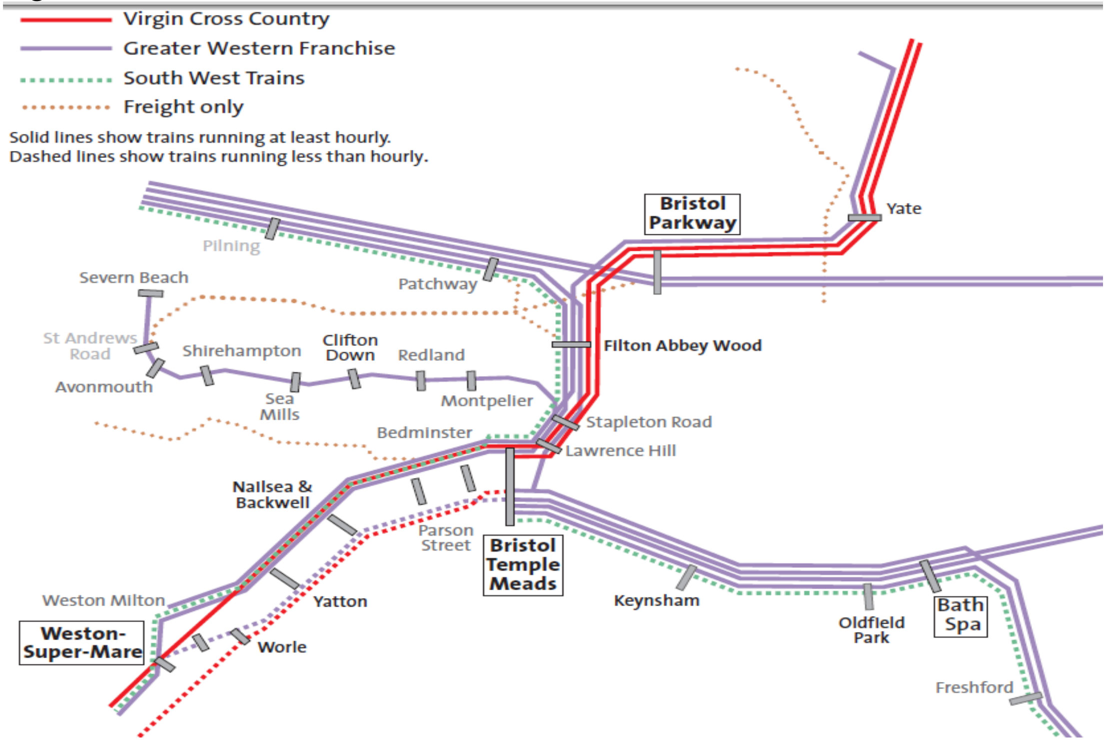
Table 7 Person trips and mode in 2003 (average hour, morning peak)

Mode	Person Trips	Mode Split (%)
Car	154,700	88.8%
Bus	13,600	7.8%
Rail	4,400	2.5%
Park and Ride	1,550	0.9%

This low modal share of rail is partly a reflection of the penetration of the rail network in the South West and also the rural nature of the region. Both residents and visitors to the region rely heavily on the car. The proportion of households in the South West owning a car in 2004 is 84 per cent, up from 74 per cent in 1994 (South West Observatory 2007). It is estimated that 23 million visitors a year come to the South West from other parts of the UK for tourism (DfT 2007k) contributing £4,928 million in 2003 to the economy. The overwhelming majority, 90 per cent of these visitors arrive by car and this level of car dependence is threatening the environmental quality of the region - the cornerstone of its attraction (South West Tourism 2005). Rail has a small share of the visitor market with about seven per cent arriving by train, of which most are from within the region and from London and the South East (DfT 2007k).

Figure 9 shows the rail routes in and around Bristol. Bristol Temple Meads is the central station within Bristol City though it is at least a twenty minute walk from the main shopping and business area. It is one of the busiest non-terminus railway stations within the UK, situated on the Great Western Main Line and providing an interchange for train services from Birmingham, South Wales, Wiltshire, Dorset and London, serving destinations in the West Country.

Figure 9 Rail services in the Bristol Area



Source Network Rail 2008

Bristol Temple Meads also serves commuting passengers travelling to London from local residential areas and a contra-flow of passengers commuting to the commercial, employment and retail centres in Bristol. It has been identified by Network Rail as the sixth most congested station on the network and has serious passenger congestion pinch points within the existing ticket hall, concourse, and access stairs to the subway underneath the platforms (Network Rail 2008).

Bristol Parkway is located in South Gloucestershire on the outskirts of Bristol City in what is known as the 'North Fringe'. The station was opened in 1972 and was in effect a pilot for the 'parkway' station concept (a station accessible by car rather than in the town centre). In time, the surrounding area changed from a small residential area to becoming a major area of residential and economic growth. There are a number of large employers in the vicinity: Ministry of Defence, Hewlett Packard, Axa Sun Life, Rolls Royce, Airbus and the University of the West of England. Further major housing sites in the area have received planning permission and the draft Regional Spatial Strategy for the South West identifies the vicinity as an 'area of search' for further development over the next 20 years.

As was pointed out in Section 3.1 cycling levels are likely to be a factor in the level of bike-rail integration. Cycling has increased in Bristol and its surrounding area; the progress report on the joint transport plan which covers the former Avon area comprising four unitary authorities - Bristol, North Somerset, South Gloucestershire and B&NES - showed a 24 per cent increase in cycling levels above the base line in 2003/2004 (West of England Partnership 2007).

As cyclists are relatively rare at stations it was decided that the main research locations would be at Bristol Temple Meads and Bristol Parkway[13] enabling an investigation of the situation at both a central and a suburban station, offering the best chance of a sufficient sample size of those combining cycling with rail. In addition, both stations were managed by FGW giving the researcher easier access and permissions for surveys.
The next section outlines in detail the methodologies used to gather data in the exploratory phase of this research.

[13] As pointed out in Section 1.1, Bristol Temple Meads is the busiest station in the SW servicing over seven million journeys to and from the station, with Bristol Parkway servicing nearly two million in 2007/2008 (Office of the Rail Regulator 2009).

6.5 Exploratory phase methodology

The majority of data gathered to answer Questions 1 - 4 in section 6.2 were collected using a face-to-face survey of bike-rail integrators. The survey design struck a balance between the researcher's construct of what was relevant and the respondent's own construction of what was relevant by having fixed-response questions for quantitative analysis as well as several open-ended questions. The next section outlines in more detail each element of the data collection.

6.5.1 Cycle parking counts

A perception identified in initial conversations with rail staff and users at Bristol Temple Meads was that the bicycle parking racks were full most of the time and there was a general feeling that many of the bicycles 'just sit there' i.e. had been abandoned. As has been discussed in sections 3.4 and 3.5.1 there has been very little research on the use of cycle parking. Hence a methodology was developed to ascertain the level of movement in and out of the cycle parking facilities at the two stations.

At BTM there were Sheffield-type stands under cover on Platform 3 with a capacity of 300 bicycles, monitored by CCTV and only accessible through the ticket barrier. There were also 4 stands at the taxi rank outside the front entrance of the station that could accommodate 8 bikes, but during the day there were usually in the region of 25 bikes parked outside the station: at the stand and chained elsewhere. The bicycles outside the barriers were not monitored for this research. Bristol Parkway had a covered parking stand outside the station with space for 48 bikes[14].

A bike parking count was started at BTM on a Wednesday at 6.45 am in July by stapling a numbered laminated label to each of 184 bikes parked. The bikes were counted at four-hourly intervals and any untagged new arrivals were tagged. A grid system was developed mirroring the layout of the parking and noting the location of the numbered bicycles to avoid counting a bike that had left and returned with the tag still intact. This exercise was repeated at Bristol Parkway. It proved quite a challenge to maintain strict four-hourly time intervals at the two stations as the researcher was dependent on the rail service between the stations to arrive in time for the 'beat'. There was also major disruption on the network on Friday

[14] South Gloucestershire Council installed 20 bike lockers at Bristol Parkway, of which 9 were rented by early September 2008 for £11 year plus a £10 deposit. These were not included in the count. In 2009 an additional 32 covered spaces were provided.

20th July 2007, due to exceptional flooding that will have affected the number of people travelling and therefore using their bikes.

The tagging and count system was laborious but it was felt to be easier than other methods for such large numbers. For example, the methodology used for the Cycling Demonstration Towns (CDT) is an adaptation of methods used to measure car parking (Parkin 2007 personal communication), where an area is divided into 'beats' that are revisited at regular intervals to determine the number of vehicles parked through the day and the duration. Under the CDT methodology, individual identification of bikes is regarded as necessary using wheel size, handlebar style, frame style, colour, mudguards, carrier, bell etc. The sheer volume of bicycles at BTM would have made this very time consuming, so the tagging system was adopted. Using CCTV footage was also considered, but framing all the bikes in the picture in sufficient quality would have been technically difficult with the existing cameras.

At the start of the exercise it was not clear how people would react to tags on their bicycles so, in addition to a number, it included a written apology and explanation informing the bicycle owner that the tag was part of a research project giving the contact details of the researcher. There was no information given as to whether people should leave the tag on or take it off. This did cause some confusion and as a result it was not safe to calculate how many of the new arrivals had used the stands the previous day. One benefit of the time consuming count was that bike-rail integrators observed the researcher and struck up conversations which were recorded in a notebook and resulted in considerable qualitative data, giving an indication as to the variety of journey patterns, which helped in the formulation of some of the questions for the face-to-face survey.

6.5.2 Barrier counts at Bristol Temple Meads

As pointed out in the previous section, the bicycle parking at BTM is extensive and located within the station. This offered the opportunity to assess the proportion of bike-rail integrators that were taking their bicycles on and off trains relative to those that were parking before joining a train or collecting upon alighting (albeit excluding those who were parked outside the station). The only access to Platform 3 cycle parking at BTM is through the ticket barriers, so a click count was conducted here of all passengers bringing in or taking out a fixed-frame or folding bicycle on two days in October 2007 between 7 and 10 am and 4 and 7 pm. The researcher was advised by FGW that these were the peak flow periods. In addition this allowed observation of the practicalities of bringing a bike in and out of the barriers. Using these figures in combination with the parking counts, an estimate of how many of those coming in and going out of the barriers were parking their bicycle at the station or taking them onto trains.

This estimate was not considered robust so the exercise was repeated a year later but using three volunteers in addition to the researcher, to enable the counts to be done simultaneously to get a more accurate picture. On Wednesday 15th October, two researchers were standing at the barrier counting individuals in an out of the barrier and noting whether they had a fixed-frame or folding bicycle. Two researchers were positioned at the cycle parking, one counting those leaving and another counting those arriving. All counts were recorded every 15 minutes using click counters between 7 and 10 am and 4 and 7 pm.

6.5.3 Face-to-Face Survey and sample size

Chapter 4 and the conceptual model in Figure 5 show the many different factors that will influence the decision to bike-rail integrate, and a face-to-face survey at the two railway stations was considered the most effective way of obtaining a sufficient sample and gathering data to establish the personal characteristics of existing bike-rail integrators, but also their motives and experience of different methods of bike-rail integration.

Existing data on rail use and bike-rail integration in the South West were examined to establish what might be a sufficient sample size to give a true reflection of the bike-rail integrator population at the two Bristol stations.

As in Table 5 nationally, the average is two per cent of rail passengers access by bicycle but it will vary from station to station and area to area. For the purposes of this research, the figure of two per cent for those parking and one per cent for those taking bikes on trains was taken (see Appendix I) so three per cent of the average weekday figure of rail passenger throughput at BTM was 21,725[15], giving an estimate of a total population of practising bike-rail integrators at 652 on an average weekday. A sample of the 135

[15] As a result of the introduction of automatic barriers, there are now typically two sources of data covering the actual numbers of people passing through a particular station. The barriers give FGW a count and this can be compared with the national Lennon database of ticket sales run by the Association of Train Operating Companies (ATOC). Both are compiled using quarterly (13 week) periods in the financial year. On an average weekday over 13 weeks from mid July to mid October the barriers counted on average 13,973 people in and out of Bristol Temple Meads but the Lennon data showed 21,725. The discrepancy is partly accounted for by those going through the manual barriers at the station.

completed questionnaires in this research would represent nearly a quarter of the daily population at BTM.

A face-to-face survey was designed and piloted at Reading station (as this would not be included in the main data collection). Several refinements were made before 135 bike rail integrators were then surveyed at Bristol Temple Meads and Bristol Parkway. The majority (71%) were surveyed face to face using opportunistic sampling at different times of day during a three-week period Tuesday 2nd – Monday 22nd in October 2007 across weekdays and weekends (See actual spread Appendix I).

As cyclists are fairly rare amongst rail passengers, the first cyclist sighted was approached and on completion of that survey the next sighted cyclist was asked to participate. Individuals were approached at the station at different locations: by the cycle parking, in the concourse, entering or leaving the station, on the platform or even on trains if the researcher had completed a survey with another passenger and saw another person with a bicycle. As a result nine respondents in the sample were in transit and had neither BTM or BP as their origin or destination station.

This sampling technique does not include those who arrived at Bristol Temple Meads or Bristol Parkway and had parked a bicycle at their origin station, those for whom the two stations are their 'home' station where the individual had parked a bicycle solely at their destination station for their onward journey or those who parked outside the station. As the research progressed, it appeared from observation that the new cycle parking provided within an adjoining development, Temple Quay, may have been functioning as an overflow cycle parking area for those using the station. One potential problem with opportunistic sampling is that the likelihood of 'regular' station users being picked up in the sample is greater than for one-off users, although it should reflect the day-to-day population of BRIs in practice.

Each interviewee was told that the researcher was based at the University of the West of England (UWE) and was conducting research on bike-rail integration and that all information given would be confidential. For the household income question, the researcher carried a laminated card with letters against the income bands so that the respondent could identify the relevant letter rather than having to answer more directly, to avoid embarrassment in a relatively public place. The time constraints of the interviewee were taken into account; the researcher was able to follow individuals onto trains if they were in a hurry in order to complete the survey. In addition, those who were approached but said they were in too much of a hurry were asked if they would be willing to fill in a questionnaire at home and return it in a pre-paid envelope. Five people would not take a form and approximately 80 were given out with 32 returned (40% response rate). Whilst there may be response mode biases, having a postal return option is likely to have reduced the bias towards self-selection of those willing to be surveyed face-to-face (see Appendix II for survey instrument).

A further 24 individuals who had contacted the researcher having read the tag attached to each bicycle parked at BTM and BP during the parking count (see Section 5.6.1) were sent the questionnaire by email. Seven questionnaires were returned. Overall, including those questionnaires handed out and emailed and those who participated face-to-face, a total of around 244 questionnaires were distributed and 55% responded. Table 8 below summarises the percentages returned by the different survey methods.

To maximize the respondents' opportunity to articulate their response in their own way, questions that were not purely factual were left open. So for example, in the question "What do you consider are the advantages or disadvantages of cycling to the station?" no direction was given; the interviewee's immediate response was noted, using his/her own words.

Table 8 Survey method (N=135)

SURVEY METHOD	Questionnaires completed and returned	
Face to Face	96	71%
Post	32	24%
Email	7	5%

People who were surveyed face-to-face may have been starting or finishing their journey at the time of questioning but they answered for that particular leg of the journey; likewise those who filled in the questionnaire. The questionnaire was phrased in such a way that it made no difference whether they were answering for the journey towards home or away from home. Only 7 people out of the sample of 135 did not either start or finish their journey at home. Three were staying with a friend or relative and 4 had started their journeys from their workplaces but were travelling to destinations other than home.

Participants were asked an open question, "How far have you cycled to the station today?" and people answered in either time or distance or both. An assumption was made that individual respondents might find it difficult to give a distance and it might be their perception of distance and time rather than an accurate measurement. Participants were also asked how they completed their onward journey and how far it was from their destination station. Postcodes for their origin and destination were also collected as a check, though not all respondents were willing or able to give their postcode. Using this combined information to cross-check, a reasonable estimate of the actual distance travelled was calculated. For those who answered in units of time, it was converted into kilometres using an average cycling speed of 15 km per hour. Parkin (2008) argues that cyclists can probably be best classified by speed and there are probably two or three distinct classes of cyclist by speed. Apart from the cyclist's inherent physical ability or desire to go at a certain speed, there are junctions, traffic lights, terrain and gradients. The 15 km per hour figure used for the distance calculation in this research was based on a survey of Southampton cyclists (Wells, Waterson, McDonald and Tarrant 2007) which provided a mean cycling speed of 13.8 km/hour. This would equate to 3.75 km at constant speed for a 15 minute travel time target for accessibility.

If respondents did not know the distance or the time but gave a postcode the distance was calculated using a map tool that measures the distance between the two postcodes. The road-based distance was used rather than the crow-fly distance. This is likely to slightly overestimate the distance travelled whereas the crow-fly distance would be a larger underestimate[16].

6.5.4 Semi-structured interviews

The face-to-face survey was suitable to ascertain the basic demographics, motivations and behaviour of bike-rail integrators but it was not an appropriate methodology for delving deeper into the more social, emotional and cultural processes at work in the decision-making process (Chapter 4). The researcher considered that an opportunistic, semi-structured interview - a dialogue - had the potential to complement the data from the survey using prompts to understand the level of attachment of bike-rail integrators to their bicycles, whether or not it went beyond the functional. It also covered the cycling history of bike-rail

[16] Wells et al. (2007) looking at accessibility planning for walking and cycling and showed that crow fly measures tended to overestimate accessibility by 30% and if the road network alone was used it underestimated accessibility by 3%. The shortest distance on the road network may ignore short cuts only available to cyclists and walkers. Equally there may be heavily congested road routes that act as an impassable barrier for pedestrians and cyclists.

integrators, their image of cycling, the catalyst for their cycling, their categorisation of themselves as cyclists and the extent to which they were influenced by their social context. The prompts for the interview, to be found in Appendix lll, are all drawn from Chapter 4 and the conceptual model Figure 5 in Section 5.

If a face-to-face survey was completed and the researcher judged that there was time before the interviewee's train arrived or he/she did not seem to be in a hurry, the respondent was asked if they were willing to continue for a semi-structured interview using a series of prompts. In addition, those who were given the survey to complete later or were sent it by email were asked to respond to the prompts in their own words. In the case of those who were interviewed at the station, the researcher already had background information from the survey and could use this information as a starting point for investigating issues in more depth. Forty-two per cent of the sample responded to one or more prompts.

6.5.5 Internet access survey

The publication of the White Paper 'Delivering a Sustainable Railway' (DfT 2007b) sought to improve access to stations in general, but particularly to change behaviour to more sustainable modes such as the bicycle but, as was pointed out in section 3.5, the rail industry generally has not paid much attention to access to and from stations.

The data available from the National Rail Passenger Survey is limited as it is essentially a customer satisfaction survey, set up with the aim of providing customer views on rail company performance on a consistent basis, so that comparisons could be made across operators. Four questions refer to access to and from the station - Which method of access did a passenger use and were they satisfied, and which method of egress did a passenger use and were they satisfied? The sample size for the national survey is 3,000 in the FGW area and they supplement it with their own similar customer survey to 20,000 each year. One of the problems as mentioned in 6.4.4 is that the number of respondents who access by bicycle is still small, and even smaller once it is disaggregated to station level. In other words if you were to use the information to make judgements about cycle facilities at a station it would not be robust.

The researcher and the FGW Integration Manager decided that it would be a good idea to conduct an internet survey to find out more about their customer's attitudes and experimentation with alternative methods of access. This would provide useful background information for the design of Station Travel Plans generally and give insight into the behaviour of those who do not currently use cycle access and their propensity to change. The researcher provided a paper to FGW on some of the gaps in knowledge with suggestions for questions for the internet questionnaire. This information was incorporated into the FGW commissioning process of an e-survey from Oxford Research Agency. A draft questionnaire was circulated in Word format to enable the researcher and FGW to make amendments. The final questionnaire (see Appendix IV) was linked to an icon on the First Great Western booking website in August 2008. This was also linked to the Evans Cycle website as they were willing to co-fund the website survey. This came about as a result of a relationship that had been developed with Evans Cycles in the process of organising the Paddington bike event, to offer folding bikes at a discount to FGW customers. Evans cycles gave one free folding bicycle as a prize draw to encourage individuals to fill in the survey. Tickets on Eurostar to Paris were also offered as a prize.

The internet survey was put up on the FGW website in August 2008 with a link from Evans Cycles. There was a problem with the web link which meant that the Oxford Research Agency was not able to determine from which website respondents had been diverted. This research was only interested in the respondents who were actually planning and booking a rail journey which amounted to 975 out of a total of 1472 respondents. The respondents to the e-survey lived anywhere with access to the FGW network, providing useful additional and comparative information of the 'non-user' group – those who are not taking their bicycles on trains or accessing by bicycle. In addition the survey included questions about car availability and reasons for choosing rail, important in terms of developing messages that might be used to promote more bike-rail integration.

6.5.6 Interaction of data gathering and observation

The parking counts and barrier counts were time-consuming but involved being present at the stations and going backwards and forwards on the trains between Bristol Temple Meads and Bristol Parkway, which allowed observation of rail travellers with bicycles; how they moved around stations, how they got on and off trains, how they might search for the cycle sign on train doors[17], the interaction with other passengers on crowded trains e.g. instances in which bike-rail integrators squeezed bicycles onto already overcrowded trains, folding and unfolding of bikes on the station platform, propping up bikes against pillars to buy a

[17] Although the train companies give real-time information to cyclists about where the accommodation will be found in longer train formations, on occasion the information is incorrect, and this can involve dashing from one end of the train to another on a crowded platform.

ticket while keeping a constant eye on the bicycle, the relative ease of getting on and off different types of trains.

In addition, informal conversations with rail staff manning the barriers and at the information booth close to the parking at Bristol Temple Meads gave insight into their perspective. The combined sources outlined in the previous sections succeeded in building up a very detailed picture of how existing facilities are being used at Bristol Temple Meads and Bristol Parkway.

During the research a wider perspective beyond the data collection in Bristol has been gained through the internet survey, attendance at ATOC integration group meetings at which representatives from other rail operators discuss access management including bicycle access, the piloting of the questionnaire at Reading, the organisation of a Bike Event at Paddington station to raise the profile of cycle access and visits to Cambridge, Finsbury Park and others to look at different station parking regimes. A trip was made to Copenhagen to observe how one of the first bike hire schemes worked in practice and also to see the multipurpose train carriages which are used to carry passengers, bikes, pushchairs and the disabled. The researcher also attended the Velo-City conference in Brussels and tried the Paris Vélib' swipe and ride system.

6.6 Action Research

The second, interventionist or action research, phase of this research project was partly built on the literature review but also the knowledge generated in the exploratory phase using the methodologies described in the previous section. Once the researcher had intervened or taken action it was not possible to argue that the researcher was 'apart from' the action. The presence of the researcher herself prompted actions on the part of FGW (a part-funder of this research project) and created unforeseen research opportunities. It was at this point, that the researcher had to make choices to take advantage of these opportunities and she has tried to be transparent about them. "It is not possible, either theoretically or practically, to engage in an inquiry that addresses all dimensions fully and completely; rather, there will always be choices about what is important to attend to any particular moment" (Reason 2006 p 198).

The researcher took the view that purely interpreting the 'world' is a wasted opportunity if a chance is offered to take action within it and would subscribe to the view that knowledge can be acquired through responding to a real need in life. Research knowledge can be learned through working in a context of action. It can be "the result of the transformation of our experience in conversations with both self and others that allows us consistently to create useful actions that leave us and our co-inquirers stronger" (Reason and Bradbury 2008 p6).

The review of the literature has shown that there has been very little action to promote bike-rail integration and that combining action in the form of an intervention could potentially reveal information about the process as well as the outcome. Though becoming an actor rather an observer poses dilemmas in terms of the ontological and epistemological foundations of a research project, the potential benefits outweigh the disadvantages. The first characteristic of action research is to address practical purposes but it is not simply about what works, purely outcome-based, but about trying to integrate practice with theory (Reason 2006).

Reason and Bradbury's working definition of action research is:

"Action research is a participatory process concerned with developing practical knowledge in the pursuit of worthwhile human purposes. It seeks to bring together action and reflection, theory and practice, in participation with others, in the pursuit of practical solutions to issues of pressing concern to people, and more generally the flourishing of individual persons and their communities" (Reason et al. 2008 p4).

It is a dynamic process that allows the evolution and development of ideas. There are many different orientations of action research to draw from; some have used action research to improve their professional practice and organisational development (French and Bell in Reason 2008 Chapter 8), others for health promotion, empowering communities and even national policy development (Stringer 2008). The fact that action research has a 'working definition' is an indication of its fluidity as a methodology but what is common is a process of inquiry that involves cycles of action and reflection that are open to change, an evolutionary and developmental process.

The original proposal for this research project was accepted for support by the Managing Director and Commercial Director of FGW. The specific personnel left their roles fairly soon after the project started. However, the key collaborator was the Integration Manager, Andrew Saunders, who fulfilled that role throughout the project. He was responsible for FGW's bike-rail policy and as a cyclist and occasional bike-rail integrator, he had an understanding both as a user and as a provider. There was a common understanding that there were issues around bike-rail integration that were problematic and that this research project could help to find solutions. On average, the researcher was in touch with FGW weekly which allowed discussion and reflection throughout the research project. The relationship with FGW was mutually beneficial; the researcher gained privileged access to information and FGW obtained immediate access to the data.

The researcher was conscious that this frequent contact had the potential to pull the perspective in one direction, that of bike-rail integration from the point of view of an operator rather than a user. At the inception stage of the research it was clear that some bike-rail integrators were angry about the lack of facilities provided for them and reported not being 'treated well' by the rail industry. FGW's perspective is that they are trying to balance the needs of a diverse passenger body as a private company, but within a highly regulated industry. The researcher had to be aware at all times of these different perspectives. The striving for objectivity was crucial within the exploratory phase of this research using methodologies at the 'positivist' end of the spectrum, but the researcher would argue that this 'balance' had to be maintained even within the action research phase. The action research phase addresses Questions 5 & 6 (See Section 5.2) which are of a very different nature, looking for solutions to facilitate bike-rail integration, but the solutions from FGW's perspective may be very different from that of the existing or potential users.

Within the action research phase, decisions were made on a case by case basis and for example, the researcher was asked to help design an internet access survey (see fuller explanation in section 6.6.5) which though its goals went beyond the research project, provided an opportunity to gather data on bike-rail integrators in other geographical areas and to rail users who do not access rail by bicycle. By assisting in the design of the internet survey, the researcher was able to collect additional data and expand the boundaries of the project to put her survey data into the overall access management context.

In chronological terms, the design, implementation and outcomes of the interventions to answer Questions 5 and 6 were actually a process of overlapping stages, a constant re-evaluation of the information gathered to answer Questions 1 - 4. The researcher as 'actor' has a very different perspective from a researcher who follows and excavates data from this process after the fact.

The interaction and negotiation amongst partners within the interventions including the researcher is unlikely to be 'recreated' in documentation or recalled exactly as it happened through interviews. Records of activity contained in the researcher's four notebooks, email correspondence, minutes of meetings and telephone conversations are the data used to describe the process and outcome of the two interventions in Chapter 8. This is supplemented by data from in-depth interviews conducted post the trial of rail with walking and cycling access (Section 8.4). This data collectively provided insight into the difficulties of putting theory into practice. A more dynamic picture of practice was obtained than could be gathered through formal interviews of those in the rail industry, local authorities and other interested parties. The researcher engaged the partners in a dialogue, an interactive process of exchange of information to co-develop solutions and the 'knowledge' gained provided insights to inform future investments and promotional activities for bike-rail integration. During the process the researcher learnt that emails, documentation and meeting minutes can only tell part of the story and that being present as a participant enables the researcher to read 'between the lines'.

One particular illustration of how 'being present' can be useful was during the first phase of the research when the researcher's FGW collaborator offered to help with the research and conduct a barrier count with the researcher. He witnessed the difficulty that those with bicycles had at peak hour trying to get through the ticket barriers and the implications for the rail staff and other passengers. This could not have been conveyed by the researcher sending a report of the counts through the barriers. This direct experience gave the data presented by the researcher to FGW at a later date a context which could form the basis of discussions for future research and action.

6.7 Summary

The research strategy has a number of different elements driven by the logic of the research questions with the aim of ultimately contributing to the design of interventions to promote bike-rail integration as an alternative to the car. A mix of quantitative and qualitative research methods were used to obtain different perspectives in an exploratory and action research phase. Some would argue that the grounds of knowledge 'epistemology' within this research project are in conflict, but the researcher has taken a pragmatic view that the world can be seen as both materially and socially constructed and that the different methods of research that the two world views imply can be seen as different ways of gathering complementary data. The exploratory research has constantly informed the action research phase and the following chapter outlines the main results from the exploratory phase. Chapter 8 describes, and reflects on the interventions.

Chapter 7 Existing behaviour and propensity to change behaviour

7.1 Introduction

The majority of the results of the exploratory phase of this research are reported and discussed in this chapter alongside some comparative secondary data. The sections are broadly aligned with the first four research questions in Section 6.2 to build a picture of existing bike-rail integration behaviour at two Bristol stations.

Section 7.2 outlines the personal characteristics of existing bike-rail integrators and how these characteristics interact with the individual's transport, physical, social and cultural context over time as hypothesised in the Conceptual Model in Figure 5 Section 5.2

Section 7.3 shows the results that specifically look at the types of behaviour in which bike-rail integrators engage to access the railway station - the choice of bike-rail integration method, the extent to which there has been experimentation with different bike access or alternative access modes, the distances cycled to the station and the influence of cycle theft on these choices. The parking and barrier counts are reported showing how the existing parking facilities are being used as well as the proportion of those taking their bicycles on the train.

The results show that there is a considerable investment of time required in choosing to bike-rail integrate successfully and outlines the motivations of the bike-rail integrator sample and their views as to the advantages and disadvantages of bike-rail integration.

Section 7.5 gives the results of the internet survey showing the extent to which rail users might consider cycle access and also the extent to which existing bike-rail integrators in Bristol would consider bike hire if it was available.

The final section looks at the influence of the availability of a car, the extent to which the bike-rail integrators have considered alternative access modes and are committed to cycling to the station.

These results and their relevance to the design of interventions to promote bike-rail integration are discussed.

7.2 Who are existing bike-rail integrators?

The results in this section give an overview of the basic demographics found in the Bristol bike-rail integrator sample through the face-to-face survey and semi-structured interviews. It takes the 'who' in this question in the broadest sense as it is argued that an individual's basic demographics cannot be divorced from his or her social context in terms of the decision to bike-rail integrate. It is not enough to know the age or gender of an individual to determine their propensity to bike-rail integrate and therefore data from the semi-structured interviews including quotes is included in this section to illustrate some of the linkages outlined in Chapter 4 and incorporated in the conceptual model in Figure 5 Section 5.2

7.2.1 Personal characteristics

The gender split of the sample collected at Bristol Temple Meads and Bristol Parkway of bike-rail integrators is shown in Table 9: males predominate with a third female.

Table 9 Gender split N=132

	Frequency	Percentage
Male	94	71%
Female	38	29%

This is not significantly different to the ratio found amongst cyclists generally with 69 per cent males and 31% per cent[18] using a Goodness of fit Chi-squared test. ($\chi^2 = 0.3$, df = 1, p < 0.05 calculation Appendix V).

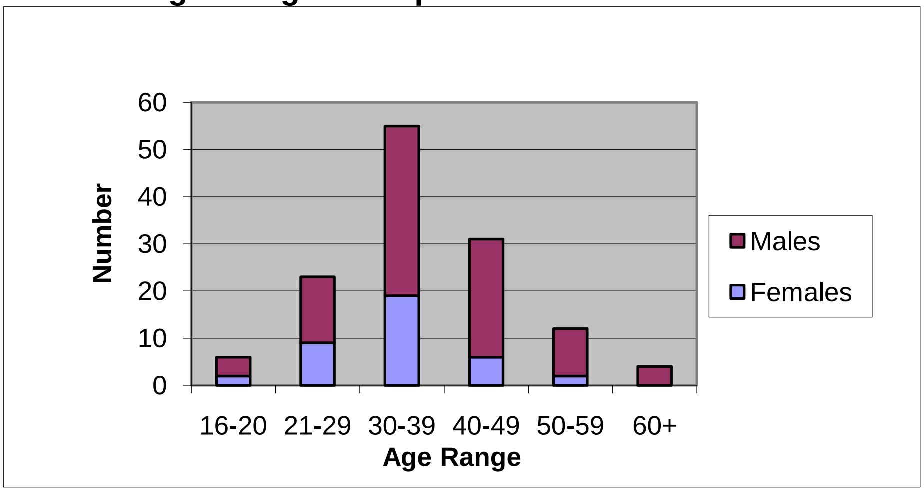
Across all age groups males make more cycle trips on average than females, and this difference is greatest among young people aged 17-20 (DfT 2007j), with men in this age group making five times as many cycling trips as women. As was pointed out in Section 3.3 the more cycling there is in society as a whole, the more equal becomes the gender split, so in The Netherlands it is about 50:50 (Smith 2005). The fact that there are currently more male bike-rail integrators than female may be partly a reflection of their different perceptions of risk, as when women were asked why they did not cycle they most often said they did not

[18] This ratio used combined data from 2002-2008 defining cyclists as those who had made a least one cycle stage in a diary week.

cycle because they were afraid of cycling in urban traffic but also that cycling was less able to cater for the number of tasks they were combining (Section 4.3)

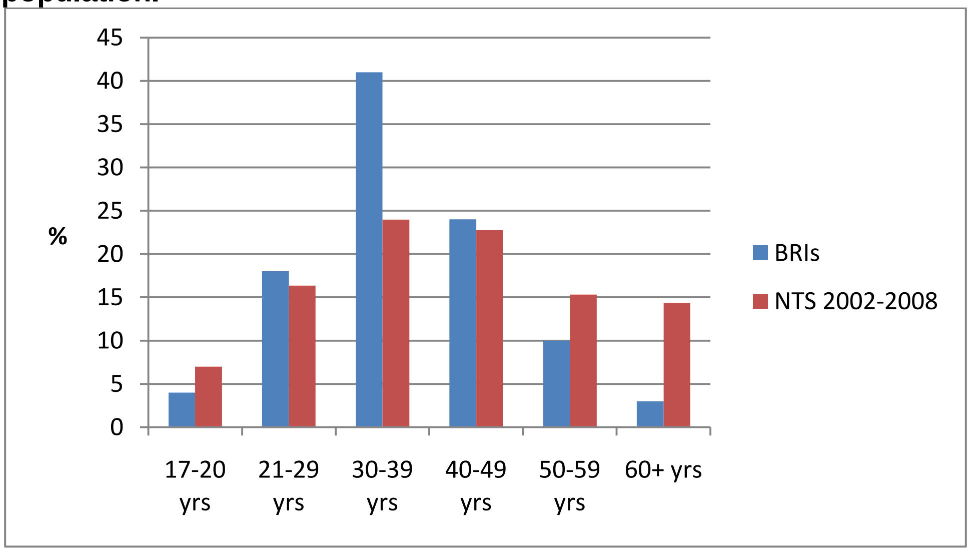
The age of those surveyed in this research is shown in Chart 15 and as can be seen the largest number of bike-rail integrators fall in the 30-39 age group.

Chart 15 Age and gender split N=132



There is a significant difference between the age breakdown of bike-rail integrators and cyclists using a Goodness of fit Chi-Squared ($\chi^2 = 32.11$, df = 5, $p < 0.05$ calculation Appendix V). Chart 16 shows that the main observed difference is the larger number of bike-rail integrators in the 30-39 age group.

Chart 16 Age comparison of bike-rail integrator sample and 'cyclists' in the population.



Source NTS 2002-2008 'cyclist' someone who has cycled at least one stage per week

Bike-rail integrators are more likely to be in their thirties and less likely to be over 60 compared to cyclists in general. The fact that fewer of the bike-rail integrators are over sixty is likely to be a reflection of the fact that the vast majority were employed; 72% full-time, 8% part-time and 9% in self-employment.

Table 10 below shows the household income of the sample of bike-rail integrators in this research: 23 per cent of households had incomes below £17,000 and 23 per cent above £50,000, with the majority falling in between.

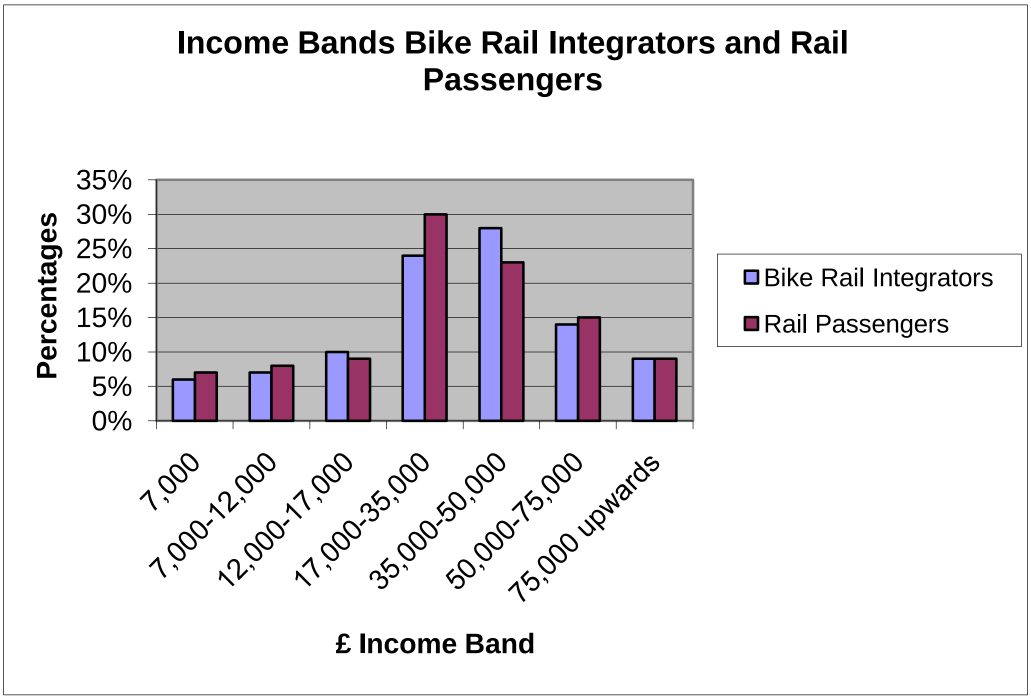
Table 10 Household Income of bike-rail integrators N=133

	HOUSEHOLD INCOME	
Income	Frequency	% over-18s
<£7,000	8	6%
£7,000-12,000	9	7%
£12,000-17,000	13	10%
£17,000-35,000	32	24%
£35,000-50,000	37	28%
£50,000-75,000	19	14%
£75,000-	12	9%
under 18	3	

The level of income of bike-rail integrators is comparable to that of all rail passengers and Chart 17 below shows the percentage of respondents in this sample falling in each income band, plotted alongside the percentages of respondents falling in those income bands in the national rail travel survey[19] (DfT 2007a). Using a Goodness of fit Chi-squared test (χ^2 = 4.26, df = 6 $p < .05$ calculation Appendix V) significance level there is no significant difference between the percentage of bike-rail integrators in each income band compared to rail passengers generally.

[19] It should be noted that the second, third and fourth income bands were not exactly comparable in that they differed by £500 per year.

Chart 17 Comparison of income bands of the bike-rail integrator sample with rail passengers generally (N=130)



An important point to note here is that the NRTS methodology was to capture rail trips on a typical weekday (i.e.outside of the school holidays) contrasting with the bike-rail integrator survey which sampled across weekdays and the weekend. Even if the 16 surveys conducted at weekends in this research were removed from the sample, there was still no significant difference between the proportions of bike-rail integrators relative to rail passengers in general falling in the income bands (Goodness of Fit Chi-squared test was performed $\chi^2 = 4.89$ df = 6 , $p < 0.05$ calculation Appendix V).

It is interesting to refer back to Section 4.3 Chart 12 which shows passenger income bands relative to journey, noting that more leisure journeys are taken by those on low incomes than any other group. In other words, there is a relationship between journey purpose and income which could be relevant in isolating different groups to target for the promotion of bike-rail integration.

For the purposes of the National Travel Survey, analysis is by income quintiles across years, rather than exact numerical boundaries. The percentage of cyclists that fall within the five quintiles is relatively constant as can be seen in Table 11.

Table 11 Cyclists (who have made at least one bicycle trip in a week) by income status

% of Cyclists who fall within these quintiles	Real Household Income Quintile
16%	Lowest
20%	Second Level
23%	Third Level
22%	Fourth Level
20%	Highest Real Income
100%	All Income levels

Source NTS 2006

However, looking at the frequency of the bicycle trips within a week, those people living in households with lower levels of income make, on average, fewer bicycle trips and travel shorter distances than those in higher income households (DfT 2007g).

Bike-rail integrators were asked into which income band their household fell (Section 6.6.3). It is questionable whether asking for income data in a single question is reliable and to what extent the individual answering knows the overall household income (Micklewright & Schnepf 2007). Despite this caveat it appears that bike-rail integrators are likely to be in employment and therefore are more likely to be in the higher income bands, mirroring rail users in general. In other words, in terms of income, they are similar to other rail users. Yet as Lingwood (2009) points out, there is a perhaps a perception amongst those in the rail industry that cyclists represent less revenue- generating potential and their needs given a lower priority (see Section 3.5.1).

This more detailed information about the demographics of bike-rail integrators could assist in making the argument to invest in better facilities for cyclists at railway stations. Income level is just one amongst many factors that may influence whether an individual bike-rail integrates or not. The next section explores how personal characteristics exist within a complex web of interactions as outlined in the conceptual model in Figure 5 Section 5, including the social and cultural context.

7.2.2 Interaction of life stage, socialisation of cycling, cycling culture and physical and transport context

The previous section showed that the highest number of bike-rail integrators were in their 30s and there is a relationship between age and life stage (Section 4.3). A parent may have cycled at a young age but if their own children did not witness them cycling then a socialisation opportunity does not occur. Observation and seeing the outcome of behavioural choices underpins Bandura's social learning theory (Bandura 1977 as discussed in Section 4.3). An individual's cycling history or their experience of cycling will influence their propensity to cycle as well as their geographical context. So, for example, if an individual is living in a country or town where cycling is a marginal activity the likelihood of knowing someone else who cycles or seeing someone else cycling is lower than in an area where there is a 'cycling' culture, where it is possible to observe others cycling on a daily basis.

The semi-structured interviews highlighted the fact that many respondents had moved in and out of cycling, depending on a number of factors: where they live, the location of their work and the people they encounter. As the conceptual model in Figure 5 Section 5.2 shows, there is a web of interaction between physical, transport, social and cultural context which is illustrated by the quotes in the text boxes below from bike-rail integrator respondents.

> *"I started at school, cycled for 10 years, got a car very briefly then cycled at University, then I got a car again and drove everywhere, now I'm cycling again"*
>
> *"I cycled as a child/teenager but stopped for a while. As off-road bikes became popular, I started again. I haven't cycled much off road lately but continue to cycle"*

A number of factors may prompt the cessation of cycling and others will stimulate a return to cycling. Several respondents in the semi-structured interviews mentioned that a move had prompted them to start cycling.

"I moved house, it was easier to cycle to the station for work than drive"

"I took a break at college, I didn't bike, I used to live in a rural area then moved to an urban area and started cycling"

"I grew up in Cornwall and did the Camel Trail, the trigger was my 3rd year house at university, it was further out so I got a bike"

This lends support to the idea that a move may cause someone to break a habit and review travel choices (as introduced in Section 4.2.3), but cycling may also be the reason for choosing a particular location. The last quote above shows that perhaps a pleasant cycling experience as a child created a positive view of cycling so that, after a move, a particular necessity was presented and the respondent considered cycling as an option. Another person without that background might not have considered cycling as an option. Life stage is also bound up with 'motility capital' as described by Flamm and Kaufman (2004) and socialisation as discussed in Section 4.3.

Others had been prompted by their social context, by someone close to them.

"*Cycling for me is a continuation from childhood but I got more serious when I moved in with a flatmate that cycled seriously*"

"I cycled as a child, I got knocked off my bike, I broke a leg, gave up and then started again. My boyfriend absolutely converted me. He and his father have proper professional bikes, follow the Tour de France. I like biking but roads/traffic are off putting"

Respondents mentioned the influence of parents, friends and colleagues several times which is consistent with the Diffusion of Innovations Model (Rogers 2003): an important deciding factor on whether someone adopts an innovation is a face-to-face exchange, most effectively with peers (see Section 5.3).

The discussion of social norms in Section 4.4 illustrated that perhaps one barrier to cycling in the UK is the lack of a culture of cycling. It was notable that the only places that were named by respondents in their past were those that are known for high levels of cycling: The Netherlands (2 respondents), Cambridge (5 respondents), York (1 respondent), Hull (1 respondent) and (Germany 1). One respondent did however mention the town of Gosport, less well known nationally as a focus of cycling.

"I grew up in Gosport which has no hills and loads of people cycling, including most of my family and friends"

Though Gosport might not be associated with cycling by people who live elsewhere, for this respondent the importance of the place was closely linked to his particular social circle. In the same way that Fincham (2007) describes the lifestyle associated with bicycle messengers, within a town not known for cycling, there could be clusters of people who know each other socially who cycle and it becomes part of their lifestyle (see Section 4.4.2).

A Dutch bike-rail integrator who had grown up in Holland but lived in Cardiff made the comment "*I feel, as a foreigner, I can get away with cycling; my neighbour has 5 cars*". He used a folding bike and also said that in his area it was still seen as a sufficiently 'new' idea that people would come up and ask him about the bike. In other words, for him cycling was a normal activity but he found himself in a different culture where cycling was seen as something different. A German respondent also found the cultural difference noticeable. She mentioned how when she had first arrived in Bristol, she had laughed about the fact that people wore cycle helmets. However, much to her annoyance very soon she found herself wearing a helmet because she realised that the cycling environment in the UK was very different from that in Germany. She found the traffic and driver behaviour in the UK much more intimidating.

Other respondents were less concerned with what others thought about their cycling behaviour.

"They would all like to join me, I think, but all have good excuses not to. They all worry about my safety. In fact my daughters buy me helmets and yellow jackets for Christmas"

"All my family are strictly 16-valve drivers, they must collectively have over 5,000 pounds worth of pristine bikes in their garages gathering dust"

This section illustrates the complex web of interactions predicted by the conceptual model and provides a useful perspective with which to view the next section which reports the actual behaviour found in the Bristol bike-rail integrator sample which is by definition a snapshot. Behind these results are the individuals with their particular cycling histories, social and cultural context (Gergen & Gergen 2008 Section 6.4).

7.3 In what types of behaviour do existing bike-rail integrators engage?

7.3.1 Access and egress mode

Table 12 below shows that the vast majority of those interviewed accessed the railway system by bike, though five walked and five drove (but are rightly included in the sample as they made the egress leg journeys by bicycle).

Table 12 Access mode N=135

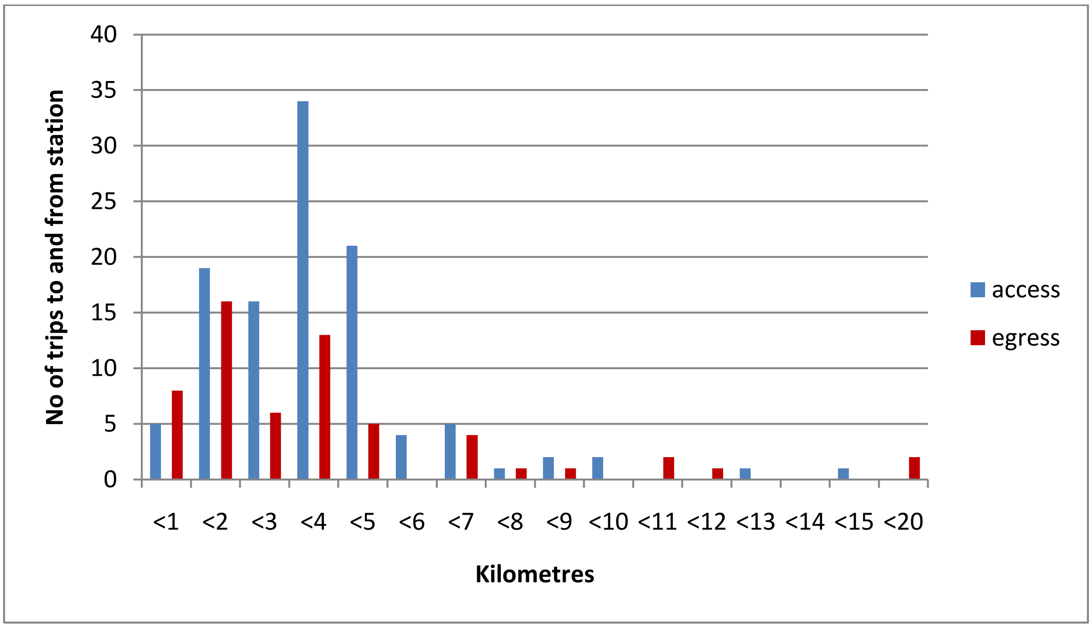
Mode	Used to access railway system	Used to egress from railway system
Foot	5	38
Bike	125	79
Bus/coach	0	4
Taxi	0	3
Lift	0	4
Car	5	0
Other/Underground	0	7

7.3.2 Cycling distance to and from the railway station

For the 124 respondents who cycled from their home to the station, the average distance they cycled was 3.5 km. The average distance for all the cycle journeys (204 trips to or from the station) was 3.7 km which equates to a 15 minute journey, assuming a cycling speed of 15 km per hour (see discussion in methodology section 6.6.3).

As can be seen in Chart 18 this average masks the longer egress journeys of 5 participants who cycled between 15 and 20 km as this was the purpose of their journey, to ride a bicycle at the other end for leisure. Thirty-six percent of those cycling from their origin to access the rail network cycled less than 3 km and 52 per cent of those that left the rail network on a bicycle, cycled less than 3 km. The most common cycle journey lengths to and from the station are between 1 km and 5 km.

Chart 18 Number of trips per distance band by Bristol bike-rail integrators N=135



The open question about distance allowed respondents to answer in a way that they felt comfortable with. The answers gave a clear indication of the difficulty of ‘knowing’ the distance accurately, so that many gave the time it took them to cycle rather than the distance. The perception of the distance is likely to vary according to obstacles along the way, the gradient, the route taken and the cyclist’s level of fitness and speed. There was some evidence within the data that the answers given for broadly similar origins or destinations were substantially different. In terms of this research, it is likely that the perception of distance as well as the actual distance is a potential barrier to attract non-cyclists to bike-rail integration (Section 4.2.4).

Chart 18 above confirms that origins or destinations within 20 minutes or 5 km are reachable for current bike-rail integrators. In terms of the promotion of bike-rail integration this gives a good indication as to the likely catchment area of a railway station for those accessing by bicycle. The frequency with which the respondents made the same journey for which they were interviewed is reported in the next section.

7.3.3 Journey Frequency

Thirty-eight per cent of the sample of bike-rail integrators were commuting every weekday but an equivalent percentage, 37%, were either making a first-time journey or another pattern of infrequent journeys (Table 13). This is perhaps surprising given that, using opportunistic sampling, there is likely to be a bias towards surveying regular commuters.

Table 13 Frequency of journey for Bristol bike-rail integrators (N=133)

Journey Frequency	How often the respondent made this particular journey	Percentage
First time	23	17%
Two to three times a week	7	5%
Three to four times a week	8	6%
Four to five times a week	17	13%
Every weekday	51	38%
Other		20%

The open question "How often do you make this particular journey by rail?" was answered in many ways and it was not easy to fit the data into neat categories. Respondents did not necessarily have a regular pattern as shown in the text box below and constitute the 'other' category in Table 13. It is striking that this category and the 'first time' category make up 37% of the sample.

"It varies from week to week"

"varies, could be every day, or once a month"

"sporadically"

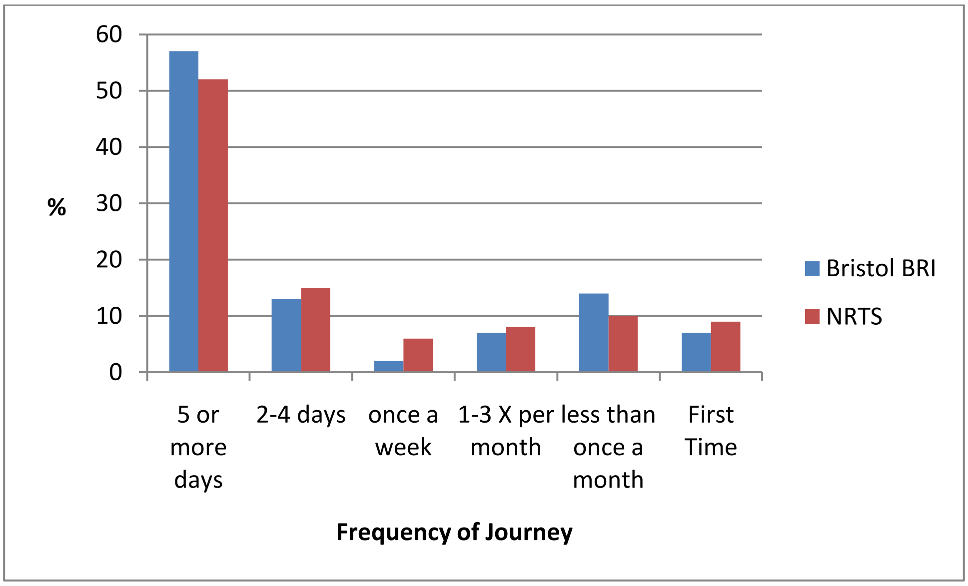
"every weekday for a week and then not at all"

"I go out on Monday and return Thursday"

"I do the journey 4 days in a row and then 4 days off"

In Chart 19 below the answers were re-categorised to facilitate comparison with the NRTS (DfT 2007a), which was more restrictive and did not offer an 'other' category. Those that fell in the 'other' category of the bike-rail integrator sample were placed in the most appropriate category or in the less-than-once-a-month category. Bike-rail integrators who had responded that they made the same journey 4 to 5 times a week were categorised in the 5 or more days[20]

Chart 19 Comparison of Bristol journey frequency (N=119) with NRTS



Source DfT 2007a

There was no significant difference between the frequency of journey for bike-rail integrators relative to rail travellers generally using a Goodness of fit Chi-squared test (χ^2 = 4.94, df = 5, $p < 0.05$ Appendix V).

Just over half of those in the Bristol sample who were travelling on a weekday were travelling 5 or more days a week. The rest were travelling less frequently and this was supported by the bike tagging exercises at both Bristol Temple Meads and Bristol Parkway bike parking stands which is reported in the following Section 7.3.9. The importance of this information is to give an indication of the extent to which the average figure of 2 per cent of rail passengers accessing rail by bicycle (DfT 2007a) are the same individuals making regular journeys or different individuals making occasional journeys. Journey frequency has an influence on the form of bike-rail integration.

[20] The sixteen respondents in Bristol who were surveyed at a weekend were removed from the sample for consistency with the weekday sampling of the NRTS.

7.3.4 Form of bike-rail integration

Table 14 shows the form of bike-rail integration used by the Bristol sample. There is no national figure as to the level of these different forms of bike-rail integration.

Table 14 Form of bike-rail integration N=134

FORM OF BIKE RAIL INTEGRATION	No.	%
Bicycle parked at origin only	55	41%
Bicycle parked at both ends	7	5%
Full size bicycle carried on train	51	38%
Folding bicycle carried on train	11	8%
Bicycle parked at Egress end only	10	7%

Sixty-two of the bike-rail integrators surveyed took their bikes, whether folding or fixed framed, onto the train, and 72 had parked bikes at one or both ends of their journey. As was shown in Appendix I Table FGW data[21] showed that about 2% of passengers had a bike parked near or at the station from which they accessed the rail network and 1% took their bike onto a train. As bike-rail integrators are relatively rare it is difficult to make a confident judgement as to whether within the BRI sample for this research those taking bikes on trains are over represented. There may be a bias resulting from the opportunistic sampling. Though the researcher positioned herself near the parking, it was often necessary to follow the interviewee to the platform or even onto the train to complete the survey. The next sighted cyclist was then likely to be one who had got on or off a train. It was not possible to identify those bike-rail integrators who had parked their bicycle at their origin station outside Bristol or indeed had parked a bicycle at their egress station outside Bristol. However, this sampling strategy has resulted in effective representation of the views of the two main categories of bike-rail integrators, those that park and those that take their

[21] Within this survey, the sample size at Bristol for BRIs would be small though several waves could be combined over a number of years.

bike on the train, but not necessarily in a proportion that reflects the actual situation. The likelihood is that the method of bike-rail integration adopted will depend on the individual's requirements for a particular journey, as well as what is available in terms of facilities at both ends of the journey. In other words, the ratio of those who take their bicycles on the train relative to parking at the station will vary from station to station.

The next section explores why the respondents in the Bristol sample had chosen their particular form of bike-rail integration and to what extent they had considered other options. Information about the experience of the different methods and the extent to which individuals have experimented is important to inform future investment as each method requires the provision of different facilities.

7.3.5 To what extent have bike-rail integrators considered the different methods?

7.3.5 i Bicycle at both ends

Seventy-four people responded to the question "Have you considered a bike at both ends?" of which less than half said "Yes" (45%). After a review of the comments, it became clear that many others had also considered the idea but eliminated it for a variety reasons, including the view that their journey did not require it.

Table 15 Consideration of bicycle at both ends (N=116)

	Frequency	Percentage
Considered bicycle at both ends	53	45%
Haven't considered bicycle at both ends	21	18%
Not applic.– bicycle already at both ends or one off trip	42	36%

In the "not applicable" category, seven respondents had a bike at both ends and the others were making the journey for the first time, or it was a one-off or very sporadic journey. Looking at the responses of those who had a bicycle parked at the origin, 15 respondents commented that it was not necessary because they lived or worked very close to the station at the other end of the journey. One person did not have a bicycle at the other end because his journey involved a very steep hill and there was a good bus alternative. Another was in the process of acquiring a bike for the other end of their journey. Another said it was too much effort to maintain two bicycles. Three respondents who were taking bicycles on trains also appeared to be considering a bicycle at both ends; *"Haven't got round to it, bringing my bike is not too much hassle" "Haven't actioned" "Long term, I'll probably have two bikes".*

It is possible that bike-rail integrators keep bikes at more than one destination, and the very direct question, "Do you have a bike parked at any other stations besides your home station and the station mentioned above?" was added during the survey so the sample size is only 47 (excluding those with bikes on trains), out of which one person had bicycles at three stations: Winchester, Southampton and BTM.

Keeping bicycles at two stations requires a significant effort: purchasing a second bicycle, getting it to the other end of the journey in the first place and the continued maintenance. Both stations need to have secure parking. Unless the journey is fairly frequent, long term and the activity at the other end is at a sufficient distance from the station, this option is unlikely to be considered viable. If bike hire was available it could offer an alternative option.

7.3.5 ii Bicycle carriage

Those respondents who were not taking a bicycle on the train were asked whether they had ever taken a fixed frame bicycle or a folding bicycle on a train. Table 16 below shows that only 20% of the bike-rail integrator sample (N=133) had not, mainly commenting that it was not necessary for them. Others perceived it as difficult: *"Train companies try to make it difficult, bring back the guards vans" "I did consider it but people say it is difficult and I didn't know how to book it".* One person did not know that you could take a bike on a London train.

Those respondents who answered that they had taken fixed-frame bicycles on trains in the past but were not taking a bicycle on this particular journey had had varying experiences ranging from *"excellent, no problems"* to *"unpleasant at times and I don't feel comfortable" "not on a daily journey, too stressful, other passengers get annoyed, not enough space"* and some still did take their bicycles on trains but for other journeys. It was not clear to what extent those who did not have a bicycle on the train with them that day was due to negative experiences in the past or because individuals were making decisions on a journey-by-journey basis.

Table 16 Number of respondents who have taken bicycles onto the train but not for the journey for which they were being surveyed. (N=133)

	NUMBER OF RESPONDENTS	PERCENTAGE
Never taken a bike on a train	**27**	**20%**
Taken a folding bicycle	**1**	**1%**
Taken a fixed frame bicycle	**39**	**29%**
Taken both a fixed framed or folding bicycle	**4**	**3%**
Not applicable as had bicycle on train	**62**	**47%**

This range of experience was also shown by the comments of people who were taking their bicycles on the train on the day they were surveyed. Their comments ranged from *"excellent", "fine", "OK"* to *"stressful"* and a "*nightmare*". This experience is likely to be dependent on the route, carrier, time of day and the flexibility, or otherwise, of particular train staff. Sometimes those with bicycles had to miss trains as the available space was full. Respondents had worked out strategies to avoid this problem, making their journeys at a different time or on a different route or carrier. One person commented that there was less space on the Virgin trains but that taking the First Great Western trains with more space took longer. In other words, bike-rail integrators were taking a number of factors into account while planning their method. One respondent who had no need of his bike at the other end articulated that he took his bike on the train because it would not be safe at his local unmanned station.

7.3.5 iii Folding bicycles

Respondents who did not have a folding bike were asked if they had ever considered owning one. If they answered 'yes' they were asked why they had not obtained a folding bike. Forty-five per cent said they had not considered a folding bicycles. In Table 17 below the 'not applicable' category includes the 11 people who took their folding bicycles on the journey relating to this survey, those who were using their bicycle as part of the purpose of the journey *i.e.* touring or BMX riding and those who had a folding bicycle but were not using it[22].

[22] There were at least four people out of the total sample of 135 who had folding bikes but chose not to use them for the journey on the survey day including one who had taken a full size bike on the train. Another person claimed they rarely used their folding bike and had 2 bikes one parked at each end.

Table 17 Consideration of folding bicycles (N=135)

	Number of Respondents	Percentage
Have not considered folding bicycle	**59**	**45%**
Have considered folding bicycle	**49**	**37%**
Not Applicable – own one (11) or one off journey where bicycle is part of the purpose i.e BMX or leisure trip.	**23**	**18%**

More people answered that they would not consider a folding bicycle but in retrospect the word 'considered' may have led to confusion as some people who answered 'no' then went on to say in their comments that they had considered owning one but then justified their rejection in some way. Strong pre-conceptions were vocalised *"I detest them, cumbersome, I'd look like a complete idiot, not a proper bike" "don't like them" "look slow and small wheels" "(they) don't look like they can go fast" "I don't trust them, heard they snap when they fold".*

There were those who were second-guessing the purpose of the research and perhaps had a feeling that wider ownership of folders was going to be put forward as an alternative to fixed frame bike use, which they rejected - *"Don't see why I should have to"* and *"Too much of a compromise for me".* One person, who had had a folding bicycle but it had been stolen, said it had been *"Ok for short distance, cycling slowly… but the wheel radius is a problem".*

Half of those who said they would consider owning a folding bike but did not at present own one, mentioned cost. The other issues raised were that folding bicycles could not carry as much, either in terms of shopping or a heavy rider. There appears to be an image issue which was mentioned by those who answered that they would not consider owning a folding bike but this also came up with those who would consider it - *"never tried it but feel they have an image problem, do-gooder, not me"; "expensive and look stupid"; "don't look good to ride, compromise between comfort and practicality".*

Others who were considering a folding bicycle made it clear that they had not got to the point where taking a fixed frame bike was too difficult: *"a folding bike is too expensive, only reason I would get one is if I can't get space and have to wait for next train"… "I can get away without it, not essential, do a lot of touring can't afford 2 bikes"*. Another respondent had solved the problem by taking a fixed-frame bicycle at a different time when it was less crowded rather than buying a folding bike.

One person articulated that purchase of a folding bicycle had resulted from their experience of bringing a fixed framed bicycle onto a train *“I got in people’s way, more hassle so I got a folding bike*”. In other words they felt a social pressure.

Folding bicycles themselves take up space and as one traveller commented *“people getting on and off at Oldfield Park, it is even difficult with a folding bike*”. Two respondents with folding bicycles mentioned the lack of storage for folding bikes on the new trains. Another commented there was more space on the intercity trains in contrast to the local trains.

These comments around folding bicycles suggest that there are real and perceived barriers that need to be overcome to promote their use to existing bike-rail integrators and maybe even larger for those who do not already cycle.

7.3.6 Cycle access

The ease of access was considered an important factor that might influence the decision to bike-rail integrate. An open question was asked deliberately, so as not to suggest possible difficulties and to see if respondents perceived or encountered problems. It was anticipated that the lack of cycle routes, traffic conditions and poor signage might be mentioned but this did not happen. In fact the majority (78%) articulated that they did not have access problems at the origin station and 85% did not have difficulties at the destination or egress station. The predominant complaint was that it was difficult to negotiate the ticket barriers at BTM with the consequent queuing and delay that it caused. Three respondents mentioned that they found it difficult to find a bicycle parking space at BTM and another two mentioned the difficulty of manoeuvring a bicycle through a crowded station. These specific problems may not arise at all stations but it was surprising perhaps that comments were not made about cycling conditions generally to get to the station. This does point to the difficulty of survey design, that by offering individuals categories for their answers, it can prompt individuals to articulate a problem which, prior to that survey, they did not consider a problem. Equally, those interviewed are already bike-rail integrating and therefore to some extent may have overcome any access barriers that may remain a problem for new users.

7.3.7 Cycle theft

Bike-rail integrators were asked in this snapshot survey whether they had ever had a bicycle stolen or vandalised at a railway station; 19 per cent said they had had a bike stolen and there were a few mentions of vandalism.

The issue of theft came up in other questions as a factor influencing the respondent's choice of method of bike-rail integration. For example when asked about whether they would consider having a bicycle at both ends, ten people mentioned security as an issue. Of the 11 respondents with folding bicycles, four mentioned security as the reason why they had bought a folding bicycle. As mentioned in Section 7.3.5 ii, one respondent was working at BTM station so did not need it for an onward journey but feared for its safety at his local station. Another brought a folding bicycle on the train to Bristol as he did not like leaving a bicycle at his unsecure home station and would chain his folding bicycle to the rack at Bristol and take out his fixed framed bicycle for his onward journey within Bristol.

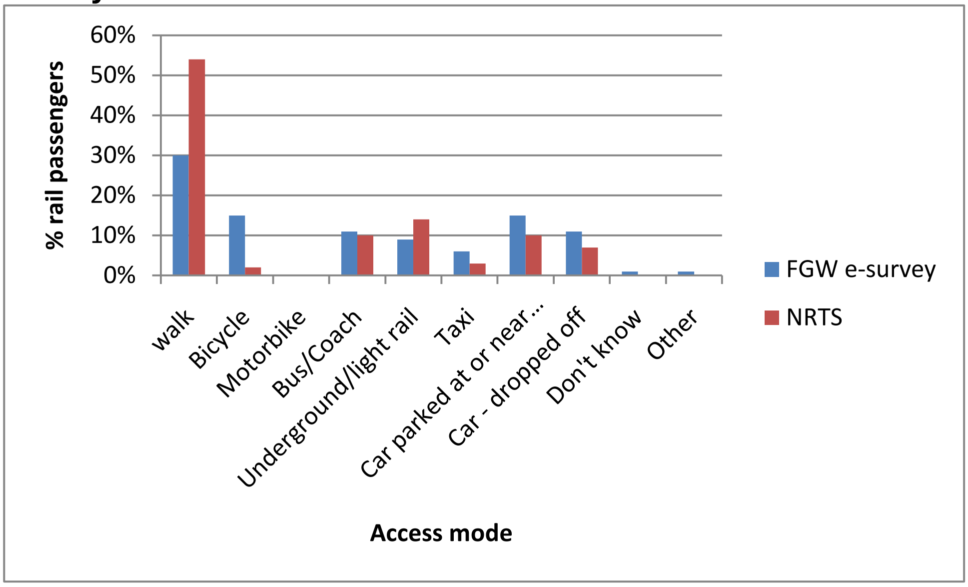
Bicycle theft is clearly a problem, as is the perception of risk of theft, and this is likely to be a barrier to bike-rail integration for some people. Nonetheless, there are others who continue to bike-rail integrate even after having had several bikes stolen. For example, one respondent had had two bikes stolen in three years at Bristol Parkway.

The context of how long people had been bike-rail integrating is not provided, and this made the categorisation for this table difficult, so people who took bikes on trains also answered this question, even though it was not strictly applicable. However, there were some who also parked at the station at other times. These respondents were not put in the 'not applicable' category, which included those who had parked for the first time and those who took bikes on trains but did not park at other times.

7.3.8 Methods of bike-rail integration, some comparative data from the internet survey

Out of the 975 individuals who responded to the internet survey, 15 per cent answered that they would access by bicycle and of those the vast majority (68%) would take their bicycle on the train. This is a high proportion relative to the NRTS (DfT 2007a) access mode figures shown in Chart 20 below and this bias is likely to have been caused by two things: offering a folding bicycle as a prize for filling in the questionnaire which is likely to attract those who access by bicycle but also those who currently take their fixed frame bicycle on the train but may be encountering problems and want to switch to a folding bicycle. In addition, the survey was conducted in August with 63% of those responding undertaking a leisure journey (which compares to the NRTS figure in the South West of 29% which does not include weekends) which may be more likely to require the use of the bicycle the other end.

Chart 20 Internet survey access mode relative to the National Rail Travel Survey



Source DfT 2007a

The fact that there were a greater proportion of respondents intending to access by bike (152) allows comparison with the Bristol sample data of 135. The reasons for not taking a bicycle on the train were similar to those given in section 7.3.5 ii by Bristol bike-rail integrators and divided into two categories, those who did not need a bicycle at the other end and those who were deterred by the lack of space, uncertainty and the particular difficulties at peak time.

The internet survey asked a further question to the 140 respondents who had at some point taken a bicycle onto a train – Why do you take your bicycle onto the train? The majority replied that they took a bicycle on the train for ease of getting to their ultimate destination but one in ten answered that the parking facilities at their origin station were not secure, which gives an order of magnitude to the problem which supports the discussion of cycle theft in the previous section. It raises the possibility of removing 10 per cent of bicycles carried on trains through the provision of more secure cycle parking to free up space on trains for those who do need to take their bicycle.

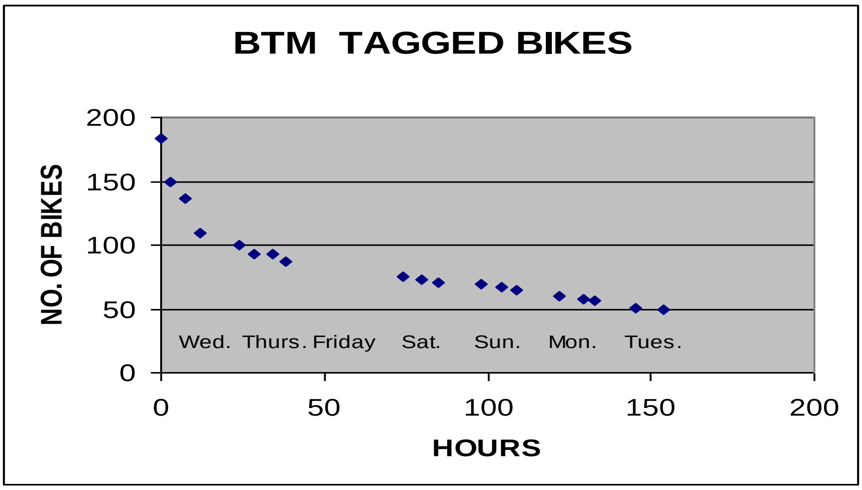
7.3.9 Existing cycle parking and how it is being used

As has been outlined, some bike-rail integrator behaviour was the direct result of the perception that cycle parking was not secure. If further bike-rail integration is to be promoted then as a very first step, better bike parking facilities will have to be provided. This section looks at how the existing cycle parking at Bristol Temple Meads and Bristol Parkway was being used.

In July 2007 all the bikes parked were tagged when the first train service of the morning arrived, as described in Section 6.6.1, to test the hypothesis that many of the bicycles were abandoned. Chart 21 shows the results at Bristol Temple Meads (BTM) where after two peak rail travel weekdays, a Wednesday and a Thursday, 87 out of the original 184 bikes had not moved.

The parked bicycles were not being used every day. Forty-nine bicycles had not moved after a week and of those, 29 did not move for a further six weeks and were removed by FGW as abandoned. The other 20 bicycles that did not move in a week but were 'in use' suggested that either their owners were on holiday, or they were working elsewhere or they used their bicycles very infrequently. This exercise was repeated at Bristol Parkway where 36 bicycles were tagged and the majority had moved after the first day, after two days 7 remained of which 5 had not moved after a week. Three bicycles remained in September and were considered abandoned and removed.

Chart 21 Decay of bicycle parking acts at Bristol Temple Meads



This first exercise simply measured how long it took for the original parked bicycles to be used. A second exercise measured the number of parking acts during the day; four counts were taken at specified times of the day and three counts at weekends. At each count, departures and new arrivals were counted using a grid recording system which allowed a spatial check on the tagging system. It showed a much lower level of activity at weekends as can be identified in Table 18.

Table 18 Bicycle parking arrivals and departures at Bristol Temple Meads

	Arrivals	***Departures***
Wednesday 18th July	195	164
Thursday 19th July	211	231
Saturday 21st July	40	43
Sunday 22nd July	35	53
Monday 23rd July	139	161

The last count of the day as shown in Table 19 suggested that a considerable number of the bicycles had been left overnight and at weekends which suggested that some were being used for egress trips for those living outside Bristol.

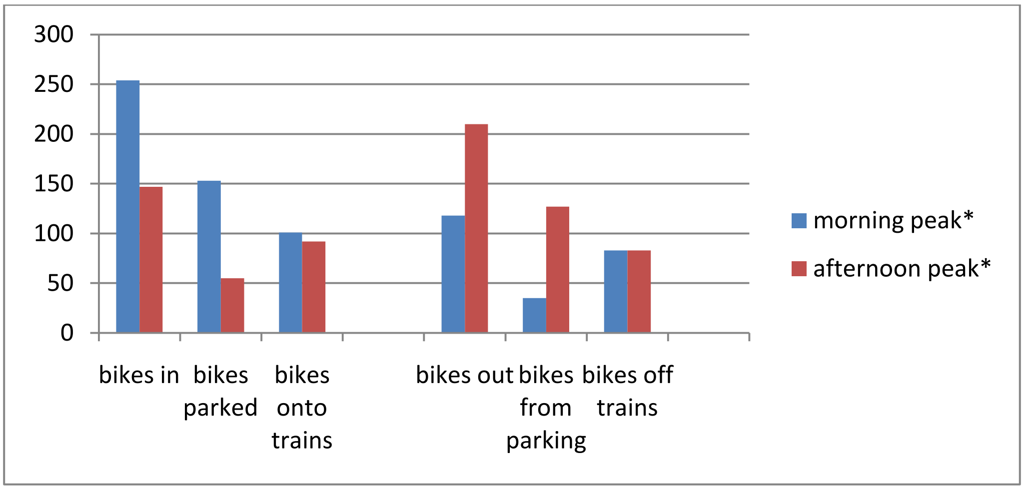
Table 19 Bicycles parked overnight at Bristol Temple Meads

	Date and Time	***Total No. bicycles***
Wednesday 18th July	7 pm	215
Thursday 19th July	9 pm	195
Saturday 21st July	9 pm	232
Sunday 22nd July	9 pm	214

The capacity for bicycles at Bristol Parkway was 48. The official rack is located outside the station building with limited security measures. Only a few bicycles were left overnight. These bicycle parking counts established that parked bicycles were not necessarily moving everyday and that at Bristol Temple Meads there were a considerable number of bicycles left overnight.

As cyclists have to bring their bicycles through the ticket barriers at BTM to access the cycle parking it was possible to conduct simultaneous barrier and parking counts to establish the levels of the different methods of bike-rail integration[23]. Chart 22 below shows the results for the morning peak 7 am to 10 am and the afternoon peak 4 pm to 7 pm and shows roughly the symmetry you would expect. The first two columns in both the morning and evening show the overall flows in and out through the barrier and the subsequent columns break the flow into those that were parked and those that were taken onto trains. As can be seen, bicycles parked in the morning by those living in Bristol are removed in the evening for the journey back home. Those Bristolians who take a bicycle onto the train in the morning return with them in the evening.

Chart 22 Bicycles taken in and out of the barriers at Bristol Temple Meads Station



*morning peak is 7am to 10 am and afternoon peak is 4pm – 7 pm

[23] This methodology does not capture those that had cycled, parked at their home stations before arriving at Bristol and exited the barriers, or those living in Bristol who may have a bicycle parked at their destination station elsewhere for their onward journey.

Table 19 showed that there were approximately 200 bikes parked overnight at Bristol Temple Meads, yet in the morning peak, as Chart 22 shows, fewer than 50 bicycles were removed from the parking to exit the barriers and just over 50 came back into the station to park in the evening peak.

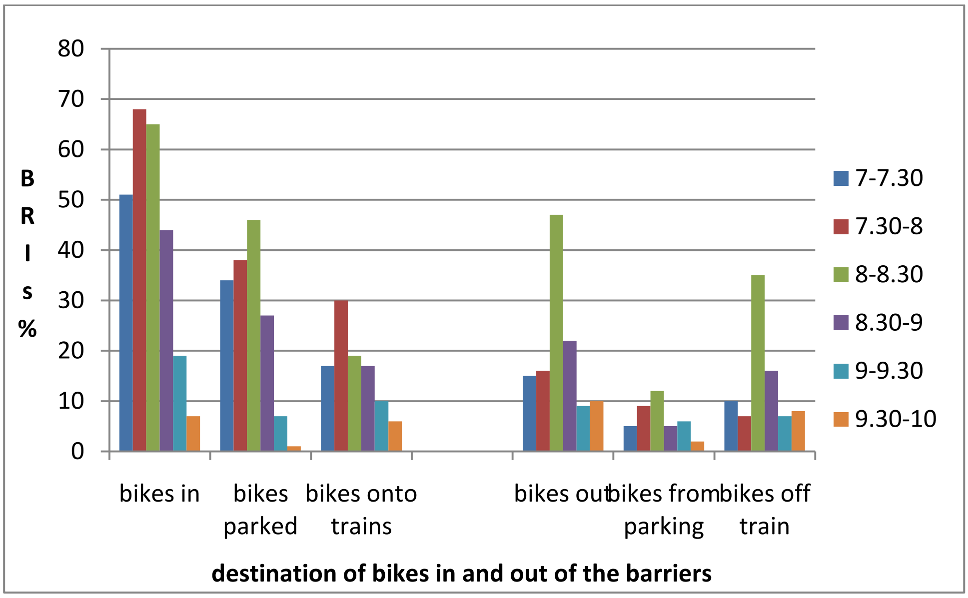
Of the bicycles leaving the station in the morning peak, about a third were removed from the parking and two thirds from trains. In the morning, the flow of passengers with bicycles coming in through the barrier from their homes in Bristol is greater than the number that go out of the barriers, arriving from other parts of the country. It was clear that two passenger groups were using the bicycle parking, those who live in Bristol and those who live elsewhere. This was a less common a practice at Bristol Parkway, with parking outside the barrier and therefore limited security.

The researcher learnt, from the discussions with individuals approached whilst conducting the parking counts, that the quantitative parking data needed to be interpreted with caution, as the behaviour patterns underlying these counts were complex as shown by the examples below:-

- A male bike-rail integrator who lived in Bristol came into BTM in the morning to remove his bicycle from the parking to ride into Bristol (in other words this count might have been interpreted as someone arriving from elsewhere rather than living in Bristol). In fact, he hadn't taken his bicycle home in Bristol the previous evening because it was raining.
- A female bike-rail integrator was also removing her bicycle from the bicycle parking in the morning because she had come back with luggage late at night and decided to get a cab home and leave her bicycle at the station.
- A doctor came through the barriers in the morning after a night working at a hospital in Bristol and was returning home.

Chart 23 below shows the movement of passengers with bicycles in and out through the barriers at half-hour intervals during the morning peak, and whether bicycles are parked or removed from parking, or taken on or off trains. It illustrates that between 7.30 am and 8 am a greater number of bicycles are parked than are removed, but this becomes nearly equal between 8 am and 8.30 am. In other words, as you might expect, those living in Bristol coming in through the barriers with their bicycles to take trains out of the station arrived earlier to park their bicycles than did those arriving from elsewhere to remove their bicycles to use for the onward journey into Bristol.

Chart 23 Morning peak - barrier counts - passengers with bicycles



There is a particular mismatch of supply and demand, or a parking crunch, between 7.30 am and 8.30 am, when those living outside Bristol have not vacated the parking space for those living in Bristol.

Chart 24 Evening peak – barrier counts of passenger with bicycles

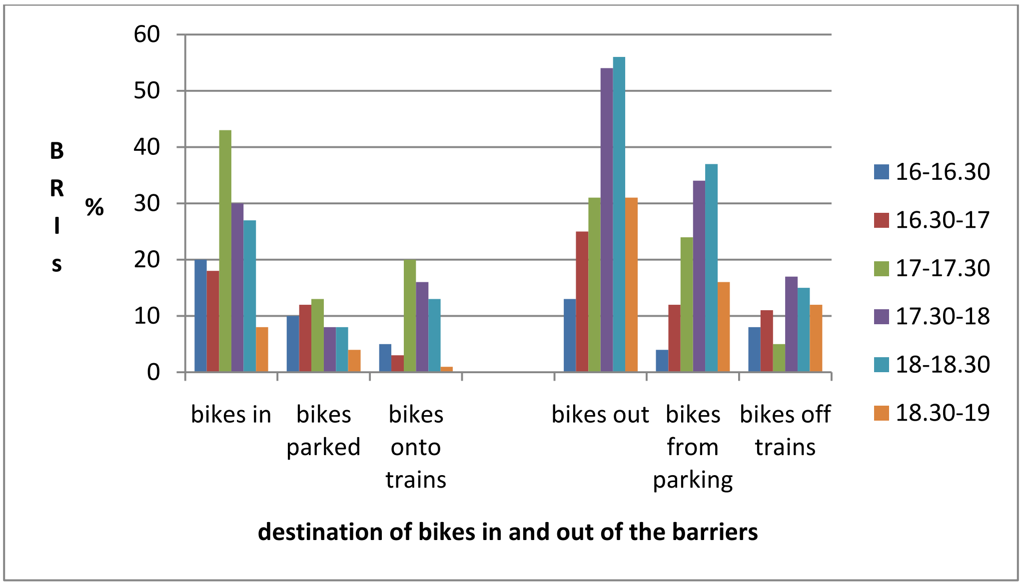


Chart 24 shows that the evening peak for individuals coming into the station is between 5 pm and 5.30 pm whereas for those exiting through the barriers it is between 5.30 pm and 6.30 pm.

Barrier Counts during the morning and evening peak on a Tuesday and Thursday in October 2007 were conducted and the data presented in Charts 25 and 26 show that there is a consistent peak of arrivals between 8 am and 8.30 am in the morning but the evening peak is less consistent.

Chart 25 Bicycle counts in and out through the barriers at Bristol Temple Meads Thursday October 4th.

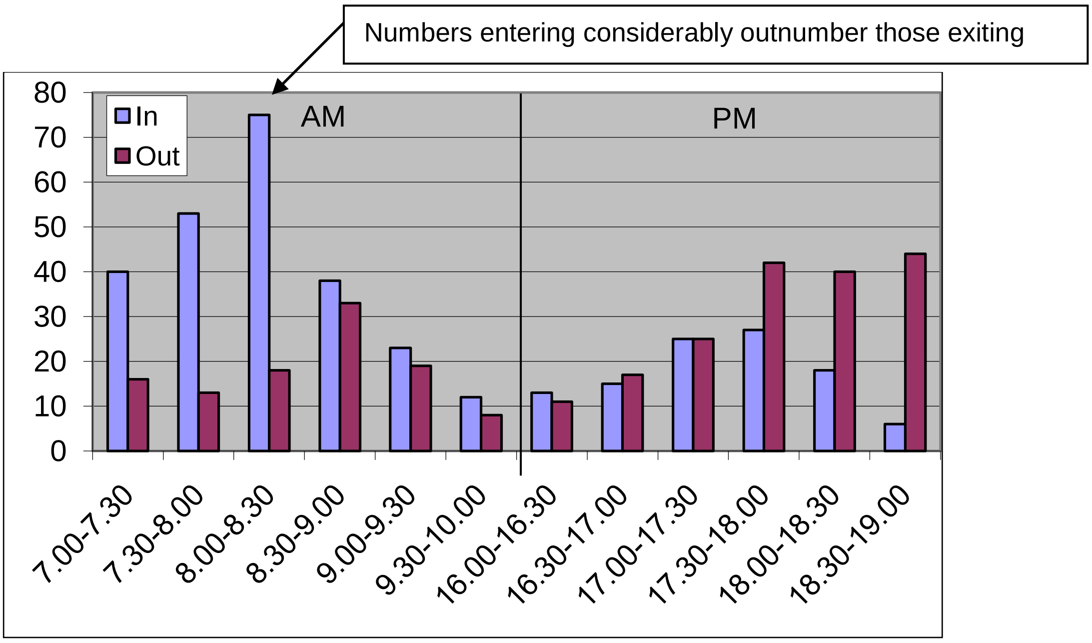
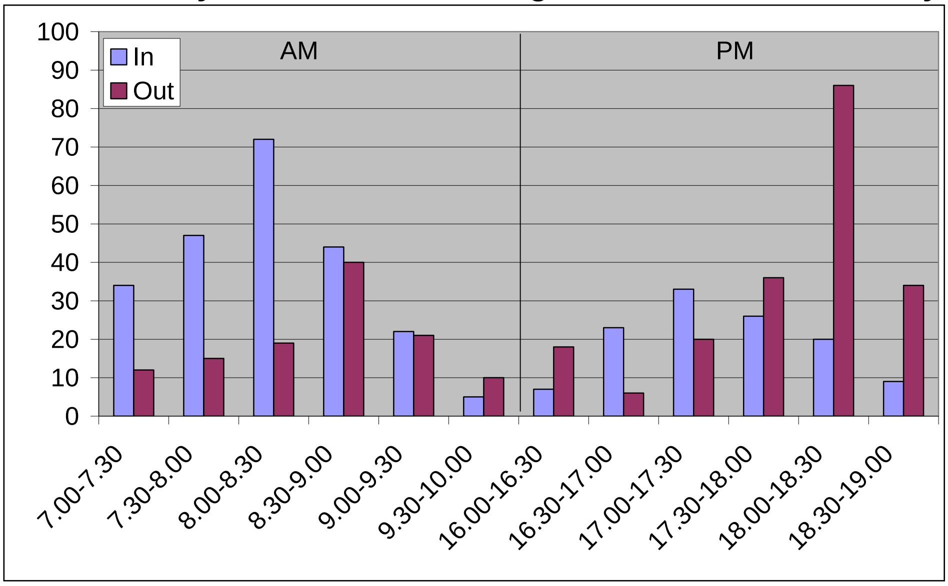


Chart 26 Bicycles in and out through the barriers on Tuesday October 9th



The figures in Table 20 below were averaged out over the three barrier count days, albeit one that was taken a year later, which showed that, of the bicycles coming into Bristol Temple Meads in the morning, about 10 per cent were folding bicycles in contrast 25 per cent of the bicycles leaving the station in the morning – in other words coming off trains from elsewhere. This pattern was broadly reversed in the evening peak with 21 per cent of the bicycles coming into Bristol Temple Meads being folding bicycles and 10 percent of all bicycles leaving the station in the evening peak.

Table 20 Total barrier counts over three days showing the proportion of folding to fixed frame bicycles

Morning Peak	**Fixed in**	**Folding in**	**Total**	**Fixed out**	**Folding out**	**Total**
Thurs Oct 4th 07	217	23	240	84	23	107
Tues Oct 9th 07	200	24	224	84	33	117
Wed Oct 15th 08	227	27	254	86	32	118
Afternoon Peak	**Fixed size in**	**Folding in**	**Total**	**Fixed out**	**Folding out**	**Total**
Thurs Oct 4th 07	83	21	104	158	21	179
Tues Oct 9th 07	94	24	118	180	20	200
Weds Oct15th 08	113	34	147	195	15	210

The discussion in the previous sections about the experimentation with different methods of bike-rail integration show that this proportion of folding bicycles to fixed frame bicycles is likely to vary from station to station, depending on the particular context, the security of available bicycle parking and the capacity available on trains.

The combined parking and barrier counts have provided considerable data on how the parking is being used and, in combination with the qualitative data collected through chance conversations as counts were being executed and the face-to-face survey show that these counts represent a multitude of behaviours. The three examples below illustrate that the daily commuting bike-rail integrator is only part of the story.

- A female bike-rail integrator lived in Cumbria and worked in Bristol Monday to Thursday so her bike was left over the weekend and removed from the station between Monday and Thursday.

- A train driver living in Brislington who cycled to Bristol Temple Meads along the river and parked his bike at very different times of day depending on his shifts.

- A Bath resident parked her bike at Bristol Temple Meads to use it during the week to cycle up to Bristol University. If she needed her bike at the weekend in Bath she would take it home on the train on a Friday night and return it the following Monday.

This level of data collection has not been done before and it clearly illustrates the complexity of the journey patterns individuals are undertaking and the level of movement within the cycle parking area. The perception that bicycles never moved proved to be wrong: only 10% were derelict (that is taking the available parking spaces at BTM as 300 which were full during the day and often had more than that number parked). In other words, the fact that the stands appear full is not because they are clogged with derelict bicycles (though there could be more frequent culls) but because the bicycles belong to two different groups parked at different times. Many of the bike racks are being used by two rail passengers each day, those who live outside Bristol and park overnight, and those that live in Bristol and park during the day. The times of travel of the two groups do not necessarily coincide which is not too much of a problem until you have limited capacity. Within the racks there will be some bicycles that move once a week and others that move every day.

This detailed information is useful in terms of assessing the likely impact of providing new cycle parking. So, if you increase parking capacity it is possible that it may attract more bicycles belonging to those living outside Bristol who may only use them infrequently and not remove them from the racks in time for Bristolians to use them. In other words, it is possible that you would be providing increased capacity for a half hour period between 7.30 am and 8 am (Chart 25 and 26). New capacity could be created with a more consistent management or culling of abandoned bicycles. If some bicycles stand in the rack for seven days a week but are only used once a week, it suggests that providing bike hire could also free capacity. In addition, the availability of hire bikes would enable tourists and visitors to access Bristol by train and make their journeys within Bristol on a bicycle. If, as was suggested by the internet survey result (Section 7.3.8), one in ten of those taking bicycles on trains are doing so for fear of leaving their bicycles, the provision of more secure parking might also free capacity on the trains.

The bike-parking and barrier count methodology was not able to estimate to what extent the same people bring the same bicycle every weekday but the face-to-face survey suggests that more than a third of bike-rail integrators are making a first time journey or another pattern of infrequent journeys (see section 7.3.3 Table 13). In other words, the pool of bike-rail integrators might be larger than would be estimated from simply making a calculation from the number of spaces provided. The next section outlines the results that give an insight into the motivating factors for bike-rail integration.

7.4 Why do bike-rail integrators engage in this behaviour?

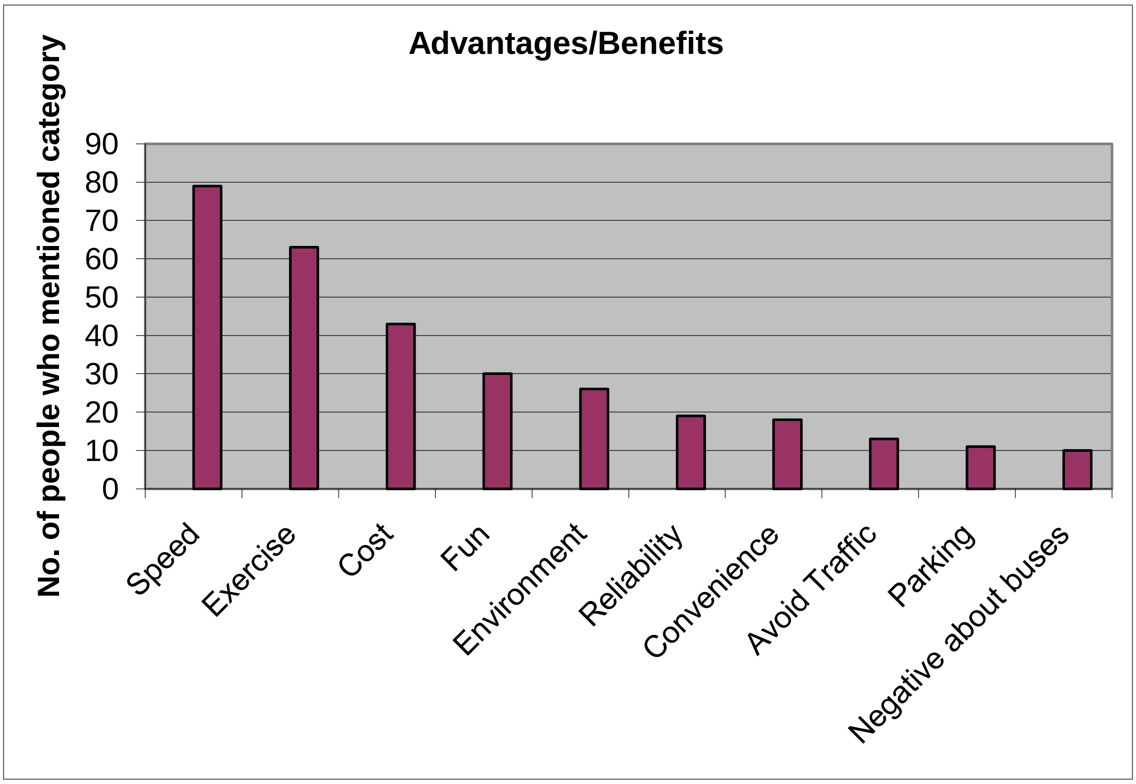
The previous sections have illustrated that there is quite an investment of time in choosing to bike-rail integrate successfully and therefore it is important to understand why, despite the apparent difficulties individuals still choose to do it.

7.4.1 Advantages of cycling to the station

Bike-rail integrators were asked open question, "What do you consider are the advantages or disadvantages of cycling to the station?" The responses have been categorised in Chart 27 on the next page showing the number of respondents who mentioned each category summarising the motivations behind their decision to bike-rail integrate. These included attributes generally regarded as having positive associations - speed, exercise, cost, fun, environment, reliability - alongside 'push' factors with negative associations - lack of car parking, congestion, unreliability or lack of a bus service.

Some respondents gave several answers and some just one. "*Absolutely the most convenient mode of transport ever invented especially in cities*" said one respondent. Patterns were looked for in the data and comments categorised. For example, in the case of speed it was referred to in a number of ways: *"quicker than walking"; "quicker than by car"; "quicker than by bus"*; *"faster*" and *"to avoid traffic*". In a sense, avoiding traffic could be interpreted as speed or reliability and those who articulated it by saying to 'beat' traffic or avoid traffic were drawn into the separate 'avoid traffic' category. The reliability category is the number of times respondents stated that they could "*control*" the time their journey took - "*reliable*" "*consistent journey time*" "*guaranteed journey time*" "*know exactly the journey time*". In other words, reliability is a different concept to speed and describes the need to have certainty of journey time.

Chart 27 Advantages/benefits of cycling to the station (N=135)



Exercise was referred to in a number of ways – “*healthier*” “*keeping fit*” “*exercise*” “*mood*” and “*mental health*”. Several people said that cycling to the station was the only exercise that they got, one person used the term “*incorporate exercise into the day*” another person claimed “*it saved on a gym*” and another was specifically getting a bicycle to go on a sponsored bicycle ride for which he had been training indoors on a gym bicycle.

Fun is a category where respondents mentioned the benefits in terms of their experience of cycling itself rather than viewing it as just a mode of transport *“I love cycling” “better mood” “wakes me” “fresh air” “enjoyment” “less stress”.* Perhaps mental and physical well-being could be a category into which exercise and fun could both fall.

Environment captures those who said things like *“environmentally friendly” “not contributing to pollution” “greener” “more ecological”*.

Convenience is a more nebulous term, as one person’s convenience may not be convenience for another but, apart from those who actually use the word convenience, it also includes those who used the word *“easier”.* One surprise is that very few people used the words independence and flexibility.

This open question did yield a high level of consistency across answers but there seemed to be a division of respondents into those who made very specific calculations about journey times and others who when asked the question simply answered "*I feel better*" or "*I'm in an office all day, it's for my mental health, I'd be depressed*".

This question raised many of the issues discussed in Section 4.2.4 about the different weights of instrumental and affective factors in travel decision making. The ways in which respondents articulated their answers shows the difficulty of measuring the relative importance of these factors. For example, individuals may be motivated to cycle for quite similar reasons, but they articulate it rather differently. Someone who gets very impatient waiting in traffic, or waiting at a bus stop might respond to the notion that cycling is a way of "beating the traffic" rather than that it is just quicker. Others articulated the benefits relative to their alternatives, so for example, ten respondents saw cycling as a way of avoiding the bus and made negative comments about their experience with buses.

In the semi-structured interviews one prompt explored the balance between cycling for practical reasons or the more emotional reasons, the enjoyment. Over half of the respondents mentioned practical reasons during the conversation but several mentioned that the two are closely related.

"I don't think you can separate: on the one hand I consider it to be a necessity for practical reasons, but on the other hand it is something I like doing"

"I do it for both practical reasons and as a choice, it makes a lot of sense and I love it. Why choose?" It is fun, good for you, often quicker and leaves your CO_2 conscience clear"

There are factors that relate to the respondents' circumstances as well as those that have more to do with their mental and physical health. One respondent answered that cycling is her only option as she lives on a houseboat and the station is sufficiently far that, without a bicycle her only other alternative would be walking which would take too long. Two respondents mentioned that it obviated the need for a second car. There are others that see cycling as one of many options, so, for example, one respondent made a complex calculation for each journey taking in factors such as time of day: he would bike-rail integrate to Bath in the rush hour but drive off-peak. This data further supports the conceptual model in Figure 5 Section 5 showing the web of interactions of influencing factors that combine to prompt the decision to bike-rail integrate.

The semi-structured interviews provided further support for the face-to-face survey question about advantages and disadvantages. The practical considerations were most commonly mentioned i.e. speed, convenience (38 respondents), followed by exercise (28 respondents) and environmental and enjoyment.

How people described their enjoyment of cycling varied. Some discussed the enjoyment of scenery, being outdoors and the physical activity "*I enjoy the feeling of cycling and the increased fitness it give me*". There were those who liked the excitement "*I like the excitement of cycling in Bristol: it's hairy!"*

7.4.2 Disadvantages

Fewer respondents gave an answer to the element of the question asking whether they saw any disadvantages of cycling to the station. Clearly those in the sample are bike-rail integrating so they are likely to see more advantages than disadvantages as a proportion (those not making the journey for the first time) will have solved some of the problems initially encountered. Hence, the few that did see disadvantages tended to give one or two disadvantages, whereas respondents were more likely to give several answers for advantages. A contributing element might have been the ordering of the question in that it was asked as one "What do you consider are the advantages or disadvantages of cycling to the station?"

Table 21 below shows that there were four respondents who stated that they did not think there were any disadvantages to cycling and a further 74 respondents said nothing. Weather and the lack of consideration of car drivers and safety issues were the two main disadvantages that people mentioned. The station issue category in Table 21 includes crowding and queuing at the barriers. Two respondents mentioned the issue of clothing and difficulties with wearing a suit.

Journey context, the specific journey and its purpose will influence which of the interacting factors in the conceptual model Figure 5 Section 5 are particularly important at a given time. So for example, leisure journeys are likely to be a less regular pattern with varying destinations and the timing of the journey may be more flexible. The next section shows for what purpose the bike-rail integrators were travelling.

Table 21 **Disadvantages (N=131)**

	NO. OF RESPONDENTS
DISADVANTAGES	**53**
NO DISADVANTAGES	**4**
NO COMMENT	**74**
	NO. OF TIMES A CATEGORY MENTIONED
WEATHER	**29**
DRIVER BEHAVIOUR/SAFETY	**19**
LACK OF PARKING/THEFT	**8**
STATION ISSUES	**5**
LACK OF SPACE ON TRAINS	**4**

7.4.3 Journey purpose

Table 22 **Journey purpose of Bristol sample (N=135)**

Journey Purpose	Frequency	Percentage
Work	72	53%
Education	11	8%
Employer's Business	20	15%
Personal business	3	2%
Social	15	11%
Shopping	3	2%
Leisure	7	5%
Other	4	3%

As can be seen in Table 22 above, half the respondents in the Bristol sample were commuting to work and a further 15% were travelling on business.

Table 23 shows that the Bristol sample has a greater proportion of individuals commuting and a lower level of those travelling for leisure than found amongst rail travellers which may be explained by bike-rail integration being more common for commuting. Using a Goodness of Fit Chi-squared test this was found to be a significant difference and even more significant if just the data for South West travellers was used. (χ^2 = 6.33 (NRTS) = 23.61 (NRTS SW), df = 2, $p < 0.05$) (Appendix V)

Table 23 Journey purpose comparison

Journey Purpose	Bristol sample %	NRTS %	NRTS % in the South West
Commuting (work and education)	82	63	48
Business	23	16	24
Leisure	14	21	29

In the NRTS (DfT 2007a) journeys are grouped into three main categories: commuting, business and leisure. The definition of commuting includes journeys connected with education: mainly students travelling to school or college. Leisure trips include a fairly wide mix of reasons for travel, such as social visits, shopping and entertainment. The Bristol bike-rail integrators[24] were grouped similarly for comparison. These patterns are likely to vary across the South West, so, for example, in the far South West during the summer there would be a much higher proportion of leisure travellers.

Martens (2004) has argued that there are ‘push’ factors to access rail by bicycle as the alternatives often confer less benefit. Hence the Bristol bike-rail integrators were asked “What other journeys apart from to and from the station do you make on a bicycle?” to gauge to what extent they cycled generally. Responses were recorded against pre-defined categories: work, education, employer’s business, personal business, social, shopping, days out and short breaks (see Table 24)[25]. Four people out of the total sample mentioned that they raced and two that they had trained for an event.

[24] Those travelling at weekends in the BRI sample were extracted to be comparable to the average weekday sample of the NRTS
[25] An ‘other’ option was provided. The categories were not openly visible to interview respondents but those that returned the survey by post did see the categories.

Table 24 Number of other cycle journey purposes excluding leisure and short breaks (N=135)

NUMBER OF OTHER PURPOSES	No. of Respondents	Percentage
0	22	16%
1	18	13%
2	32	24%
3	41	30%
4	17	13%
5	3	2%
N/A	2	1%

If “days out” and the short break options were excluded, of the individuals surveyed 16% did not use bicycles for any journey purpose other than the journey purpose they were making that day. In other words, they did not cycle for any other utility purpose, though they may have made leisure cycling journeys: days out or breaks. This suggests there is a group of individuals who only cycle to the station as a utility journey; they do not cycle for other utility purposes, although they may do so for leisure. As shown in Section 3.2, 26 per cent of motorists are occasional cyclists and of those, 83 per cent cycle for leisure only. This suggests that there is a pool of individuals with cycling experience limited to leisure and perhaps the journey to the station could be a first step towards seeing cycling as a transport mode rather than a leisure activity.

In the semi-structured interviews, respondents were asked to categorise themselves as types of cyclists: fair weather, utility, leisure and sport cyclist were suggested. A spectrum emerged ranging from those who cycled in any weather and firmly categorised themselves as utility cyclists only, those who cycled for leisure as well as utility purposes, and those who predominantly cycled for leisure. So, for example, one respondent articulated that he was a utility cyclist but also a ‘fairweather’ leisure cyclist.

As was discussed in Section 5.4.1 there are real difficulties with categorisation as the reality is rarely clear cut. So, for example, an individual categorised as a 'leisure cyclists' may in certain circumstances make journeys for other purposes. Table 25 below shows the number of times each category of purpose was mentioned by respondents that they cycled for, or indeed were cycling for on the day of the survey. So, 79 per cent of those surveyed cycled to their workplace either the whole way or as part of a bike-rail integrator journey captured in this survey.

Table 25 Number of respondents who said they cycled for each category (N=133)

	No. of Respondents	Percentage
WORK	105	79%
EDUCATION	20	15%
EMPLOYER'S BUSINESS	32	24%
PERSONAL BUSINESS	68	51%
SOCIAL	91	68%
SHOPPING	93	70%
DAYS OUT	78	59%
SHORT BREAK	50	37%

This suggests that there is a wide range of cycling behaviour amongst bike-rail integrators supporting the idea that within the group 'cyclists' there are many subgroups (see section 3.2 (Lawson 2002) and section 5.4.1 (Davies et al. 2001)). Davies et al. (1997) looking at attitudes to cycling identified five different types of cyclist; practical cyclists, idealist cyclists, fair-weather cyclists, lifestyle cyclists and mainstay cyclists.

Fifty respondents said they had cycled on a short break and the majority had taken their own bicycles with them (Table 26). One respondent did not take his bicycle and presumably hired or borrowed a bicycle at the destination. Respondents used more than one method to convey their bicycles depending on the journey (Table 27).

Table 26 Cycle carriage for short breaks (N=48)

	How many respondents
TOOK THEIR BICYLES ON A SHORT BREAK	47
DID NOT TAKE THEIR BICYCLES	1

Table 27 Method of cycle transportation (N=48)

	How many times that method mentioned.
TRAIN	32
CAR	21
FERRY	4
CYCLED WHOLE WAY	3
PLANE	7

Amongst those who are familiar with bike-rail integrating is a group who choose to use a car for a short break and take their bicycles on the car. As was mentioned in Chart 4 section 2.3, rail travel generally is relatively rare and there are many cyclists who do not use rail, but one advantage of rail over a car is that you can cycle without having to return to the same place. Equally, if parking a car at the destination was difficult this might act as a prompt to consider rail.

However, one reason for using the car rather than the train is that if the group travelling is bigger than two, with a limit of two bicycles on trains on some routes, the group would have to split up and take different trains. These are considerations that need to be taken into account if interventions are to consider the promotion of bike-rail integration for leisure. As was explained in the introduction, this research project has not been able to look specifically at bike-rail integration for leisure but as the previous sections have made clear, with limited capacity for bicycle carriage, decisions about the prioritisation of the different types of bike-rail integration will have to be made. It could be argued that for the more regular commuter journeys, bicycle carriage would be less necessary if the parking facilities were improved or bike hire provided. It could be envisaged that the bicycle carriage capacity could be seen as a back-up alternative for regular bike-rail integrators in a number of circumstances – bad weather, bicycle maintenance or a later than expected journey. For those who are taking a bicycle as part of a leisure activity it may be more important to have a specific bicycle and equipment and they may not wish to return to the same place. The next section looks at how the bike hire alternative is viewed by existing bike-rail integrators but also how cycle access is viewed by rail travellers who do not currently access by bicycle.

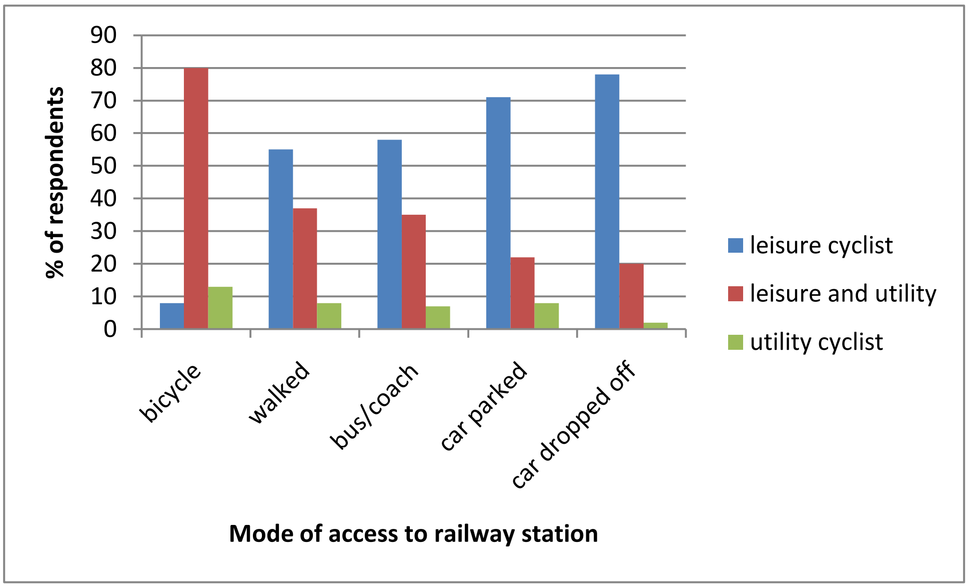
7.5 Would current rail users consider cycle access and would current bike-rail integrators consider bike hire?

This section outlines the results of two hypothetical questions to see the extent to which rail users might consider changing their behaviour to cycle access and the extent to which bike-rail integrators might consider bike hire. As was suggested in Section 5.4.1, what people say they will do does not necessarily correlate with what they actually do but it gives an indication as to their propensity and gives insights into what might be some of the difficulties in promoting either option.

7.5.1 Would current rail users consider cycle access?

The internet survey showed that of those planning or booking a rail journey (N=975) 61% owned a bicycle and 45% were not going to use it to access the rail network for their journey. All those who owned a bicycle, whether they had said they would use it to access the station or not, were asked to classify their bicycle usage as either a leisure cyclist, a leisure and utility cyclist or just a utility cyclist. They were given the definition of a utility cyclist as someone “using a bicycle for a reason e.g. going to work”. Chart 28 shows the answers of those who would access by different modes and shows clearly that car users are clearly more likely to see themselves as leisure cyclists and perhaps do not see cycling as a mode of transport but as a recreational activity.

Chart 28 Self categorisation of those owning a bicycle and how they intended to access the railway station (N=594)

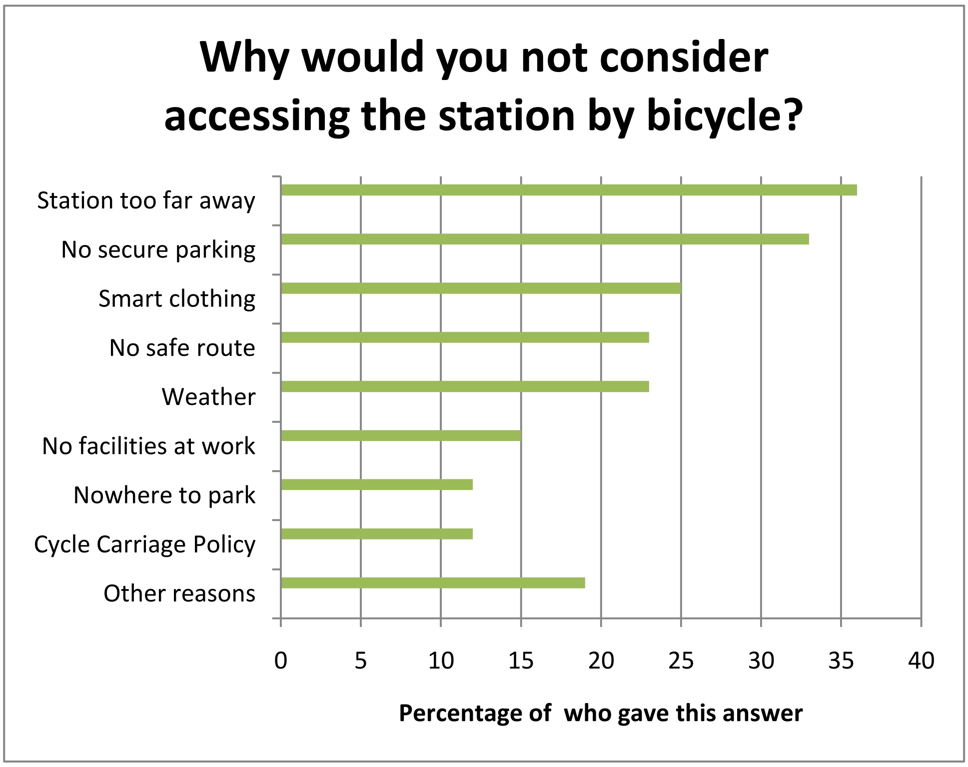


All those who owned a bicycle (61% including those who were intending to use their bicycle for access) were asked if they would ever consider accessing the station by bicycle and, regardless of whether they had said they intended to walk, use public transport or park their car, over half said they would consider using their bicycle to access the station. This was not the case for those who had said they would be dropped off at the station of whom less than half said they would consider accessing by bicycle. There could be a number of explanations for this, including that they would be departing for an extended length of time and needed to carry luggage.

The responses are hypothetical and therefore not the same as actually carrying out the behaviour, so the result has to be treated with caution but it does suggest that a reasonable proportion are at least willing to entertain the idea of using their bicycles to access the station and this in turn suggests there may not be a distance barrier.

Those respondents who owned a bicycle but had said they would not consider using it (N=209), were then asked, "Why would you not consider accessing the station by bicycle?" and the percentage of individuals who gave a particular answer is shown in Chart 29 below. Distance was mentioned most (supporting the research outlined in Section 3.5.2) but only slightly less often mentioned was "not safe to leave a bicycle at the station", which was the actual description in the questionnaire (labelled as "no secure parking" for ease of representation in the Chart 29 below). This lends further support to the findings in section 7.3.7 and 7.3.8.

Chart 29 Reasons for not considering accessing by bicycle (N=209)



7.5.2 Will existing bike-rail integrators use hire bikes?

The face-to-face survey of the 135 bike-rail integrators outlined in Section 6.6.3 included a hypothetical question to understand better the potential demand for bike hire as an additional cycle access option and as was pointed out in Section 7.3.9, a way of increasing bicycle parking capacity by removing bicycles that are used infrequently.

Respondents were informed that “new technology has allowed the possibility of hire bikes being available 24 hours at railway stations that can be unlocked using a swipe card” and were asked the hypothetical question “Would you consider hiring a bike at the station at which you completed this journey if it was possible at reasonable cost?”

Of the 120 respondents who answered this question nearly two thirds said that they would consider hiring a bike[26] despite the fact that they already owned a bicycle and had found a

[26] In the internet survey 30 per cent of respondents who said they would use their bicycle to access the station (N=152) said

method of bike-rail integration that suited their needs. This result showed that even amongst existing bike-rail integrators there is a potential demand for rental bicycles. However, hypothetical questions are always difficult and understandably people wanted more details about how the system would work. Some answered the question in the context of their own particular journey and others considered the general relevance of the concept to them. So, for example, one person believed the system would not have sufficient flexibility as they took a bicycle on trains to many different stations, so its availability at one or two stations and not others would be of less use.

Of those who said they would not consider it, there was a sense that they had already invested in a bicycle so why would they consider it. Negative statements included *"I like my bike"* and *"I've got a bike"*. One person replied *"I'd prefer to spend £25 on a second bike"* so they would prefer to have a bicycle at both ends rather than hire a bicycle. Others had an image of clunky bicycles and were concerned about whether the bicycles would be suitable for their needs and purposes: Would they adjust for a tall person? Would there be good availability at the stations? Would there be panniers for luggage? Hence, the concept appeared to clash with a key motivator of bike use - flexibility and certainty - whilst bike hire might add to uncertainty, summarised with the question 'would the right bike be available?'

Similar practical issues were raised by those who would consider bike hire as can be seen in the text box below.

"I go to Paddington a lot, it would be great there, I occasionally take my bike but it is a nuisance"

"Could be good, as I have no idea what the weather will be like in Bristol when I leave Birmingham with my bike"

"I'd be interested for business trips"

"Some people don't like the hassle of taking bikes on trains, but I'd use my own bike as I wouldn't want to pay".

The comments show that the respondents were trying to work out how bike hire would be useful to them. One person suggested it should be free and another thought it should be

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that they would consider hiring a bicycle included in the rail ticket. Cost, maintenance, length of hire and availability were all considerations.

As the previous sections have shown, there are many different motives and circumstances for the different methods of bike-rail integration. Bike hire may not suit everyone for all their journey requirements but it would give additional flexibility including for emergency use in case of puncture, theft or repair. As is shown in Table 13 Section 7.3.3, many bike-rail integrators were making infrequent journeys and therefore maintaining a bicycle at both ends is less feasible and given that there is a lot of uncertainty around the availability of space for bicycle carriage, bike hire offers an alternative. As was pointed out in section 5.3 it would also make trying cycle access easier before making the decision to purchase a bicycle.

7.6 The influence of car availability

A key section in this thesis is Section 2.3, outlining the influence of car ownership and usage on the use of alternatives like cycling or bike-rail integration. The growth in car ownership in the last 27 years has been through one car households adding additional cars. This probably leads to a surplus of availability which requires less negotiation within households about who gets access to a car and for which journeys and therefore less exploration and deliberation about alternatives. Decisions are then made on perceptions of alternatives rather than experience and, as was pointed out in section 4.2.1, 4.2.2 and 4.2.4 these perceptions can be distorted.

Within the bike-rail integrator sample there were two individuals too young to drive but, of the rest, 62 per cent owned a car (Table 28). Thirty-eight per cent of the bike-rail integrator sample said they did not own a car, though in some cases they added information that their partner had a car. In other words, ownership does not necessarily imply availability.

When the car owners were asked if their car was available for the journey to the station that day, 71 per cent said their car was available to them but they chose not to use it. So 44 per cent of the total bike-rail integrator sample had a car available for that journey but chose to cycle.

Table 28 Car ownership and availability (N=133)

CAR OWNERSHIP AND AVAILABILITY		
	Number	Percentage
Car Ownership	82	62%
Car Available but didn't use it to access the station	58	44%
Car Available and used it	5	4%

As with all questionnaires there is a limit to the number of questions and the key was 'availability' and in retrospect it might have been useful to know how many people lived in each respondent's household and how many cars were available. In metropolitan built-up areas or large urban areas between about 20 per cent and 30 per cent of households do not have cars (Chart 5 section 2.3). For Bristol the figure is at the higher end with 29 percent of households without a car or van (Census Office of National Statistics 2001).

Those bike-rail integrators with a car available were asked a supplementary question; Why didn't you use your car to get to the station? Some gave positive reasons as to why they had cycled, others negative reasons, for example, that they did not want to pay for car parking, and in some cases both positive and negative responses. The push factors were a dislike of traffic, the hassle, the cost and lack of availability of parking. Several answered *"it wouldn't make sense to drive to the station" or "I wouldn't consider it".*

Seventeen per cent of the Bristol sample (N=135) answered that they would consider using the car for the whole journey. Their reasons for choosing to bike-rail integrate were a preference for train travel*, "so much more pleasurable, a proper outing, exploring" "time to read and relax", "I can work on the train, driving is exhausting".* Similar reasons were given for not using the car for the whole journey to those given for not using it to access the station. Several mentioned that their journey was too long and therefore too tiring to drive "*M5 commute is unpleasant*" "*M4 and fatigue*". Cost was also mentioned: one respondent said *"a train season [ticket] is £608 and parking would be £1400 in Bristol*". The following box shows the some of the reasons given for why respondents were not using their car for the whole journey.

“used to drive, started to bike-rail two years ago for fitness, pleasantly surprised”

“I would need a second car, hate traffic jams, the cost and bad for the environment”

“10 years ago maybe, but not now”

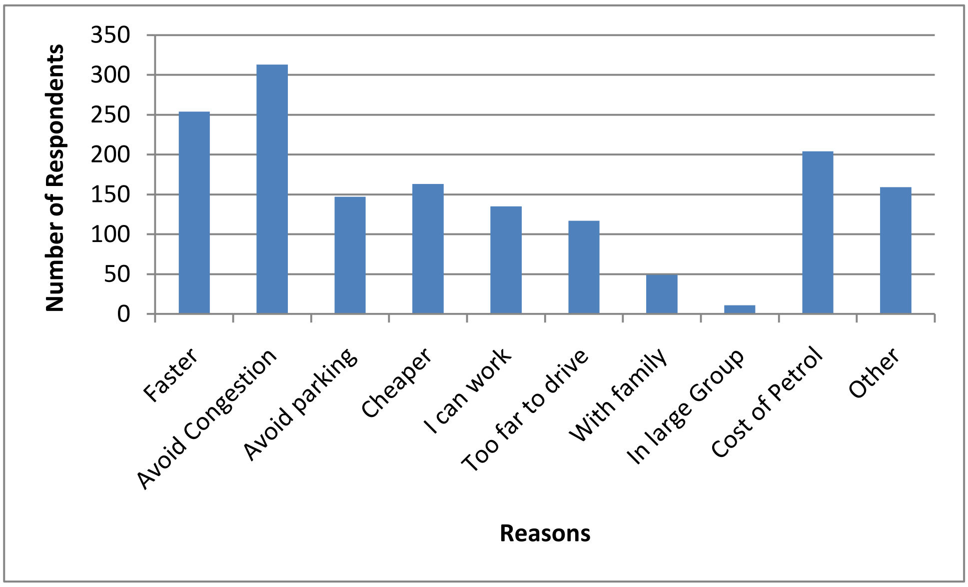
“don’t like driving and there is a viable alternative”

“I like to read and relax”

There are positive reasons why individuals are using rail rather than their car but the lack of availability of car parking at the station (Section 2.5) and at the final destination of a journey may also act as ‘push’ factors.

Chart 30 shows the reasons that internet survey respondents gave for choosing rail despite having a car available.

Chart 30 Reasons for choosing to travel by rail rather than car (N=772)

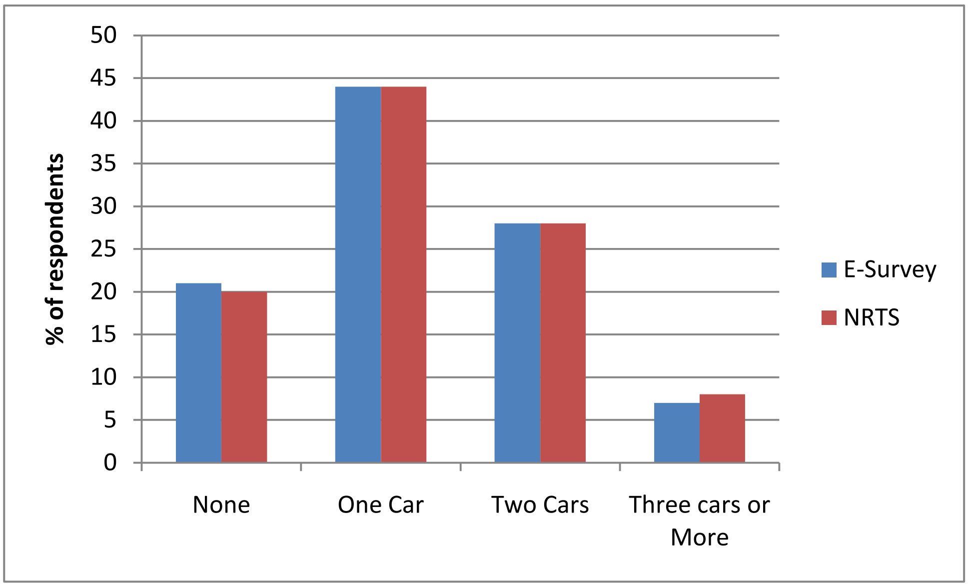


The answers in Chart 30 broadly corroborate some of the answers given in the face-to-face survey in Bristol but, interestingly, in the internet survey respondents were given the categories, rather than an open question. This introduced the idea of cost of petrol which did not come up in the open question in the face-face survey.This supports the evidence discussed in section 4.2.5 that the format of the questionnaires affects the answers.

If those with access to a car are actively choosing rail, it is useful, in terms of attracting new users to understand what they perceive as the benefit. If those actively choosing rail are doing so because it saves time, avoids congestion or they can work on the train, marketing measures can encapsulate these messages. In the case of motivations for cycle access, exercise was the second most important motivator (see Chart 25 Section 7.4.1). The opportunity to read and exercise were used as messages in the bike-rail experiment oulined in Section 8.4 to see if they would attract individuals out of their car.

The internet survey provided data from a wider geographical area, and Chart 31 below shows the levels of household car ownership within the households of the 975 respondents, relative to the NRTS sample. A follow up to respondents in car owning households asked whether a car was available to them for the specific journey for which they were booking a rail ticket. Fifty per cent answered that a car was available, slightly higher than the 44 per cent in the Bristol bike-rail integrator sample.

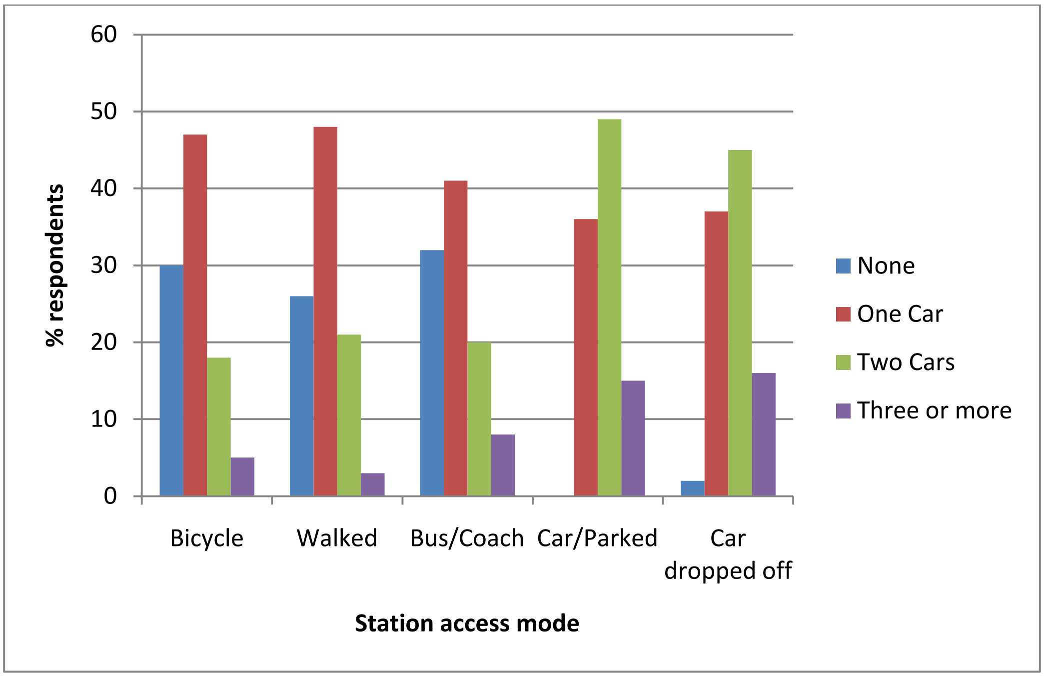
Chart 31 Household car ownership in internet survey relative to NRTS (N=975)



Source DfT 2007a

Chart 32 below plots the access mode that an individual proposed to use showing that those with two or more cars in a household are more likely to access rail by car but even in households with two or more cars there are individuals that choose to cycle. Again, this supports the ecological model approach (see Figure 5 Section 5.2) that it is difficult to extract one single influencing factor, car availability, as they are all inter-related. As was discussed in section 3.5.2 there are mixed results in terms of the availability of a car influencing the choice of access mode; the choice will depend on other factors including the availability of parking, the levels of congestion surrounding the station and parking charges. However, Chart 32 does suggest that those who were planning to cycle to the station were most likely to live in a one car household which supports Parkin's (2007) suggestion that individuals might be using a bicycle as a second car.

Chart 32 Choice of access mode to station relative to household car ownership (N=975)



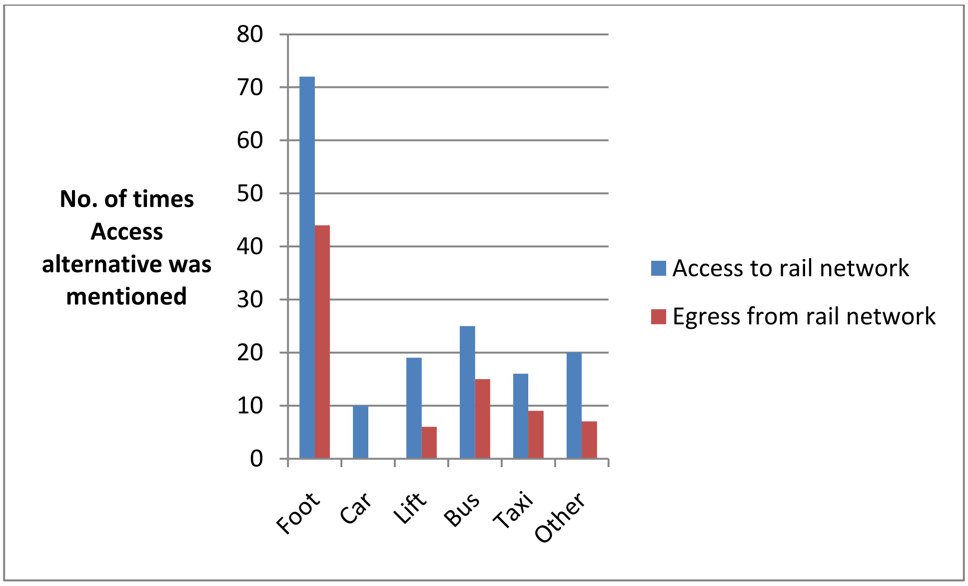
The next section looks at the alternative access modes that bike-rail would consider.

7.7 Consideration of alternative access modes

As was shown in Section 2.5 Table 5, walking is the predominant access mode to the rail network and it would appear that most of the bike-rail integrators in the Bristol sample saw walking as their alternative access mode. The number of times each alternative access mode was mentioned was recorded and is shown in Chart 33.

The original question asked was, "What alternatives do you use to get to or from the station if you don't cycle?" but it was met with some resistance: it was as though the respondents were confused by the question, leading to responses of the form "why would I be looking for alternatives?" Hence, the question was rephrased after 15 surveys to ask: "What other alternatives do you use to get to or from your home or destination station if you don't cycle? Or if you always cycle, what do you consider are the feasible alternatives to and from these stations for you?", in other words encouraging respondents to think of the alternatives even if they didn't perceive an alternative as necessary.

Chart 33 Alternative access modes considered (N=120)



Fewer people answered for the egress journey because, as was shown in Table 12 Section 7.3.1, they were already using an alternative mode. Seven out of the sample of 135 said that they considered there was no alternative to the bicycle for accessing the rail network and 4 said there was no alternative for their egress.

Interestingly the "other" category in Chart 33, for the journey to the origin station, included 11 respondents who said they would have used their local Bristol station (this was also the case in revealed preference data in Holland Section 3.4). For the journey for which they were interviewed, they had cycled to Bristol Temple Meads because the services were more frequent and they could save as much as £2 per journey. The frequency of the trains on certain rail lines can be seen in Section 6.5 Figure 8, with some stations being served less than hourly. The Severn Beach line provides the local service within Bristol and is approximately half hourly[27]. It may be that several of these respondents would not use rail if they could not access more frequent services by train. Four other respondents said that if they could not cycle to the station they would drive the whole way.

[27] At certain times of day there are more frequent services and at other times fewer.

A weakness of this question was that the actual alternatives available were not known. In the context of the shift in transport policy (Section 2.4) the ideal would be for cycle access to substitute a car or taxi access journey but the contribution of cycle access may be more indirect through reducing the overall journey time (including accessing a more frequent but less local service) and therefore increasing the attraction of rail relative to a car journey. The more interesting question would be to know, whether if cycle access was not possible, how many of the sample would continue to use rail.

It does appear that once someone has begun cycling to the station it becomes a habit. Table 29 shows that 91 per cent responded that they mostly or always cycled to the station.

Table 29 Commitment to cycle access (N=119)

Would you say you use your bicycle to the station	Number of Respondents	Percentage
Mostly and Always	108	91%
Some days and sometimes	6	5%
Rarely	4	3%

'Always' in practice is a complex concept, it cannot be literally interpreted and this became clear in the answers to the supplementary question "What might be the reasons for not cycling to the station on a particular day?" The three most frequently mentioned categories are below:

"*Can't think of any" "I'm a cyclist, no reason not to" "none"*

"*Bike broken" "puncture*".

"*The weather*"

All of these three categories got equal mention, 16 times. The difficulty of carrying luggage was mentioned by 11 respondents. Other less common reasons were given relative to a particular trip and its context, i.e., they might be travelling in a group or with family, staying overnight, requiring a car for a meeting in the course of the workday or their bicycle was left at work on a previous day. Clothing (wearing a suit), the dark and illness were given as a reason by one person each. These responses mirror those given by individuals about why they used their car for short journeys discussed in Section 2.3.

A clear message was that Bristol bike-rail integrators were committed to cycling to the station and only if their bike was absent, broken or had a puncture would they consider an alternative. This could be interpreted as, once they had adopted this behaviour and gained experience, they had developed a habit, so they could not see why they should be looking for alternatives in much the same way as car drivers may ignore information about alternatives (Section 4.2.3). It may also be a reflection of the fact that individuals who choose to cycle in a car dominated society have to be committed (see Section 4.4). As with the question about cycle access to the station in Section 7.3.6, respondents did not appear to identify many barriers, this may be because they are group that is determined to bike-rail integrate despite barriers. What it does suggest is that if individuals were introduced to bike-rail integration and were supported in that choice with better facilities they too might become committed.

The following section concludes this chapter by showing the relevance of these findings to the design of interventions to promote further bike-rail integration.

7.8 Summary and relevance to the design of interventions

The bike-rail integrators in the Bristol sample were shown to be predominantly male (71%) and in their thirties. Their level of income is comparable to those of rail travellers generally and the majority (89%) were in full-time employment, part-time employment or self-employed. Their cycle journey to and from the railway station was on average 3.7 km and many stated that their alternative access mode to the railway station would be walking.

The main motivations for bike-rail integration were found to be saving time or money and taking exercise. Bristol bike-rail integrators appeared to be very committed to cycling to the station and found it difficult to understand the question asking them to identify alternatives.

There was considerable diversity of response as to their motivations and cycling histories. Respondents had moved in and out of cycling prompted by life events. The semi-structured interviews highlighted the extent to which their decisions went beyond the purely rational and were influenced by their social and cultural context, supporting the discussion in Chapter 4 and the Conceptual Model in Figure 5 Section 5.2. The results also show that existing bike-rail integrators are a diverse group with cycling having varying levels of importance in their overall travel behaviour. There was a group whose only utility cycle journey was to the railway station, otherwise their cycling activity was confined to leisure. This could indicate that cycling to the station confers particular benefits relative to the alternatives.

Five methods of integration had been deployed by the respondents, with some individuals using more than one type, depending on the journey purpose and frequency:

- cycling and parking at the station nearest home
- maintaining a bike at one or more ‘destination’ stations
- combining the above two options – bike at both ends
- investing in a folding bicycle to facilitate carriage due to space restraints of restrictions set by operators
- taking a fixed frame bicycle onto a train and using it for access and/or egress trips
- making an entire journey by cycle in one direction, but making either the outbound or return journey carrying the bicycle on the train

The decision about which method to use was found to be influenced by:

- the security of bicycle parking or the perceived security of parking
- the ease or difficulty of taking a bicycle on the train, which depends on the route, the carrier, the time of day and the flexibility of the staff
- the distance at either end of the rail journey
- the journey frequency - it would not be worth investing in a second bike parked at the destination station or a folding bicycle for infrequent journeys

It became clear from conducting the face-to-face interviews that there are people who feel strongly that they have a ‘right’ to take their bicycles on trains and were very suspicious of the intention of this research. They did not want this research to result in that opportunity being taken away. Only 20 per cent of the Bristol bike-rail integrator sample had never taken a bike on a train. At the other end of the spectrum, there were those who articulated that they did not take a bicycle on the train because they do not like the feeling of inconveniencing others or the uncertainty of whether they would find a space on a train or not. This is an illustration of social pressure as discussed in Section 4.4 and individuals vary in their susceptibility - as shown in the ecological model in Figure 5 Section 5.2, the individual (and their characteristics) interact with their social context.

Respondents had experimented to find a method that suited their needs and many had considered other options. So, for example, they had changed their travel time to guarantee a space for their bicycle on the train; tried different routes or train providers where different amounts of bicycle parking space existed; bought a folding bike or a second bicycle for the destination station. Individuals were making trade-offs between the risk of uncertainty, not being able to get on a train with their bicycles and the level of convenience of a seamless journey provided by taking a bicycle on the train. In some cases, individuals who did not perceive that the bicycle parking available to them was secure, took their bicycle on the train, even if they did not need it at the other end of their journey.

Respondents recounted being unable to find room to take their bicycle on their usual train or that the experience had been too intimidating when there was standing room only for passengers on crowded trains. This presented a choice; not to travel by rail; to travel at a different time; to purchase a folding bicycle or keep a bicycle at both ends. This exploratory part of the research has shown clearly that this kind of decision-making is taking place but it has not measured the extent of suppressed demand for bike-rail integration or the extent to which individuals have tried bicycle access, or for that matter rail travel itself, and whose experience has led them to discard it as an option.

The research has shown that current bike-rail integrators are willing to be flexible, make trade-offs and invest the time to change their behaviour according to the situation presented to them and the particular journey. The picture that emerges shows that a considerable investment of time has gone into finding the optimum bike-rail integration method for a particular journey: an investment in mastering a complex set of travel behaviours to obtain the most ‘seamless’ journey, often involving trial and error in creating ‘motility capital’ (Flamm and Kaufmann, 2004). The current level of bike-rail integration in Bristol appears to be self-regulating and indicates that there may be considerable suppressed demand. It is self-regulating in the sense that there is a level of equilibrium in bike-rail integration that the current facilities can sustain.

As has been pointed out in Section 2.5, there has been very limited promotion of bike-rail integration and it can be hypothesised that the existing group observed in this study is sufficiently determined and considers that the benefits outweigh the considerable uncertainties. If bike-rail integration is to be promoted to a less determined group there needs to be a reduction in the investment of time needed to master this behaviour and the trialling of it made easier. The conceptual model in Figure 5 Section 5.2 shows a number of potential levers – providing better facilities, changing its image and changing the transport context by increasing car parking charges. The current reality is that bike-rail integration is probably ‘framed’ in a negative way by default rather than design and this could be changed using a package of measures to prompt behaviour towards bike-rail integration.

The discussion in Chapter 3 illustrated that there is plenty of opportunity as a first step to provide better parking facilities for existing users which may also have a behaviour-releasing effect for new potential users (with only 45% of stations with bicycle parking). The bicycle parking and barrier counts give important background information for investment decisions for the provision of facilities showing that 10% of the bicycles were not in use and therefore capacity could be released by better management of the cycle parking resource. Likewise, with improved security of bicycle parking, approximately one in ten bicycles might be left at the station rather than taken onto a train.

Various interventions could be adopted to change the existing equilibrium, so for example, season ticket holders currently with a bicycle at both ends could be offered a discounted folding bicycle, thereby releasing bicycle parking capacity. A charge could be made for bicycle carriage at peak times or even bicycle carriage could be banned at peak time which would necessitate increased provision of bicycle parking.

The qualitative data and observation around the parking counts showed that the movements in and out of the cycle racks represented complex behaviour patterns and that simply providing more parking might not offer the most cost effective solution (see further discussion in Chapter 8). The provision of bicycles for hire could release bicycle parking and bicycle carriage capacity but could also provide a new cycle access option. As has been shown, the different methods of integration can be used by the same individuals but to meet the needs of a specific journey. Any intervention to promote bike-rail integration will have to consider the likely effect on the behaviour of existing users as well as the response of potential new users.

Image was shown to be factor in determining whether an existing bike-rail integrator would consider a folding bike, the survey eliciting quite strong views amongst those who are already cycling. This suggests that the question of image may be an even greater barrier for non-users or individuals without any cycling experience.

Where TOCs are seen to be promoting cycle access, that in itself can change the ‘image’ of cycling. If the facilities provided are prominent and well managed, it broadcasts that cycling is considered important. As has been argued, in this thesis, experiencing a behaviour can change attitudes and, cycle access being a relatively low-cost option, trialling is feasible. Rogers’ model (discussed in Section 5.3) suggests that if an innovation is visible it has a greater chance of being adopted; it is visible at stations, where large numbers of people congregate. As the results show, individuals have experimented to find a method of bike-rail integration that suits their needs, giving an opportunity for 're-invention' (Rogers 2003: 17): adopters are able to 'customise' their particular method to fit their context.

As discussed in Section 3.3, in other societies where cycling and bike-rail integrating are more common there is a greater diversity of the various social groups in the overall population of 'cyclists' relative to those found in this sample, who are predominantly males in their thirties. Consideration in the short term might be given to whether an intervention should target those with the characteristics of existing bike-rail integrators or aim to attract a different and more diverse group. To the extent that potential bike-rail integrators are similar to those already practising this behaviour, the findings have shown that different marketing messages may be effective: some may respond to the idea of exercise, others to the time savings or reducing the necessity for a car or second car or the certainty of their journey time to the station.

The hypothetical question on the internet survey to those booking a rail journey showed that half of those owning bicycles would consider cycle access to the rail network. If these individuals could be persuaded to try cycle access, the results suggest that, once an individual had discovered bike-rail integration, they found it conferred sufficient benefits so that 91 per cent of the bike-rail integrator sample mostly or always cycled to the station. Respondents found it difficult to consider an alternative access option (Section 7.7). They had perhaps developed a habit and therefore were not looking for alternatives. When pressed to think of their alternative access mode, over half thought it would be walking. A preferred objective of any intervention would be to reduce car access behaviour to the station rather than walking access. However, it is the indirect effect that is important. Cycling over walking reduces the overall journey time, allowing a more seamless journey that improves the relative advantage of a rail journey over a car journey.

In this research 44 per cent of the Bristol sample had a car available to use for the particular journey for which they were being interviewed, yet they chose to bike-rail integrate. The motivations were diverse, again illustrating the complex web of interactions amongst the influencing factors. Negative or 'push factors' were given by some - high parking charges and traffic congestion - others articulated positive and affective reasons. They enjoyed cycling or travelling by train and some respondents disliked driving. Some individuals who have a car may use it out of habit but as this research has shown there are also individuals who have consciously sought out alternative ways to travel despite having a car available and have found that bike-rail integration confers sufficient benefits to them that they leave their car at home.

There was also evidence to support Parkin's (2007) findings that some households treat cycling as 'a second car'. As was discussed in Section 2.3, if a two-car household decides for economic or environmental reasons to reduce their ownership to one car it provides an impetus to experiment with alternatives. Within the Bristol bike-rail integrator sample there were those who had reduced their car ownership or were considering reducing their car ownership and those who did not own a car at all. The chronology of events was not clear, whether a respondent first started to bike-rail integrate and then decided a second car was unnecessary or whether bike-rail integration prevented the necessity for purchasing a second car or indeed a car at all. The results show that the availability of a car does not indicate whether an individual is more or less likely to convert to bike-rail integration. Bike-rail integration is one option that enables an individual to become less car dependent and as Buchan (2008) has argued, the low car ownership that exists in London is partly explained by the range of alternative options to meet different journey needs, of which bike-rail integration is one.

The existing transport context, e.g. congestion or the parking regime can be manipulated to favour bike-rail integration relative to a car journey. This was shown by one respondent who travelled from Bath to Bristol who would bike-rail integrate at peak but use the car off peak. It is this kind of detail that shows that respondents might have given different answers depending on the time of day they were interviewed. In this case, the respondent would not have been sampled by the present methodology off peak as he would have been driving. The answers to a survey are very context dependent which makes the identification of potential users through segmentation problematic, as discussed in Section 5.4.1.

Further evidence for the importance of the bike-rail integrator's particular context, as outlined in Figure 5, Section 5.2, was shown by the fact that circumstances outside the individual's control were found to trigger a change in behaviour. Fifteen of the respondents who participated in the semi-structured interviews had started cycling because their previous behaviour was not satisfactory in some way.

The findings have shown that to perceive an individual as a 'bike-rail integrator' or 'cyclist' is inaccurate. They may also be a car driver, pedestrian or bus user at other times. Similarly, as discussed in Chapter 5, it may not be cost effective to categorise individuals by their attitudes as these too may change in different contexts and at different times. The next chapter therefore discusses two interventions designed to test the feasibility of two possible interventions to promote bike-rail integration. Based on the argument that behaviour can change attitudes, and that investing time and effort in very precisely identifying the targets groups may not be cost effective, these interventions are designed to offer easily identifiable groups the chance to experience bike-rail integration. Individuals self select and the assumption is that sufficient numbers will gain benefit to continue, thereby starting a process of social diffusion as outlined in Section 5.3.

Chapter 8 Action Research – the choice of interventions, their development, implementation and outcomes

8.1 Introduction

Chapter 6 outlined the overall research approach including the transition from an exploratory research phase to an action research phase. As outlined in Table 2 in Chapter 1 the underlying question of the action research phase is ‘How can ‘soft measures’ be applied to promote bike-rail integration? The trialling of two interventions to promote bike-rail integration is a way of answering this question as well as exploring the practical and organisational barriers likely to be encountered. In the process, information about the propensity to change behaviour towards bike-rail integration was gathered.

The results outlined in Chapter 7 have given a picture of the existing behaviour of bike-rail integrators, their motivations and the practical barriers encountered. The results of the internet survey showed that 61 per cent of those planning or booking a rail journey owned a bicycle and that of those, more than half would consider accessing rail by bicycle (except those who had been dropped off at the station). There was also an indication that more than two thirds of existing bike-rail integrators would consider hiring a bicycle.

The collaboration with FGW in this research project offered the opportunity to trial two different interventions: a pay-as-you-go cycle network (Hourbike) and an intervention to attract those driving to the UWE Frenchay campus to switch to rail with walking or cycling as the access or egress mode.

This chapter is divided into three sections. The first looks at how the findings in the exploratory phase of the research and the conceptual model (Figure 5 Chapter 5) could be applied using a station travel plan as an example. Station travel plans are part of the new policy agenda described in Section 2.5, reflecting the overall shift in national transport policy described in Section 2.4. The insights explored in Chapter 4 can be used to ‘reframe’ the perception of bike-rail integration, to provide a prompt to encourage an individual to at least deliberate over a change in behaviour as well as to provide facilities or an incentive that make such a change possible. This lays the theoretical groundwork for the following two sections which outline the design, development, implementation and outcomes of Hourbike and the intervention to attract car drivers to bike-rail integrate. Additional literature that is particularly pertinent to bike hire and bike sharing schemes is included in this chapter as background.

The researcher's log of activities, meetings, telephone conversations, emails and reports were used to build a picture of the process of design, the definition of objectives and implementation. The extent to which the researcher became an 'actor' is also documented in this chapter together with the continuous re-evaluation of information gathered in the exploratory phase outlined in Chapter 7, the literature outlined in Chapters 4 and 5 and the actions. To some extent the initiatives overlap in time and personnel.

The researcher as 'actor' has a very different perspective from a researcher who follows and excavates data from a process 'after the fact'. This different perspective provided useful insights into practice, the susceptibility of non-users to change their behaviour towards bike-rail integration and the impact of a new facility - bike hire.

8.2 Theory into practice

The new national policy to increase sustainable access to railway stations using station travel plans has the potential to join up existing travel plans and other smarter choice initiatives (Section 2.4), as stations are at the core of an integrated transport system. The advent of this new policy and the collaboration with both FGW and South Gloucestershire provided the researcher with the opportunity to apply the conceptual model (Figure 5 Section 5.2) developed from the literature review in Chapter 4 to a real world situation using the data collected in the exploratory research phase. This process is ongoing and is therefore included in the future research Section 9.2.1.

A station travel plan is a social marketing exercise, a package of measures designed to change rail access behaviour. The conceptual model (Figure 5 Section 5.2) suggests that an intervention such as Hourbike is likely to have more impact if it is joined up with other initiatives that make cycling easier through the provision of improved cycle routes as well as initiatives that re-frame or improve its image. It also highlights the importance of the overall transport context so that the measures used in a STP will depend on the situation at each station, the car parking availability, the frequency and coverage of the bus services, the availability of taxis and the level of congestion in the surrounding area.

A station travel plan can bring together all the stakeholders with an interest in rail stations (rail industry, local authorities, passenger groups, bus and taxi operators, cyclists and others) to develop and agree common objectives and a co-ordinated approach to delivering them (ATOC 2009.)

Theoretically, station travel plans provide the administrative mechanism by which the different institutions responsible for the necessary combination of measures within a travel plan can operate to influence the different factors in the conceptual model Figure 5 Section 5.2. Each STP will have different objectives depending on the particular context at that station and the willingness of different organisations to become involved. The Bristol Parkway Station Travel Plan (BPSTP) can be found in Appendix VI as an illustration of one of the 24 STP pilots in the UK.

The literature discussed in Chapter 4 showed that individuals will be more susceptible to change at certain times in their life course (Section 4.2.3) and the results in Section 7.2.2 confirmed this to be the case, as bike-rail integrators had started cycling after certain life events - a house move, a job change or social contact within another individual who cycled. The personal characteristics of potential users will also influence their propensity to change and their perception of the interventions (Section 4.3). Bike-rail integrators were motivated to cycle to the railway station for both positive and negative reasons (Section 7.4.1). Cost was the third most frequently cited motivation for bike-rail integrating (Section 7.4.1), suggesting that increasing car parking charges at a railway station could prompt consideration of cycle access. All this information can be used to ensure that the messages, events and activities within a station travel plan have a better chance of success.

A station travel plan is a co-ordination of the several levers from Table 30 below all working in the same direction to promote more sustainable access. The table shows how the theoretical discussion in Chapter 5 - the deliberation about new behaviour, changing perceptions and increasing behaviour control in the left-hand column - can inform the measures or levers that can be implemented within a travel plan in the right- hand column. The conceptual model in Figure 5 Section 5.2 can be applied to promote a change in the context in which the decisions are being made or as Thaler and Sunstein (2008) would argue, the choice architecture is manipulated to ‘nudge’ individuals towards new behaviour (see Section 4.2.1). Table 30 is an adaptation of a generic table for personal travel planning (DfT 2007j p10) and illustrates different options to improve bicycle access within a STP.

Table 30 Potential levers for behaviour change towards bicycle access

How behaviour can be influenced	What are the levers?
Deliberation of behaviour	Visible bike event at the station Availability of bike hire Personal contact Travel conversations with bike-rail integrator Offer of free materials Increase price car parking price Reduce available parking Priority parking for car sharing
Changing perceptions	Marketing messages - information about the benefits of cycle access-speed, convenience, flexibility, exercise
Changing actual experience	Infrastructure improvements, safe cycling route and secure parking
Increasing behavioural control	Personal advice and support, training and route-finding
Changing social norms	Working with media/community organisations Use of role models Encouraging word-of-mouth communication Involving all rail passengers and rail staff
Making a plan or setting a goal	Personal plan to cycle to the station twice a week
Experimenting with behaviour	Incentive (e.g. free rail ticket, bike discount, reduced bike-hire membership) as in the second intervention of this research to attract new users to rail
Reinforcing behaviour	Gifts Positive Feedback Loyalty Club

Adapted from DfT 2007j

The levers work at different levels. Deliberation takes place at the individual level but changing social norms works at the societal level, though it is a process made up of the interactions between individuals, their immediate social network and the society as a whole. As has been pointed out in Section 4.4.2, the current image of cycling may not be attractive to non-cyclists (70% of the population) and is therefore a considerable barrier.

The BPSTP (Appendix VI) is the overall framework within which Hourbike and the intervention to attract car drivers to bike-rail integration are situated and provides two examples of measures that could assist in meeting station travel plan objectives (see Section 9.2.1) using different combinations of levers from Table 30. The next section describes the Hourbike intervention.

8.3 Hourbike

8.3.1 Introduction

In the Netherlands where bike-rail integration is more common, fewer rail travellers make the egress trip by bicycle than make the access trip from their home station. Krygsman and Dijst (2001) argue that this might be a particular barrier to rail travel as it adds to the overall journey time if an individual has to walk to reach their final destination rather than bicycle (Section 3.4). If individuals are unable to take a bicycle on the train or maintain a bicycle at both ends there is no opportunity to cycle to the final destination. The provision of bike hire at railway stations could provide the means for this onward cycle journey and therefore alter the transport context in the conceptual model (Figure 5 Section 5.2).

The face-to-face surveys showed that many of the Bristol bike-rail integrators have considered the different methods of bike-rail integration (Section 7.5.3 and 7.3.6) and do not always use one method but alternate between methods depending on the journey. The analysis of the cycle parking data collected at Bristol Temple Meads in Section 7.3.9 also suggested that bike hire could make more efficient use of the available bicycle parking space, by providing a bicycle for visitors or less frequent travellers who may park a bicycle for seven days but only use it once a week. Two thirds of the Bristol bike-rail integrator sample said they would consider hiring a bicycle even though they were already accessing rail by bicycle and therefore owned a bicycle (Section 7.5.2). The availability of bike hire would offer one more bicycle option that offers flexibility including for emergency use in case of puncture, theft or repair, but also has the potential to attract new users by allowing a relatively inexpensive trial of cycle access (see Section 5.3).

New technology has also made automated bike hire more affordable enabling 24-hour availability with minimal staffing requirements. As this research project progressed, the idea of bike hire at stations coalesced and was seen by the researcher as one practical way of enhancing the experience of bike-rail integration by:-

- providing an alternative egress mode for tourists/visitors but also for commuters and business travellers making less frequent journeys
- reducing the need for bicycle carriage on trains
- making more efficient use of bicycle parking facilities at station

- allowing rail users to avoid a long wait for a taxi or bus, and reduces the journey time in a congested environment relative to a car journey and also relative to walking

In addition to these practical reasons for making bicycles available through hire at stations, the development of conventional bike hire into a bike-sharing scheme (see more detail in following section) has the potential to make cycling more visible particularly in societies which lack a 'cycling culture'. As was pointed out in Section 4.4 the whole concept of social norms may be very important where cycling levels are low as in the UK. As Cialdini et al. (1991) suggest, there is an information processing advantage and a decisional shortcut when an individual is choosing how to behave in a given situation. If the majority of the population cycled it would be less of a decision to join them. The presentation or framing of the idea of behaviour change is important, and even the placement of bike hire or bike sharing facilities could act as a cue for deliberation about the possibility of cycling (Thaler and Sustein 2008 Section 4.2.2).

The presence of easily available bicycles could encourage more people to cycle on the bicycles provided by the schemes but also on their own bicycles as has been the case in Paris (TfL 2008 p29). In other words, bike sharing can be a catalyst for creating a virtuous circle towards more cycling as described in the Diffusion of Innovations Model in Section 5.3. An individual starts cycling prompted by the easy availability of a bicycle through a sharing scheme and observation of others using the bicycles. The individual derives benefit from this behaviour, enjoys it, talks about their experience to friends, family and colleagues who in turn may register and try the scheme. Gradually as more individuals take up cycling, a level, 'critical mass' is reached where further diffusion becomes self sustaining.

There are a number of different bike hire models, which range from an automated bike hire system to 'public bikes' or 'bike sharing'. The models differ in their use of technology, governance and objectives and Table 31 below gives an overview.

Table 31 Bicycle hire and Sharing schemes

Name/ Country	**Scope**	**Technology**	**Objective**	**Financing**
1995 City Bike Copenhagen	Available central part of the city	Coin operated	Available to all, another mobility option	Not -for -profit
2000 Ov Fiets (translated means public bicycle Holland)	Bicycles available at 200 railway stations	Mixture manual and smart card	Regular rail users to improve journey chain particularly egress journey	Nederlandse Spoorwegen
2001 Call-a-bike Germany	Railway stations	Mobile phone Bike self -locking/no stands	To provide a more seamless journey for rail travellers	Deutsche Bann
2004 Oybike Hammersmith UK	25 stations and 70 bicycles	Mobile phone	Enhanced mobility options for local residents and those working locally	Government and local gov. grants, local businesses as part of travel plan initiatives
2005 Vélo'v Lyon France	Grown to 4,000 bicycles 400 docking station	Smartcard	Bike sharing – each bike used on average 8 times per day, about 20,000 trips per day	J C Decaux operated in exchange for outdoor advertising
2007 Vélib' Paris France	Started with 10,648(now 20,600) bicycles and 750 (now 1,451) docking stations	Smartcard	Reduce pollution, help users to stay fit, raise awareness of cycling. First year bicycles were rented 26 million times with an average journey time of 18 minutes	J C Decaux pays Paris a fee of 3.5 million Euros and a % of revenue in exchange for outdoor advertising at 1600 billboards,
2007 Bicing Barcelona Spain	1,500 bicycles at 100 docking stations grown to 6,000 bicycles at 200 stations	Smartcard	New public transport mode for last leg of the journey. 22,000 trips a day average trip 15 minutes and bicycles used on average 15 times a day	City of Barcelona pays a fixed sum each year to Clear Channel. 1/3 of finance from revenue, on-street parking charges
2009 BIXI Montreal Canada	3,000 bicycles at 300 stations - now 5,000 bicycles	Smartcard	Alternative form of urban transportation	City Parking Department contracts BIXI to operate
2010 SERCO/BIXI London UK	6,000 bicycles at 400 stations	Smartcard	Public bicycle sharing scheme for short journeys in and around central London.	Transport for London contracted SERCO and BIXI contract 140 million over 6 yrs

8.3.2 Experience of different models of bike hire and their relevance to the promotion of bike-rail integration

Table 31 above gives basic information on several bike hire models as necessary background for the choices made in the design of Hourbike. There is no clear definition of what constitutes a 'bike-sharing' or 'public bikes' system but the different models are distinguished by their objectives, scale, financing, technology and organisational structure. Further details can be found in Sherwin & Parkhurst (2009), the feasibility study for the London Scheme (TfL 2008) and in an overview from Cycling England (2009)).

The growth in the number of these schemes has been very rapid. In 2004 there were eleven schemes in operation worldwide (Paul DeMaio 2004) and this number had grown to over a hundred schemes in the planning or implementation stage in 19 countries by 2008 (Helmeth 2008). Several of the first schemes failed as a result of theft but new technology has allowed the new systems to identify the customer and smart bikes have been designed to be utilitarian and vandal proof (DeMaio 2004).

The catalyst for some of the earlier schemes, Ov Fiets (The Netherlands) and Call-a-bike (Germany), was the need to facilitate a more seamless rail journey and address the issue of the lack of a bicycle for the egress journey. These schemes are a particular form of bike hire whereas the more recent schemes including the Paris Vélib' have much wider objectives and would be better described as bike-sharing or 'public bike' systems. Bicycles are made available in a public space that can be used by anyone[28] for any journey they wish to make at a certain cost. The pricing structure is geared to encourage individuals to return the bicycle to the system as soon as possible so that others can use it. So, for example, in the Bicing scheme in Barcelona, a bicycle might be used fifteen times a day by different people (TfL 2008). In contrast, each bicycle in the Ov Fiets system is used less frequently, possibly only once a day and is priced at 2.85 Euros for 20 hours relative to the price of carrying a bicycle on a train at 6 Euros (Gelissen 2009). So, for example, a bicycle would be used for an onward journey from the rail network to the workplace and the bicycle would be stored at the workplace and returned to the railway station in the evening by the same individual.

The OV-Fiets initiative ('OV-fiets' means 'public transport bicycle') in the Netherlands was put forward by ProRail, the national railway management agency, in collaboration with The Netherlands Railway Nederlandse Spoorwegen (NS) as a solution to the egress trip (Emmen, Pauwells & Kramer 2004). The original idea was to provide a new, quick, easy

[28] who is identified through the payment system other than in the case of a coin operated system

and reliable bicycle rental service to provide a more seamless journey at both ends of a rail journey. The scheme was started at 4 stations in 2000 and had grown to a scheme serving 140 stations by 2007, with about 40,000 subscribers using 3,000 bicycles (Telephone conversation with the Chairman of Ov Fiets Ronald Haverman 7th Dec 2007). Some of the stations have as many as 200 bicycles available for rent and others as few as five bicycles; the scheme has continued to grow, with bicycles available at over 200 stations in 2009 (Cycling England 2009). This system was built on an existing network of bike guards who man bicycle parking facilities at stations and who were able to administer the scheme giving renters a bicycle once they had joined the scheme. At unmanned stations cycle lockers were used; these could be opened with a smart card.

Ov Fiets is increasingly seen not just as a way of making the journey more seamless and attracting more people to rail but also as a way of reducing the demand for bicycle carriage (Gelissen 2009). It is priced accordingly and as new technology has become available the Ov Fiets service has evolved incorporating the service as an option on rail season tickets and business travel smart cards.

The distinguishing feature of this system is that it is designed specifically for regular Dutch rail users rather than tourists, as it is necessary to have a Dutch bank account as security against bike theft. The scheme has brought a number of benefits including a small reduction in car use, growth in train trips and a growth in cycle access for less frequent trips, including those for business and meeting family and friends (Martens 2007). The Dutch Cycle Federation estimates that every subscriber to this scheme generates about 4-5 extra train trips per year, especially outside rush hours (Martens 2007).

These outcomes are positive and show that the provision of bike hire at stations has increased the use of rail. In terms of the Bristol area where this research took place, many trains at peak time are at capacity and therefore if the availability of bike hire encouraged train travel off peak it would be particularly desirable. The availability of bicycles for hire at Bristol could prevent some individuals taking their bicycles on the train (Section 7.4) or parking a second bicycle at their destination, thus freeing capacity for others.[29] This type of system could address several of the requirements in Bristol but would require support for the idea as well as the finance from the rail companies.

From the potential user's perspective, as those using rail may alight at different stations for a variety of journeys, a network wide system of bike hire would be the optimum rather than

[29] Secure cycle parking would also have to provided as Section 7.3 showed that as many as one in ten bike-rail integrators were taking their bicycle on the train, not because they needed it at the other end but to prevent theft.

individual schemes at different stations. However the fragmented nature of the rail system in the UK and the franchising system as outlined in Section 2.5 is likely to act as a barrier to implementing this kind of scheme. Network rail could implement such a system at the larger stations but it would also mean each rail operator agreeing to implement the same system in their stations and providing the funds to support it. It became clear to the researcher through conversations about bike hire at the integration group of ATOC that a national scheme was not being discussed and the time frame would be outside the scope of a PhD research project.

In addition, the Ov Fiets and Call-a-bike schemes (see text box below) were both introduced in countries with high cycling levels (Section 3.2 Chart 8) as a means of making rail travel more seamless. The overall transport context in the UK is very different.

Call-a-Bike

was set up in Munich in 2001 with the idea that the national rail company Deutsche Bahn could combat the steady decline in the number of rail passengers if it expanded transport services to include the ride both to and from train stations and thereby eliminated the missing links in the chain of travel (WZB Forshung 2007). In this case the bicycles are activated using mobile phones and the locks are within the bicycles so they can be locked to a traffic sign or cycle stand at the next major intersection. When the user wants to 'free it up' for the next person, he or she telephones to notify the central administration of the location of the bicycle (Call-a-bike 2009). This is called the Flex-system which has expanded to six German cities with 75,000 customers in 2007 using 5,000 bicycles, accounting for half a million rides (WZB Forshung 2007).

This led the researcher to look at other models that had been introduced in countries with lower cycling levels more comparable to Bristol, and which were found to have much wider objectives beyond the simple provision of a practical facility and more towards a system that raised awareness of cycling as an alternative mode of transport. The Vélo'v in Lyon and the Vélib' in Paris are both examples of schemes introduced into bicycle hostile environments to promote cycling for a multitude of journeys within an urban context, including public transport access. These schemes were both supported and financed by the local authorities as one element of a package of measures to encourage behaviour change towards more sustainable modes (Helmeth 2008). In other words, they were not considered as just ‘another solo bike project’ but part of a package of different interventions, and their function was to help create a ‘culture’ of cycling as discussed in Section 4.4 and 5.3 to alter the social and cultural context of cycling in Figure 5 Section 5.2.

The scale of the Vélo’v in Lyon and the Vélib’ in Paris has been made possible by the financing arrangement. The local authority contracted out the implementation and operation of the scheme to JC Decaux in return for the rights to outdoor advertising space in the cities, an arrangement that has been described as “bikes for billboards” (Helmeth 2008). The different governance and financing arrangements of these two schemes shown in Table 31 is related to the scale of the schemes and the extent to which the infrastructure – the stands and bicycles – were introduced gradually or implemented at a large scale initially.

The scale is likely to be related to the impact and visibility of a scheme to meet the wider objectives of creating a cycling culture. Smith (2007) has argued that there is a size of scheme below which it is unlikely to succeed because of the network effect. If you have 200 nodes in a transport network, the addition of the 201st node enables the network to serve an additional 400 origin-destination pairs.

The larger scale of Vélo’v and the Vélib’ (Table 31) has ensured that cycling is more visible within the urban area and has led to more individuals cycling on their own bicycles (TfL 2008). This is what might be expected from the Diffusion of Innovations Model (Section 5.3). It could be argued that this visibility breaks down some of the political barriers discussed in Section 3.4 and it has been suggested that the success of the Call-a-Bike scheme in Germany improved the political support for more funding for other measures to promote cycling (TFL 2008 p 24).

Smith (2007) has suggested the first UK public bicycle scheme, Oybike in Hammersmith and Fulham (London) was too small, with users having difficulties finding a bicycle or an available space to return one to, and there were constraints on the number of journeys that could be made. The scheme had 25 locking stations with a total of 70 bicycles, which were available to registered users and also a group of sponsored users who were given access through their companies. The funding came from a number of sources, including the local authority and businesses as part of a travel plan initiative. An evaluation of this concluded that the potential for such a system lies “primarily with the leisure and recreational market and with providing links to public transport stations” (Nolan and Ishaque 2006).

In terms of designing a scheme in Bristol it was the link with the rail network that was of particular interest. The proportion of journeys made as part of a journey chain will be influenced by the transport context in the particular location. So, for example, in the Bicing system in Barcelona, 28.37% of the cycle trips are in combination with other modes, particularly the Metro and train (Buhrmanns, S 2008) but in Lyon only 10% of all Vélo'v trips are part of a chain with public transport (NICHE 2007).

The overall impact and benefit of these relatively new schemes has yet to be fully researched and calculations of environmental benefit will have to balance the extraction from public transport and its effect on loadings, the van mileage created by vehicles that re-distribute bicycles and the extent to which new public transport journeys have been created through cycle access. The wider impacts of creating a 'cycling culture' will be harder to measure.

In some cases, abstraction from public transport might be a desired objective as is the case for the proposed London scheme, a "reduction in overcrowding on buses and the underground in central London" (TFL 2008). London has particular challenges and has not included the after-rail market in their proposed cycle hire scheme because their calculations suggested that the demand would be too high and that it would be difficult to find the space to provide the parking near railway stations in the short term. [30]

As public bike systems work on the basis that each bicycle is used several times a day by different people for different journeys, it has the potential to reduce the cost over the Ov Fiets model where each bicycle is used by one person and returned to the same place. However, a major benefit of the Ov Fiets model is that the user has the certainty that they have a bicycle for their return journey which is not necessarily the case with a public bicycle system particularly on a smaller scale.

There is an ongoing debate about the different bike sharing models including bicycle design, docking hardware, backroom systems, governance, financing, levels of service including maintenance, safety, theft, vandalism and whether the user has to return the bicycle to the same place or at any hire station. Hourbike – a-pay-as-you-go cycle network – was the model developed in Bristol described in the next section.

[30] Just to cater for 8% of the 300,000 trips post rail journeys that are suitable for cycling, between 1 km and 8 km, would require 21,600 hires in the three hour morning peak and this flow would need to be matched in the evening peak.

8.3.3 Action to design and implement the Bristol model

As outlined in Section 6.7, this is the point in the research project where the researcher moved into the action research phase, becoming an active participant in the process. This section describes the process of designing and implementing Hourbike, a scheme instigated by the researcher. Section 8.3.1 showed that the availability of bike hire at stations could assist in the promotion of bike-rail integration and Section 8.3.2 has shown that a wider interpretation of bike hire, a bike-sharing model, could help to promote a cycling culture. More cycling generally is likely to lead to more bike-rail integration (Martens 2007).

The researcher decided to see if there was support for the idea of bike hire at stations or a wider network of bike-sharing within FGW. There was general support for the idea but no funding stream available or precedent within the rail industry to follow. Other partners were actively sought.

As the primary objective was the provision of bicycles at railway stations it seemed preferable to opt for smartcard technology not a mobile telephone based system (as used by Oybike) as, in the longer term, bike hire could be incorporated into public transport ticketing systems similar to the Oystercard in London.

The researcher approached Hourbike[31] as the only company in the UK at that time using smartcard technology for bike hire. As the company's philosophy was to grow a business driven by customer requirements they were willing to be flexible and co-develop a new model combining elements from the different models of bike hire specifically for Bristol. Another factor in the choice of Hourbike as a partner was that their main business was travel plan consultancy and therefore the availability of bicycles for hire was seen in the overall transport context, as one element in a wider package of measures to change behaviour.

The researcher approached a Bristol City Council (BCC) Officer who had been involved in sustainable transport solutions in Bristol over a number of years with the idea of a bike sharing network with key hubs at the main railway stations: Bristol Parkway, Filton Abbey Wood and Bristol Temple Meads (Section 6.5 Figure 8). He supported the idea on the basis that Bristol has many tourist attractions including the SS Great Britain and Explore, but as the sites are some distance apart, he considered that the availability of bicycles for hire

[31] Hourbike was then part of a company called VIPRE - a subsidiary of VPSI - an American Company specializing in sustainable transport solutions, particularly van pooling and commuter pooling in the USA. It is now a separate company.

would allow visitors to get to more sites. This new opportunity for cycling would be a way for BCC to capitalise on its other investments to increase cycling including the provision of an off-road cycle network and cycle route maps. The main railway station, Bristol Temple Meads was also some distance (a 20 minute walk) from the city centre.

This support from BCC encouraged the researcher to set up a meeting between Hourbike and FGW in June 2007 to discuss the feasibility of the concept. A series of meetings followed and a steering group was established made up of the researcher, the BCC Council Officer (South Gloucestershire Council agreed to participate but through BCC), Hourbike and the University of the West of England travel planner to develop the concept. This steering group had no legal status, it was a loosely formed group of committed individuals based at their respective organisations with the common aim of enabling cycling through the availability of ‘public bikes’. The researcher’s participation was on the understanding that she would monitor the use of the system as part of her PhD project.

It was envisaged that a small network of 60 bicycles would be set up in 20 locations to include the three railway stations. This would provide a small network in the North Fringe area around Bristol Parkway and Filton Abbey Wood stations and the University of the West of England. Another small network would be based Bristol City Centre with Bristol Temple Meads Station at the core. As noted in the previous section there was an awareness that the scale of the network was important but at the time of the discussions there were no precedents for such a scheme or allocated budgets within the relevant institutions.

The steering group’s idea was that, by demonstrating that the system worked through establishing the first few sites, there would be a natural expansion process as more businesses, hospitals, schools, primary health care trusts, gyms and retailers saw the benefits and wanted to join the scheme by signing up and financing a hub at their location. This would allow their employees and customers to be part of the scheme. For example, an employer who already had their own pool bike scheme might opt to join the Hourbike scheme to avoid the administration and maintenance of their own system, gaining the additional benefits of a city-wide scheme. Hotels could offer their customers the option of bike hire through Hourbike rather than running their own scheme.

The steering group discussed the design and implementation of the scheme including: design of the stands and bicycles themselves to prevent theft but maintain functionality; planning permission for the special bike-locking stands; financing of the system through a combination of advertising, rental revenue and service agreements; identifying potential target groups; tariffs and marketing. As the scheme was setting precedents, every detail needed to be explored in considerable detail, including issues around safety, insurance and cycle helmets. In the case of helmets, it was decided that each stand would direct users towards the nearest cycling retailer and a special deal would be negotiated for helmet purchase for Hourbike members.

It was a collaborative and evolutionary process over several months. The main upfront investment for such a scheme is the capital cost of the locking units or hubs and the bicycles but there is also the ongoing cost of the maintenance of bicycles and their redistribution between stands. Some revenues would come from membership, advertising and hire fees but these were not considered adequate to cover the costs, so each member of the steering group with the exception of the researcher - FGW, BCC and UWE - paid a certain amount for their hubs and bicycles and signed a service contract for three years with Hourbike. It was Hourbike's responsibility to run the system and make sure that bicycles were distributed within the system. The network would grow as new institutions joined, each paying for their hubs and their required number of bicycles with a similar service agreement.

The network would be a fully automated bike sharing scheme using GSM technology (Global System for Mobile Communications – GSM) with a rechargeable-battery locking system which did not require underground mains wiring. The cost to the user was set at a one-off registration fee of £10 providing a method of identifying users with a line of accountability. Each user would receive a smartcard with a passcode which allowed them to take a bicycle from the locking system. The first 30 minutes would be free and thereafter the charge would be £1 per hour or part hour. The pricing system was designed to encourage the bicycle to be returned to the system as soon as possible.

The target customers were conceived to be many; those wishing to make journeys to and from the railway stations or bus stops, commuters, daytime business trips, tourists, education and shopping trips. The steering group organisations would promote the scheme through their constituencies avoiding a segmentation exercise to target particular groups (Section 5.4.1). Potential users could be contacted via email and via newsletters within the organisations, a communication from within their social groups (see Section 4.4) as opposed to mass communication. Section 5.3 illustrated the importance of social influence within the Diffusion of Innovations model. If a few people within each organisation were encouraged to try Hourbike and found it useful, those individuals through their social contacts would spread the word to others.

The objective was to provide a very visible statement about cycling that would create a ‘buzz’ around cycling in Bristol and also facilitate the combination of cycling with rail. Its visibility and affordability could prompt deliberation to try cycling. The understanding was that it would become something to talk about, different groups within the population would have the opportunity to try and experience cycling and this would contribute to creating a culture of cycling in Bristol (Sections 4.4.2 and 5.3). It was seen as a way of joining up existing interventions within Bristol, including Lifecycle which provides adult cycle training and which could be facilitated by easily available bicycles. This cycle training could be promoted to rail travellers who had access to a bicycle through Hourbike. It could also alleviate the difficulty of storing a bicycle in the city centre (Ryley 2008). In short, it could change some key interactions within the ecological model in Figure 5 Section 5.2 changing the social and cultural context as well as the transport context.

The Bristol Hourbike model is unique, in that it is a bike-sharing scheme which can also function as an extension of the rail network and it differs from the Paris Vélib’ model both in terms of governance and choice of technology. In 2007 the Paris Velib’ was launched with the entire infrastructure in place including the static hire stands with mains electricity. The Bristol model has more flexibility, using battery-powered technology, allowing speedier installation of the hire hubs at lower cost and the potential to move them in response to demand. In other words, the problem of having too many bicycles available at some hubs and too few at others could be avoided. However, it was still anticipated that some redistribution of bicycles would be needed within the system as there may be some journeys such as downhill that would be more popular. There are pricing mechanisms under trial elsewhere that could reduce the need for such redistribution.

In the case of the Paris Vélib’, J C Decaux was contracted to provide the service in return for outdoor advertising rights in the city. This was also the case in Lyon but there have been complaints about the proliferation of billboards (Helmeth 2008). The Hourbike steering group did not consider this was an appropriate model in Bristol and opted for sharing the decision making and financial responsibility among several organisations that would create a sense of ownership to ensure the long-term sustainability of the project.

In theory, a core network would be installed and, from this small base, the system would grow to meet the demands of its members as new institutions with their constituents chose to take part. In practice, the development and implementation of Hourbike in Bristol has been a long and drawn out process which was still ongoing in December 2009 with only 10 bicycles in service since their installation in October 2008 in the North Fringe at the

Frenchay Campus, UWE and Bristol Parkway railway station. These bicycles were available for rent in the North Fringe of Bristol; one hub with four bicycles at Bristol Parkway Station; two hubs at the Frenchay Campus of the University of the West on England with six bicycles. This represented a sixth of the originally conceived network. The original plan included a hire hub at Filton Abbey Wood station, also serving the Frenchay Campus but the funds were not made available by FGW.

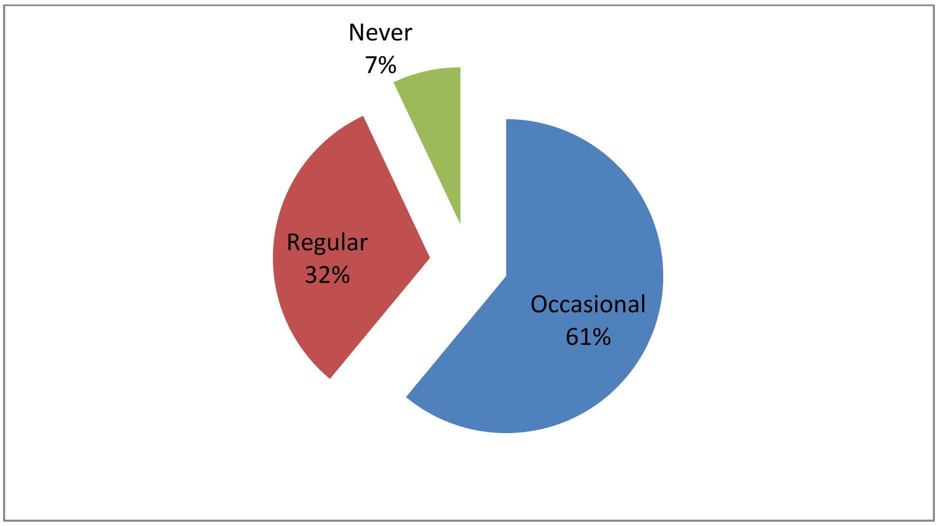
Only four hubs were installed in Bristol City Centre in 2009 – Explore, Bristol Royal Infirmary, Wine Street and the City Centre and the key hub of Bristol Temple Meads continued to suffer planning delays. The development and implementation of Hourbike represents a considerable body of work and, from data covering many conversations, emails and meetings a chronology of events has been extracted and is shown in Appendix VII. The next section outlines the membership and usage information gathered by the small network of ten bicycles in the North Fringe which gives an indication of the potential of such a scheme.

8.3.4 The outcome of the Hourbike intervention

When Hourbike was launched in October 2008 in the North Fringe the steering group agreed that individuals could register their interest in joining the wider network in the future or joining immediately. As part of this process, three questions were devised to be part of that process as well as the option to tick a box to say whether they would be willing or not to be contacted by the researcher in the future. Those registering their interest (120) or joining (225) were given three options to categorise themselves as a ‘regular cyclist’, an ‘occasional cyclist’ or someone who had ‘never really cycled before’. Chart 34 below shows that the concept of Hourbike attracted a mix including seven per cent of individuals who ticked the option ‘never really cycled before’.

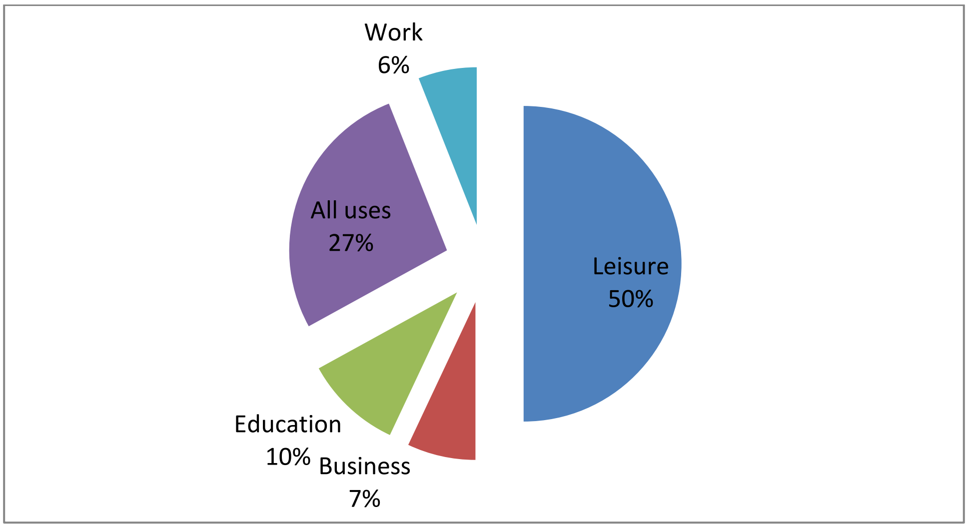
In terms of promoting cycling or bike-rail integration this is an important finding, seven per cent were ‘new’ cyclists and this number could be amplified by social diffusion as outlined in Section 5.3. In addition, it shows that the scheme attracted a large number ‘occasional cyclists’ who could be encouraged to cycle more. The fact that 32 per cent were ‘regular cyclists’ and therefore presumably have a bicycle supports the results in section 7.5.2 which showed that nearly two thirds of those already bike-rail integrating would consider hiring a bicycle. In other words, such a scheme can attract a mixture of users.

Chart 34 Category of cyclist (N=345)



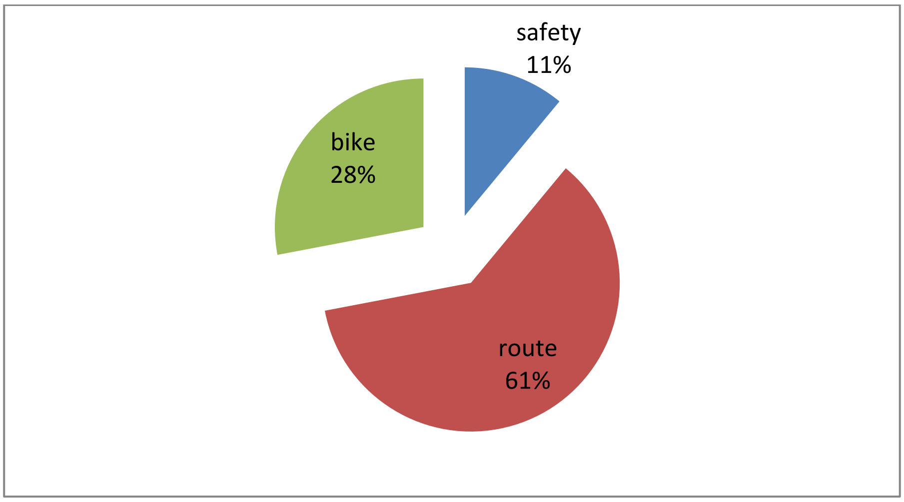
Members and those who had expressed an interest in joining were also asked for what purpose they anticipated making most journeys and were given the options in the pie chart in Chart 35 below. A quarter anticipated using their bicycles for all uses and half for leisure. As was shown in Section 3.2 Charts 9 and 10, an occasional cyclist is more likely to just cycle for leisure whereas regular cyclists tend to ride for all journeys.

Chart 35 Intended journey purpose (N=345)



In addition, respondents were asked whether they would be interested in receiving help with one of the following options; route planning, safety training or bike maintenance. Route planning advice was the predominant choice which is perhaps not surprising given that 61 per cent were 'occasional cyclists' as shown in Chart 36.

Chart 36 Help required- safety training, bike maintenance, route planning
(N=345)



The Transtheoretical model of Behaviour Change (Prochaska & Velicer 1997) introduced in Section 5.4.1, is based on the idea that behaviour change takes place in stages; Hourbike could be a catalyst to push someone from the 'prepared to cycle' to 'take action to cycle', as it provides an easily accessible bicycle. Chart 36 confirms that getting on a bicycle is just a start; a wayfinding capability for cycling also has to be developed as suggested by Flamm and Kaufmann (2004).

Chart 37 shows the number of rentals over time of the ten bicycles in the North Fringe, six bicycles at two hubs at the University of the West of England and four bicycles at one hub at Bristol Parkway Station. The walk from the railway station to the campus is 20-25 minutes (see Appendix IX) and a bus or taxi in the peak hours could take longer than that, given the high congestion levels. Despite very limited publicity and the small network that had existed for a year, Hourbikes had been rented 164 times.

Chart 37 Usage North Fringe network - October 2008 – September 2009

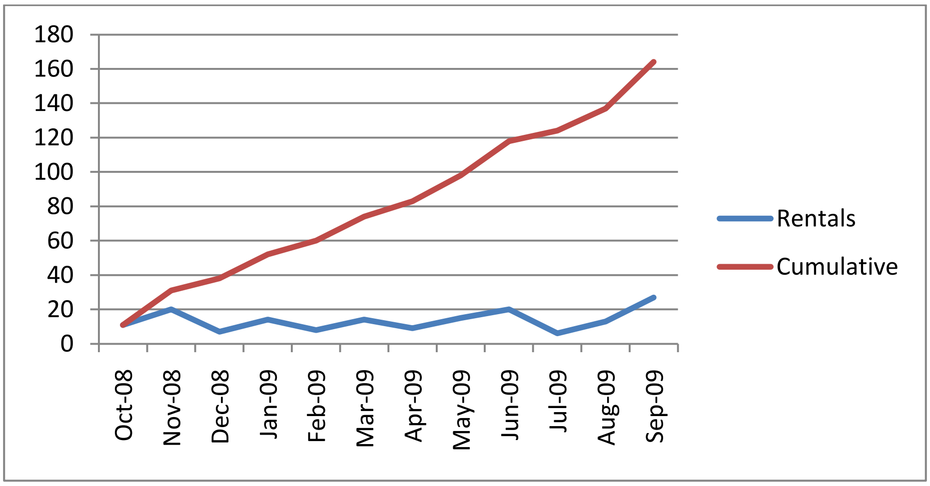
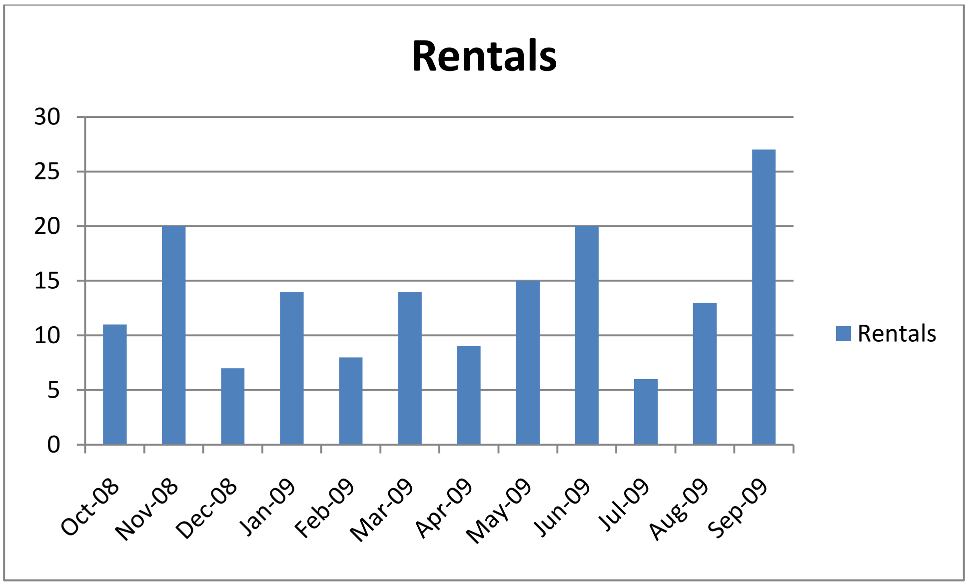


Chart 38 above shows the rentals in a bit more detail and it is surprising that there were so few in July, perhaps reflecting that fewer students and staff were around.

Chart 38 Number of rentals in North Fringe (1.10.08-31.11.09)



The delays in the implementation of Hourbike, explained in the next section, mean that the usage data is limited, but the next few charts show the type of data that can be obtained from administering a bike sharing system and the extent to which this could be useful in determining the impact but also for planning future development of the scheme. The data also has the potential to be a very important new source of data on cycling behaviour which is limited, as discussed in Section 3.2 and 3.5.1, as a result of cyclists being rare in the population.

Each time a bicycle is rented or returned, the back room computer system records that event in real time, giving information about the journey patterns, duration of rental and identity of the user. For example, the number of times a day a bicycle is removed from a certain hub is known so that if that particular hub is constantly empty, it may require an expansion and with a modular system, this can be put in place quickly.

Though representing very small sample sizes, the following charts are included to illustrate the kind of information that the Hourbike system could generate; this could be used in the future to 'monitor' initiatives to promote bike-rail integration by recording the activity at the station hubs.

Chart 39 below shows that Thursday across five months was the most popular rental day; this could simply be a function of one regular user who happens to have a particular journey that needs to be made on a Thursday.

Chart 39 Rentals by day (1.10.08-31.5.09)

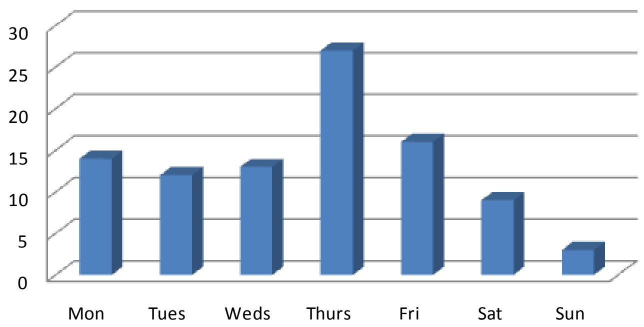
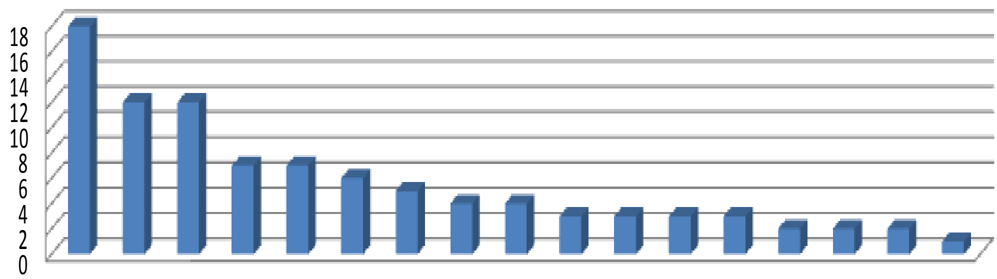


Chart 40 Number of rentals by each individual (1.10.08-31.5.09)



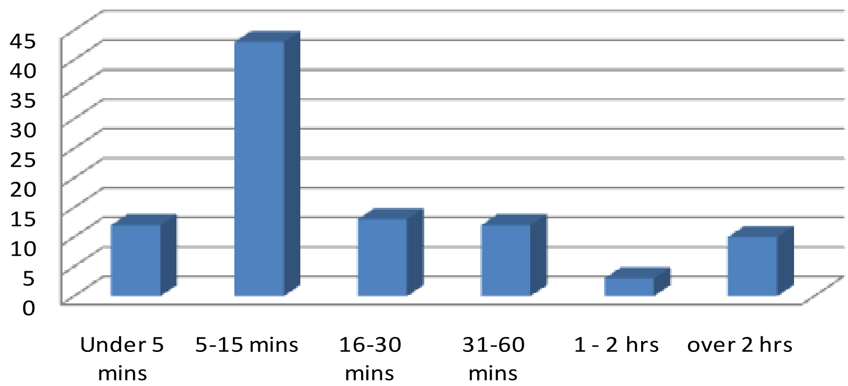
Each bar in Chart 40 represents the number of rentals that each of the users had made, so the highest number of rentals was 18 for one individual and the lowest was one rental. The software system can also log from which hub a bicycle has been taken originally and, from this data (Table 32) below it is clear that a number of individuals were using Hourbike for bike-rail integration, to get to and from Bristol Parkway station, but others were using it for other trips in some cases returning the bicycle to the same hub from which they originally took the bicycle. In the case of the student accommodation hub, this could be students using the bicycles for food shopping or leisure trips.

Table 32 Where the rental started and ended

Rental Start	Rental End	Count2
Parkway Station	UWE Frenchay Village	21
Parkway Station	Parkway Station	8
Parkway Station	UWE Frenchay Main	8
UWE Frenchay Main	UWE Frenchay Main	9
UWE Frenchay Main	Parkway Station	8
UWE Frenchay Main	UWE Frenchay Village	2
UWE Frenchay Village	Parkway Station	19
UWE Frenchay Village	UWE Frenchay Village	14
UWE Frenchay Village	UWE St Mattias	1
UWE Frenchay Village	UWE Frenchay Main	1

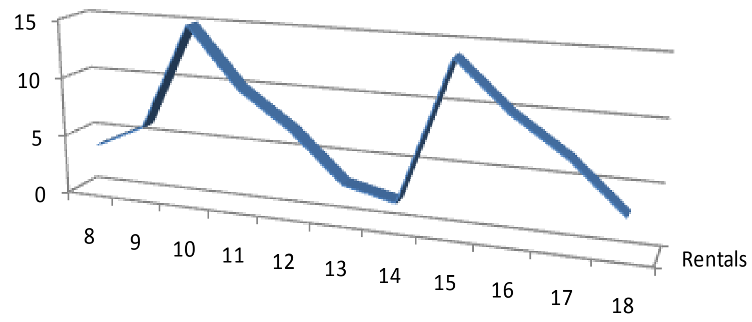
Chart 41 below supports this data showing that the majority of the trips take about 15 minutes, the time it takes to cycle to and from Bristol Parkway from Frenchay Campus. Those under 5 minutes may be individuals trying the technology in advance of a journey. Most of the journeys are under half an hour, which is free to the user, but there are also a number of hires that required payment.

Chart 41 Duration of each rental (1.10.08-31.5.09)



The time of day that the bicycles were rented is also known, as shown in Chart 42, so that, in the case of station hubs, the proportion of off-peak users could be calculated which is important in terms of making the case for rail companies to invest in this type of scheme as a way of attracting new users off peak.

Chart 42 Rentals by time of day (1.10.08-31.5.09)



The preceding charts illustrate the detailed information obtainable from the Hourbike scheme – the spatial pattern of the journeys, time and duration of hire. The questions asked in the registration process provided useful information in terms of the level of experience of users, a way of measuring the extent to which the intervention is attracting new users rather than existing cyclists.

The difficulties of implementing this scheme have prevented the researcher going back to users who have ticked a box (as part of the registration process) enabling her to contact them to discuss their experience of the system and their previous travel behaviour within the timeframe of this research project. However, some useful insights have been provided by the second intervention (Section 8.4), to attract car drivers to bike-rail integration, which included two Hourbike trials.

Hourbike has provided a 'new' cycling option for rail users at Bristol Parkway and has also shown that it can provide useful data. The limited scale has reduced its visibility and therefore the anticipated wider benefits. The next section reflects on the process and explains some of the factors that caused the delay in implementation.

8.3.5 Reflection on the development and implementation of Hourbike

The delays in implementation of Hourbike have been a considerable source of frustration for those in the steering group but are perhaps in the nature of something that tries to set a precedent. Lessons have been learnt that have relevance elsewhere but there were also delays caused by the particular situation in Bristol.

8.3.5 i Lesson relevant to others considering similar schemes

The steering group had discussed the fact that some of the existing hire bicycles available were too heavy and 'clunky' and therefore not fit for purpose in Bristol with its hills. A bicycle was specifically designed for Bristol with more gears (seven gears as opposed to none or three in some cases) and lighter, at approximately 12 kg, relative to the 22 kg of the Paris Vélib'. In terms of promoting cycling generally it was felt that maintaining some of the qualities of standard bicycles was important but at the same incorporating a variety of theft prevention features (See Picture 2 Appendix VII). The manufacture of a custom bicycle caused delays and this was exacerbated by a decision to switch to a new modular design of hire stand and electronic box for the City Centre which would enable more rapid expansion at relatively low cost.

The most challenging and time consuming part of implementing the scheme remains finding suitable sites for the hubs and this is likely to be a problem in other areas. The two main problems were obtaining planning permission of various types and the concern that existing cycle parking should not be removed in order to make way for bicycles for hire as this would antagonise existing cyclists. New sites had to be found. If the hubs were going to have any advertising to defray part of the cost, an additional permission had to be obtained from Adshel (a subsidiary of Clear Channel) who have an agreement with BCC for outdoor advertising. Hourbike, with BCC officers, looked and considered many sites in Bristol. Two examples illustrate the type of difficulties encountered:

- a hub at Temple Quays with many office blocks required a leasing agreement from the property management company, who in turn required shareholder agreement – both costly and time consuming;

- Bristol Temple Meads station, a key hub, as a Grade 1 listed building required listed building consent, resulting in long planning delays exacerbated by the number of parties involved in the decision – English Heritage, BCC, Network Rail and FGW.

> This experience led to the abandonment of another potential site at Thunderbolt Square as it was funded by Heritage Lottery Funding and the process of getting permission was considered to be too arduous.

There was no precedent for this new piece of 'street furniture' so that individuals approached or landowners all had to make decisions or invent new procedures for handling such a request, which caused further delays.

It could be argued that there is a resistance to anything new and a culture of risk aversion and, as was pointed out in Section 3.4, the promotion of cycling or facilities for cycling are not always welcome.

Another constant fear both within the steering group and within BCC was that all the bicycles would be vandalised and stolen. This made BCC wary of supporting the scheme. In all bicycle sharing schemes, as with many other forms of public transport, there is a theft and vandalism problem, but it could be seen as a question of scale relative to the benefits. Hourbike built in as much prevention of vandalism and theft as possible into the design of the bicycle and the positioning of the stands in areas with good lighting, CCTV or heavy footfall. In addition, those who joined had to give their credit card details so there was some accountability.

The issue of funding, and therefore the ability to set up the scheme at a sufficient scale to meet demand, was continuously discussed. It was felt that the scheme should be started as conceived and, if the demand was too strong, then the number of members would be limited to avoid disappointment. The issue of scale was also relevant to the governance structure and it was decided to remain as a loosely formed partnership with the scheme at a pilot scale, as it was felt that the legal and financial ramifications of setting up something more formal were too onerous. It was agreed that, if the scheme expanded, it would go over the tendering threshold within BCC and would therefore have to be reviewed. The governance structure also made decision making slow, as each member of the steering group had to pass decisions through their own internal communication structure. In retrospect, the sharing of responsibility without clear leadership made the loss of a key person, the officer from BCC, at a crucial point in the scheme's development, more significant.

8.2.5 ii Particular barriers in Bristol

There were two very significant factors that contributed to the loss of momentum for the implementation of Hourbike which were largely Bristol specific; the winning of significant central government funding to become the first UK Cycling City and the loss of the BCC officer who supported Hourbike from the outset.

The media coverage around winning the Cycling City bid focussed on Hourbike despite it being a very small part of the original bid for funding, as is shown by a story that appeared on 19th June 2008 on BBC online in the text box below.

> *"Bristol has become England's first "cycling city" in a £100m government scheme aimed at encouraging cycling.*
>
> *The city intends to double the number of cyclists over the next three years with a series of innovations.*
>
> *Sharing the funding will be York, Stoke, Blackpool, Cambridge, Chester, Colchester, Leighton Buzzard, Southend, Shrewsbury, Southport and Woking.*
>
> *Among the features in Bristol will be the UK's first major bicycle rental network, modelled on a scheme in Paris.*
>
> The government is giving Bristol £11.4m to transform cycling by creating dedicated cycle lanes, better facilities and more training for children."

However, within the bid, Hourbike was mentioned in one small paragraph

'The UK's first on-street bike rental network (Hourbike) is due to be launched in the summer and we expect that there will be the need to quickly expand upon the initial network...'

Only twenty thousand pounds within the Cycling City budget was allocated to support a Phase 2 of the Hourbike project and there was no specification as to what it would entail.

The media coverage around the Cycling City bid led to expectations of the Hourbike scheme that could not be met: in the public's mind it was a system like the Paris Vélib' with a bicycle on every corner. The Hourbike scheme had been conceived as a small scale trial with 60 bicycles prior to the launch of the Paris Vélib'.

A period of uncertainty within BCC followed the announcement of winning the bid and the officer who had supported the scheme from the beginning left BCC. It took nearly three months to get a meeting with the new Acting Project Manager for Cycling City to discuss

Hourbike. At that meeting it was made clear that BCC would continue to support Hourbike on the scale originally planned but would not give guarantees for further support. More importantly, without the original officer who saw the potential of Hourbike, there appeared to be limited understanding of what Hourbike could offer in terms of a visible manifestation of Cycling City, other than making bicycles available for training sessions and other activities envisaged around Cycling City as understood by Cycling England (see email quote from Cycling England in support of Hourbike within Table 35 Appendix VII).

The original council officer involved in the steering group had carried sufficient weight within the BCC transport planning department to keep things moving forward but his successor struggled to find the support he needed and was spending a lot of time dealing with misunderstandings within the transport planning department about what the scheme entailed. The scheme started to be perceived as liability or risk rather than something positive. It could be argued that, within BCC, cycling and anything related to cycling was still considered marginal (Section 3.4).

This uncertainty made approaching new organisations to join the scheme increasingly problematic because, without clear support from BCC there was less willingness to participate. After nine months, a new Cycling City Project Manager was appointed (16th March 2009) with a large backlog of decisions to be made regarding a number of schemes including Hourbike.

In the meantime, a similar sized scheme with 60 bicycles (mainly aimed at tourists) in Blackpool has been implemented by Hourbike, with the full support of the Council. This was officially launched on September 15th 2009 and within four months had more users than in Bristol. This is a clear illustration that the implementation was possible but in the case of Bristol the loss of the original officer and re-organisation within Bristol City Council created a decision making vacuum. The researcher was able to gain the support of the political leader on transport but he had to concentrate on canvassing for re-election in May 2009. At the time of writing, an expanded scheme was under discussion and Map 2 below shows the existing sites in green and the proposed 40 additional hubs (a total of 200 additional bicycles) consisting of 20 street based locations and 20 at the largest hotels in Bristol.

Map 2 Proposed Hourbike hubs

Bristol Hourbike grew out of this research as a way of providing another rail access option through bike hire, which it has achieved, albeit on a much smaller scale than was originally intended. It has also shown that it could be a useful research tool as a way of gathering more detailed information on cycling behaviour. The next section illustrates how the availability of bike hire could be combined with other measures to promote bike-rail integration.

8.4 Intervention to attract car drivers to bike-rail

8.4.1 Introduction

The collaboration in this research project with FGW provided the opportunity to design an intervention to pilot a social marketing exercise (Section 5.4) that could be further developed to promote bike-rail integration. As outlined in Section 2.1 and 2.3 it is the substitution of car journeys with bike-rail integration that is the overarching objective of this research. The methodology in this research specifically targets individuals known to make particular car journeys to work with a known rail alternative with walking or cycling access possible to the home station.

The researcher intervened by prompting a group of UWE staff members known to drive to the Frenchay Campus of UWE to consider a different way of travelling to campus, with the offer of two free return rail journeys from their home station. The idea was to see if the experience of accessing campus in a different way would change their existing travel behaviour. The trial puts the argument developed in Section 5.4 into practice, a social marketing exercise without psychographic segmentation that also includes personalised travel planning. A walking and cycling distance band from their home railway station was used to identify the target group (using university databases) as distance from a railway station is one barrier to rail travel (Section 3.5.2).

On this small scale, a qualitative approach using in-depth interview (interview prompts see Appendix X) was considered most appropriate to evaluate the outcome. The prompts were drawn from the Conceptual Model Figure 5 Section 5 with particular reference to the transport context, availability of a car, the particular journey and the social context. Factors such as cost and time are likely to be important but the use of in-depth interviews allowed insights into the participant's view of the world through their biographies, existing travel behaviour, attitudes, beliefs and motivations.

The map in Appendix IX shows the two railway stations Filton Abbey Wood and Bristol Parkway that serve the Frenchay campus both within a minimum of a 20 minute walk from the campus.

8.4.2 Intervention design

A purposive sample of staff members known to drive to Frenchay Campus at the University of West of England (identified through a parking permit database) and who lived within two distance bands – less than 2 km (walking band) and between 2 km and 5 km (cycling band) - of four railway stations - Bath, Bristol Temple Meads, Lawrence Hill and Stapleton Road - were given the opportunity to try accessing the campus by rail using walking or cycling as access.

In order to comply with data protection legislation, the names of staff members were not known, the UWE travel planner was simply given the home postcodes of those with parking permits at Frenchay, which were matched with staff home postcodes of those working at the Frenchay Campus site obtained from Human Resources. The matched postcodes were then sorted into the distance bands around the four stations and those within the two distance bands extracted.

It was to these two groups within walking or cycling distance of their home station that a blind email was sent by the UWE travel planner with a subject line address saying 'Opportunity for free rail travel' (see email Appendix VIII). The email was addressed 'Dear Fellow Staff Member' as a way of signalling that it was an email from one of their 'group' i.e. staff member (see Section 4.4). The same email was sent to 80 staff in the less-than 2 km distance band (twice on the 24th March and the 23rd April) and to 360 staff in the 2–5 km band (once on the 23rd April).

The email did not give participants any specific details of the trial, nor the amount of free rail travel available, those receiving the email were simply asked to contact the researcher for further information. The email used messages derived from the discussion in Chapter 4 but also the results of the face-to-face survey of bike-rail integrators. Two questions were posed at the top of the email to appeal to different motivations (see Section 7.4.1):

- Fancy some exercise as part of your daily routine?
- Want to catch up with your reading on the journey to work?

A further message in the email reinforced these motivations by saying that several staff members (a group to which those receiving the email belonged and could identify with - Section 4.4) were already choosing rail for these reasons - to catch up on their reading and to build exercise into their day, with a quote from one staff member who responded to the face-to-face survey at Bristol Parkway - "*I like the fresh air, it was a conscious decision to use my bike with the train, I feel more awake. I used to drive the whole way everyday but I felt lethargic*". This quote was intended to suggest to the receiver that others, within their 'social' group were already choosing this behaviour and so, in theory, it would be less of a decision to join them. Table 33 below illustrates the elements of the intervention and their purpose using issues discussed in Chapter 4 on the left-hand side.

Table 33 Levers used in the bike-rail intervention

How behaviour can be influenced	What are the levers?
Deliberation of behaviour	Email from UWE travel planner offering free rail travel and trial of Hourbike
Changing perceptions	Message about exercise and time for reading
Increasing behavioural Control	Personal advice on how to make the journey, weblinks to maps and personal rail timetable.
Changing social norms	Message that other members of staff were bike-rail integrating and obtaining benefit
Making behavioural plan	Two return rail fares to be used within a certain time period
Setting behavioural goal	Commitment to try two journeys and be interviewed by the researcher (cycle or walk to the station twice a week)

8.4.3 Response to the opportunity to trial a new behaviour

Twelve individuals responded to the email (see Table 34 below) by contacting the researcher and were given further information about the trial, either by telephone or email. The offer of two free return rail tickets was made and the tickets could be used on any day that suited their needs alongside a free trial of Hourbike. In return, they would allow the researcher to interview them in person after the trial. At this contact, the researcher learnt more about their existing behaviour and their level of knowledge of how to use rail. The researcher acted as a personal travel planner suggesting different ways of making the journey and the access options, providing them with the web link to the map showing the walking and cycling routes from the stations to the campus (Appendix IX) and the FGW link from which they could download a personal timetable for the relevant service. After this information exchange only six were willing to participate representing 1% of those approached.

One of the original 12 was eliminated as he had recently bike-rail integrated to UWE. Another four respondents did not respond again after they had received the basic information despite the researcher trying to make contact. As an example, one respondent had written in an email response *'I injured my ankle earlier this year and can neither walk* *nor cycle very far at the moment so a combined rail/cycle trip might be the perfect way to get to work without driving'* yet she did not respond again. The sixth respondent, after receiving the information, focussing on the fact that cycling was involved even though it was portrayed as one access option along with walking, responded '*I am going to leave this for someone living further afield and willing to get on a bike on Bristol's hills!' .* Table 34 below outlines the overall response.

Table 34 Response to Intervention

Date recruitment email sent out	**Number of staff with parking permits in that distance band**	**Number of responses**	**Number who were willing to participate once they had the information**	**Stations**
24th March 2009	80 within 2 km of the 4 stations	2	0	0
17 th April 2009	360 within 2km-5 km of the 4 stations	7	5	2X Bath Parsons Street Clifton Down
23rd April	78 (-2 who had previously responded) within 2 km of the 4 stations	3	1	Stapleton Road

Five individuals had responded to the email but when they had been given the information they did not want to participate and said it was not possible, despite attempts to ascertain what aspect of the offering was unattractive. During the discussion with the six who were willing to participate it became clear that it would have been very difficult to ask individuals to travel on certain days as opposed to supplying a ticket that could be used on any day. This caused some delay as special tickets had to be supplied by FGW and these were undated so that the participants could write on the date when they used them for validation. All participants received tickets on May 18th 2009. Participants were asked to complete the journeys as soon as possible, with gentle reminders in the form of trying to fix a date for interview.

This low level of response illustrates the difficulty of promoting behaviour change and, as anticipated, the change to two modes at once may be particularly challenging (Section 3.1).

The dialogue with participants at this first stage showed that two barriers were the lack of knowledge about the ‘alternative’ and the station’s location in relation to the campus and the routes to it (Section 4.2.4). As was shown in Section 8.2.4, 61% of those using Hourbike wanted help with route planning. In addition, at the next stage, actually making the journeys, a further respondent dropped out, so only five participants made at least one journey by rail to access the Frenchay campus and were interviewed. The sixth participant, who failed to make any journeys, was asked to answer a few background questions about his existing travel behaviour, similar to those within the interview prompts.

As a result of a delay in getting the tickets from FGW to the participants, there was a considerable gap between when they received the original email, their trial journeys and their interviews (approximately one month). As outlined in the previous section the email was carefully worded but none of the participants could remember the exact messages; however, clearly for them to respond there must have been something that triggered a response. The email was designed to prompt deliberation about a change in behaviour (see Table 35 above) and suggest a different perception of the potential benefits of a rail journey with walking or cycle access – time to read and exercise. However, it was not possible to assess which of the messages – free rail travel, time to read or exercise – proved to be the most attractive. In future with a larger sample size different messages could be tested. The inability of interviewees to recall accurately is an illustration of one of the weaknesses of interviews though in a future exercise the time between the original email and interview could be reduced.

Table 35 below provides a summary of the demographics of the individuals who agreed to take part in the trial, their access to a car, previous experience of rail and other methods of getting to campus and why they responded to the offer. What is interesting to note is the extent to which some of the participants had experimented with alternatives despite the fact that all had sole use of the car apart from one participant whose partner occasionally used it. This appears to contradict the idea that car availability removes the motivation to look for alternatives. What was not clear was how recently the alternatives had been tried, but in one case a single bad experience with the bus was enough to eliminate that alternative. There is also the possibility that when asked specifically in an interview, it was perhaps felt to be socially desirable to say that they had considered alternatives, as a way of justifying their choice of car access, removing cognitive dissonance (Festinger 1957).

Table 35 Existing behaviour, access to a car, experimentation with alternatives and motivation for responding

Age of Participant (Length of employment at UWE)	Access to car and household	Ever used rail for this journey	Tried other options for journey to campus?	Why did they respond to the offer?
Male 35 (8 years)	Lives on his own, sole use of his car	Once or twice	Taken the bus, walked the whole way(50 minutes). Recently bought a bicycle through Cyclescheme. Has car shared.	Finds driving stressful, hadn't really considered rail as a option
Male 57 (17 years) *** Did not make a rail journey**	2 person household with 2 cars	A while ago	Sometimes car shares with a near neighbour, has used the bus. No bicycle	Unclear
Male 48 (20 years)	Family of six with 2 cars and 4 drivers including two teenagers. Sole use of large car.	Several years ago quite frequently	Bus twice and felt sick 'I'd never do it again' Bicycled the whole way (1 hour) For three years used the train and walked. Has car shared. Has a bike now only uses it locally	'Just because I wanted to get myself back into a different form of getting into work'
Female Over 50 (over 20 years)	Lives on her own, sole user of her car	Never	Has tried bus which was highly satisfactory but only because she took it at mid afternoon when there were no students. Has bike but only uses it locally.	Wanted to try it to see if it was a viable alternative at the peak times on campus when the traffic is bad
Female 30 (over a year)	Shares flat with another woman, each have their own car	Once before	Used the bus once, took too long, too crowded on the way back "I'd never get the bus again". Has thought about cycling but considers the road conditions too difficult. Has car shared but no bike	I'd like to see if other options are viable, it seems a shame that the choice is just driving or nothing.
Female 29 (4 years)	Lives with boyfriend one car between them	Occasionally when her boyfriend has needed the car	Hasn't really looked into a bus option 'It would take too long, or they don't turn up' Doesn't have a bike	Offer of a free trial

The timing of the receipt of the email appeared to be a factor in whether an individual responded or not. So, when the same email was sent to the same group of people a second time, three more people responded. This could be a function of a respondent's workload or mood on a particular day or perhaps it took a reminder to get them to respond. It suggests that repetition of a marketing exercise may be important. In the case of the 48-year-old male, the interview showed that it had arrived at a particular stage in his life when he was struggling with a heavy workload and not having the time to take exercise and the email '*helped me get the idea into my head'*; the email had prompted him to deliberate.

For some who have worked in the same place for over twenty years, life stage may also be a factor (Section 4.3). For example, the participant living in a two car household with four drivers had sole use of the larger family car because the teenage drivers were not insured to drive this car and his partner did not like driving the larger car. A second car had been purchased for the 'learner drivers' giving him sole access to the family car. He commented '*We only got the second car two years ago when I started to use the car much more, we definitely could go back to one car if I was to bike-rail integrate'*. Only one participant mentioned concerns about the environmental impact of car driving. One participant required their car during the working day, others only very occasionally.

As was explained, none could remember the exact messages in the email but it became clear in the interviews that an underlying motivation to participate in this trial was the difficulty of car access to UWE, the peak-hour congestion and the unavailability of parking places. In other words, although they had access to a car, the positive attributes were curtailed by the transport context. Three participants articulated that they were motivated by the prospect of some exercise and two were looking at the rail option as a back-up, in one case to act as a 'reserve' at the worst times of year for traffic (in the Autumn) and the other for the few times her partner needed the car. In the last case the occasional deficit of car availability as described in Section 2.3 had prompted her to look at alternatives.

8.4.4 Experience of the new behaviour

Table 36 below summarises the journeys that the participants made, their experience and the likelihood of them continuing. It should be noted that Parsons Street and Clifton Down station are both within the 2-5 km band of Bristol Temple Meads station hence they fell within the BTM catchment area for this trial and likewise Oldfield Park is in the 2-5 km distance band of Bath Station. The journey from Clifton Down station was the only journey that required a change of train; this resulted in the two participants from that station only making one journey each, as neither felt it was a viable option for them, even though it was free.

Table 36 Rail journey experience

Participant length of employment	Journey(s) made	Overall Time	Experience – continue?
Male 35, > 10 years	Twice Walked to Stapleton Road, took train to Filton Abbey Wood (FAW) and walked to office	20-25 minutes (Car 10 minutes on a clear day up to 40 minutes with traffic)	Good experience '*definitely do it again'* walk at either end not onerous. Considered using a bicycle for access but decided against it.
Male 48, > 10 years	Once Walked to Oldfield Park station in Bath, Train to FAW, and walked to office. Second Trip – walked to Oldfield Park- Bath, Train to BP, Hourbike to office.	About an hour and a half both journeys (Car journey 35 minutes without traffic)	Good experience of walking at both ends. Some difficulties with Hourbike technology and worked out that with the extra travel to BP beyond FAW was not really worth the very marginal time reduction cycling. Not sure he would commit to using the train, concerned about the cost
Female, over 50 > 10 years	Once - Walked to Clifton Down, Train to Stapleton Road, Changed to train to FAW and walked	Hour and a quarter (car journey varies – half an hour depending on traffic)	After the first journey emailed the researcher saying that the journey was too long and that she did not want to do it again. The issue was the '*jerkey*' nature of the journey having to wait at Stapleton Road for 15 minutes, could not make good use of the time. Unlikely to use the train again except perhaps when the 'push factors' i.e the busiest time in the Autumn when the car alternative is difficult.
Female 30, over a year	Once Walked to Clifton Down, changed at BTM to BP, cycled to office.	Hour and a half (car journey varies – half an hour depending on traffic)	*'It felt like a long commute, I was very tired coming home'* did not like having to change trains. Very positive about the Hourbike experience and would like to use it again but not the rail itself 'It is too bitty the rail journey'.
Female 29, 4 years	Twice Walked to Parsons St, train to FAW, walked to business park	45-50 minutes car journey 25 minutes	Good experience but probably will only do it when she does not have the car available and is concerned about the cost.

The participant from Bath (48-year-old male) articulated very clearly that though the journey time was longer by rail than by car with walking access and he perceived that out of that time, 35 – 40 minutes on a train was working time. He also said the journey would also allow him to build exercise into his daily routine. The other Bath resident (57- year-old male) who did not make the journeys correctly perceived that the trial journey would take more time than his car journey (off-peak) but the potential benefits of reading time and exercise were not part of his calculation. He said *'the idea has been planted in my brain and the feasibility clearly established but time is clearly an issue when I can travel door to door in 35 minutes in a car but it could take me could nearly 3 times that by train'*. Though his original response to participate may have been driven by the messages contained in the email when it came to actually changing his behaviour, he was unable to do it. He wrote to the researcher '*Against all my best intentions, I will not be able to use these rail tickets after all. Mine and my wife's health issues have taken up a lot of time, as has getting a dog again (good for exercise and my blood pressure!) and I have had ridiculous amounts of final year assessments (non-stop since we met on 18th May and still not finished..)'.* This suggests that the intention was there but when it actually came to making the journey, his perception of the considerable effort of extra time and inconvenience was a deterrent.

As can be seen in Table 36, out of the five participants who made the journey, only one appeared to be likely to continue to use rail regularly, the participant from Stapleton Road. The participant from Parsons Street would use it as a back-up when her car was not available. The Bath participant who made the two journeys was less willing to commit to using rail on a more regular basis as he felt the cost was prohibitive. Neither participant from Clifton Down would use rail again, they did not like having to change trains or wait for a connection. One did not wish to wait at Stapleton Road as advised by the timetable *"I didn't want to sit on my own at Stapleton Road so I took the train into Temple Meads. Fine at Stapleton Road in the summer but there is no real shelter there"* and the other said "*I'd thought I'd be able to read the paper, such a short time on the train and no comfort at the Stapleton Road station to read the paper, the journey is too jerkey, you can't really use the time constructively*". Both articulated that they did not like the 'interrupted' nature of the journey and declined to use their second rail ticket to repeat the journey. Their journey time using rail was longer than by car but in this case the participants felt they could not make constructive use of the time as a result of having to change trains and wait for a connection. Stapleton Road station is unmanned.

The results outlined above are journey specific and to some extent the stations chosen were not the optimum in terms of their comparative advantage with a car journey, but FGW had restricted the availability of free tickets to those stations. The advantage of the train is likely to be for the longer commutes where there is more of a journey time advantage and also enough journey time on the train for individuals to read or work. For those who are solely motivated by getting exercise perhaps the actual journey from Clifton Down to Filton Abbey Wood could provide some benefit but it offers very little other advantage except perhaps at peak time to avoid congestion or the lack of parking.

A considerable amount of time in the interview was spent getting an idea of their existing travel behaviour to work and travel conditions and to what extent that would give an insight into why participants responded to the offer of an alternative access mode given that their habit was driving (see Section 4.2.3). As the results in Chapter 6 showed bike-rail integrators had experimented with the timings of their journey to find space for their bicycle on the train. In this case, individuals had clearly experimented with the timings of their car journeys to work to avoid congestion and parking difficulties. Their car journey times varied according to the time of day and they had developed ways of organising their work time to avoid the peak times of congestion and to ensure getting to campus early enough to find parking. There were variations from a ten minute journey time climbing to 40 minutes in the peak or a 35 minute journey climbing in the peak to over an hour. These findings support the conceptual model Figure 5 Section 5.2 showing that the decision to participate was different depending on the individual's context.

The participants would talk about the flexibility of the car and then articulate that they had only a ten minute window in which to leave their home otherwise they hit heavy traffic or would not be able to find parking on campus. One woman had developed a strategy of getting in late when usually there is very little parking available *'If I arrive at five minutes to ten, I sit in my car where I know cleaners leave and I'll get one of those places. I'm not telling you where they are, otherwise it would be impossible. To be confident of finding a parking space you have to arrive before 9 o'clock'.* Interestingly, none of the participants mentioned the cost of parking despite a recent increase in parking charges at the University. The cost of rail travel was mentioned but not the car parking charges (despite a price rise the previous year from £15 to £75 per year).

One respondent emphasised the control of time that a car gave him but when it was pointed out that in fact the congestion barrier meant he was limited in his flexibility, he then responded '*It gives me control to spend longer at work, that is what it does, before 8 am and after 6.30 pm the car journey takes me half an hour. If I'm on the train it takes me an hour* *and a half'*. Another remarked that though they felt they had more flexibility around their leaving time, the respondent said, '*often I'm trapped on campus because of the traffic queues between 4.30 pm and 6 pm*'. The traffic and parking conditions at the Frenchay campus are clearly a 'push factor' and participants were asked what they least liked about their journey to work. Their answers are shown in the text box below.

57-year-old male *'Having to drive'*

48-year-old male *'It is a very unpleasant way of getting into work .....one I get no exercise and my lifestyle means that the only way I get exercise now is when I build it into the pattern of my week, so that is the downside.....it is just dead time....I find that driving is completely dead time'*

32-year-old male *'the stress of driving, I don't like being stuck in traffic, it is quite frustrating....you sometimes get to work and you are already stressed out'*

Over-50 female *'I don't mind the driving, it is the parking and the blocked route from the M32 that I like the least'*

30-year-old female *'What I like least about my journey to work is sitting and travelling about one metre per hour if you are queuing. If you are moving it doesn't feel like a waste of time'*

29-year-old female *'just what it is putting on the planet, I'd quite like a bit of exercise, sometimes I do feel like I'm just sitting down and not doing anything'*

Yet despite this negative experience articulated in the text box above, the participants drove to work every day, partly because they could alter their behaviour to avoid the problems but their flexibility was limited by the conditions which is one of the major attributes of a car[32] .

Participants were also asked what they liked most about their journey and they appeared to find it difficult to find things to say other than the control of time, flexibility, the ability to carry things and one participant gave a more affective response '*travelling through green spaces, time to think and listen to recordings from the radio*'. Given that the participants all had access to a car, perhaps in a different transport context without such severe peak congestion, they might not have responded to the trial, which highlights the potential importance of 'sticks' within a package of measures for a travel plan (Section 2.4).

The social representation of car use (See Section 4.4) is flexibility and control but congestion and lack of car parking in this case meant that the reality was rather different. It is possible that the UWE travel plan, which encourages employees to access the campus

[32] Among the participants there was noone who had direct responsibility for children which might make it particularly difficult to alter the time of the journey to work and avoid congestion as they may have to drop off children at the start of school

by means other than the car, may have contributed to the willingness of participants to try an alternative. Participants were also asked to what extent the journey to work was discussed amongst colleagues and their responses are shown in the text box below.

57-year-old male *'not all drive to campus, some bike and bus'*

32-year-old male *'Couple of people cycle both ways, another does a combination of walking, cycling, bus or driving...quite a few people in the office who have tried alternatives and we do talk about it. That has sort of encouraged me to try and do more'*

29-year-old female *'Yes we discuss it, some drive, some walk, some get the train - variety...lot of people live close....10-15 minutes in the car or a 25 minute walk.'*

48-year-old male *'our department is quite values driven, you have a lot of people thinking about sustainability,green issues alternative ways of thinking about things....3 people I know cycle in every day out of 20 of us, there are others who cycle sporadically'*

Over 50 female '*Most of my colleagues drive, two colleagues who live closest to me would be driving'*

30-year-old female *'I only know one person who gets the bus, I don't know anyone who cycles though there is one person who cycles from Cotham'*

It is clear that to some degree participants were aware of how their colleagues travelled to work and as was pointed out in Section 4.4 whether an individual will entertain the idea of using rail or cycling will to some extent depend on those around them.

8.4.5 Experience of access to the rail network, Hourbike, and information provided

The choice of home origin stations was dictated by the willingness of FGW to supply free tickets for the trial and their willingness only extended to those stations considered to have spare capacity at peak – Bath, Bristol Temple Meads, Lawrence Hill and Stapleton Road. All lay to the west of Filton Abbey Wood, the closest alighting station on the rail line (although with fewer stopping trains than Bristol Parkway- see Figure 8 Section 6.5). The implication of this choice was that the advantage of cycle access through Hourbike was reduced, as it was only available at Bristol Parkway, which was the less attractive option for most of the participants, as it required an extra stop and added at least five minutes onto the train journey. Action research as a collaborative process introduces constraints in the research design but this intervention was piloting a methodology and, as will be shown in the following sections, many improvements could be made to this particular design for different transport contexts.

The fact that free rail tickets were only available from stations to the west of Filton Abbey Wood meant that only two participants were willing to go beyond that station to Bristol Parkway to try Hourbike. Another participant was a cyclist and would have tried it had it been available at Filton Abbey Wood but considered that the extra journey on the train to Bristol Parkway would not be offset by the faster journey on a bicycle.

Both participants who did try Hourbike said they would probably use it as an access mode only if it was available at Filton Abbey Wood. The Clifton Down participant who does not own a bicycle used Hourbike and was very positive about the experience. She asked the researcher whether Hourbike would be available in her neighbourhood in which case she might cycle to Bristol Temple Meads for a direct train. This picks up on Section 6.7 which found that several of the bike-rail integrator sample were using Bristol Temple Meads rather than their local station, partly to reduce the cost of their rail fare but also to avoid changing trains, and cycling to a larger station gave access to a more frequent rail service and more secure parking.

The Parsons Street participant had considered obtaining a bicycle through the Cyclescheme at the University and bringing it on the train but the steep steps at her station made it impossible. Another idea was to cycle to Bristol Temple Meads, which she estimated was a 20 minute walk from her house and which she considered too far to walk. The researcher suggested a folding bike might be possible from Parsons Street to which the participant responded that she would rather purchase a mountain bike so that she could use it for recreation with her boyfriend, who had just bought a bicycle through Cyclescheme[33].

The participant from Stapleton Road did not use Hourbike because he felt it was going out of his way to go to Bristol Parkway and though he had recently bought a bicycle through Cyclescheme he preferred to walk either end of his rail journey. Given that he had explained that sometimes he walks the whole way home which takes about 50 minutes, walking was not a barrier for him. Another option that was discussed was cycling one way and using the train the other way, but his response was '*In theory it is possible, in my mind when I got the bike I thought it would be a relaxing way of coming to work but having cycled around Bristol a few times now it is actually quite stressful, you probably get used to it I'd imagine, traffic is pretty bad...not a huge amount of regard for cyclists. I am very much aware now as a driver*

[33] Within a household individuals may be at a different stage of 'cycling' which was the thinking behind Cyclingworkforce Figure 12 Appendix VII

that you need to give cyclists a much wider berth...it can be quite scary and sometimes drivers can be quite aggressive towards cyclists. I don't think I'd realized that until I got on my bike myself'.

What is particularly interesting about this quote is that in this case it was not the 'perceived unattractiveness of cycling' (Section 4.4.1 Gardner & Abraham 2007) but the actual experience. This 32-year-old male is within the most common group of bike-rail integrators in the Bristol sample (male and in his thirties) yet he was unsure of cycling. In the conversation he did acknowledge that perhaps the experience would improve with practice but the fact that even he found it an intimidating experience shows the extent to which cycling conditions and driver behaviour will need to be changed to encourage others to cycle.

All participants were given basic information about how to make their journey and any additional information that they had requested. All participants had downloaded their own personal timetable from the Great Western website which they found useful and all the trains within the intervention ran on time. There were some small issues, which the researcher clarified for participants, about the routes from the station(s) to the campus though they were all directed to the map on the UWE website (Appendix IX) which shows the routes clearly.

The Stapleton Road participant said that before the trial '*it sort of passed me by that I could get off at Filton Abbey Wood and walk, I think I thought it was further than it actually is, it is only a 10 minute walk*'. Only one participant had found that the walk was further than anticipated, which was partly to do with wayfinding but may also have been because she did not like the walk – '*I didn't find the walk from Filton Abbey Wood particularly appealing as a walk even on a nice day, you go past this big wire fence (the MOD) which looks hostile, there is a duck pond on route with some ducks and that is the highlight of the walk, then you are up the side of the dual carriageway which again is not particularly attractive, so I felt if I wanted exercise, I'd rather take my car and take a walk on the downs in Bristol in lieu of that*…' As discussed in 4.2.4 this affective appraisal may be as significant as the time it takes to walk the distance. This participant also kept mentioning that she needed to carry a lot of luggage, which was a real barrier to her using rail, not only because it was too heavy to carry to and from the station, but also because some of the material was confidential and she was concerned about leaving it on the train. As Mackett (2003) pointed out, carrying heavy things was one of the most frequently cited reasons for car use for short journeys (Section 2.3).

The participant from Parson Street also mentioned that it was through a chance conversation that she learnt that there was a service from Parsons Street to Filton Abbey Wood *'otherwise I wouldn't have had an idea that I could get the train'*. Though, as discussed in Section 4.2.4, there has been too much optimism (Chorus et al. 2006) about the provision of travel information, it was clear from two of the participants that their knowledge of available services and the proximity of the stations serving Frenchay Campus was limited. Word of mouth or informal travel information (Bartle, Avineri & Chatterjee 2009) is probably significant within an institution where, as has been shown, individuals do talk to their colleagues about their journey to work. This is another reason why social marketing at an institutional level, such as an employer travel plan, can be effective; it creates a conversation about alternatives, with information exchange amongst employees.

8.4.6 The implication for the promotion of bike-rail integration

The outcome of the intervention to attract car drivers to rail with walking and cycling access supports the conceptual model in Figure 5 Section 5.2 showing that the decision or response to the trial is a web of competing and interacting factors related to the particular person, their physical, social and transport context and the particular journey that they want to make.

This was a very small scale intervention, within the scope of a PhD research project, but it does suggest that changing behaviour towards bike-rail integration will not be easy. Only six people out of 440 approached wanted to participate and, of those, only one person may continue to access the campus by rail post the trial. However, even if a small group within an organisation like the University of the West of England change their behaviour, this change could be amplified by social diffusion and in turn to begin to change the car dominant social norm within the University (Section 5.3). The second text box in Section 8.3.4 shows the extent to which participants were aware of their colleague's travel to work behaviour.

This intervention has also added additional depth and detail to the data in the exploratory phase in terms of the barriers that non-users are likely to face at different stations. Parsons Street station has a long flight of stairs down to the platform. One solution would be to procure a fixed frame bicycle, but as the participant stated, she was only able to afford one bicycle and therefore her choice was a full size bicycle for other reasons unrelated to her commute. She wanted to be able to go for bicycle rides for leisure with her partner. Secure cycle parking at the top of the steps down to the station might be an option to park her full size bicycle but to implement this facility might require collaboration with the local authority. Another alternative would be to cycle to Bristol Temple Meads where there is secure cycle parking. This data highlights the fact that the facilities and guidance to promote bike-rail integration will need to accommodate many different possibilities to attract new users.

Though only six were willing to participate in the trial, others received and read the information, and six others had responded and contacted the researcher and then decided not to take it further. It could be argued that the recipients were at a different stage of change as suggested by the Transtheoretical Model of Behaviour Change (Prochaska and Velicer 1997) (Section 5.4.1). Individuals who received the email and did not respond may never have considered rail, and the email may have prompted some deliberation or even a discussion with peers which, given a further prompt, might lead to action in the future. An important argument within this research has been the idea that access to a car prevents the consideration of alternatives. This intervention suggests that this is not necessarily the case. An individual may have sole access to a car but in a congested road network it confers less benefit and therefore an individual might consider alternatives, particularly if there is an incentive as there was in this case – free rail travel.

As has been repeatedly pointed out in this research, a package of measures is likely to be necessary, with each element 'nudging' an individual towards behaviour change (Thaler and Sunstein 2008). In this intervention there were several elements:-

- an incentive through two free rail tickets
- a practical access solution was made available free - Hourbike
- motivational messages – exercise and time were highlighted
- the social message that others in their social group were already accessing campus by rail
- informational barriers were removed through personal travel advice

Importantly, the car was a less attractive option as a result of the transport context, congestion at peak. There was a combination of incentives and disincentives. This intervention represents one combination of measures and has given some first insights into future designs for the promotion of bike-rail integration.

So, for example, two journeys probably do not allow for enough investment of time to master a new travel habit to the point where the benefits are maximised (Flamm et al. 2004)[34]. The Bristol bike-rail integrators showed the extent to which they experimented with the different forms of bike-rail integration and the timings of their journey (Section 7.3.5). The same was found to be true for the car drivers in this intervention; they had learned to leave home at a certain time to avoid congestion. Another design option would be to commit individuals to a discounted season ticket or carnet which might 'lock them in' to a new behaviour for long enough to establish their optimum journey pattern and a new habit.

As an example, in the case of the participant from Bath who did make two journeys, perhaps if he had been committed to making more journeys through a carnet or rail season ticket he would have developed a new habit. This participant was concerned about the cost of using rail, and in this case it was over and above owning two cars – a function of requiring two cars for his teenage sons to learn to drive. His sole access to a car acted as a disincentive despite his perception of the potential benefit of being able to work on the train. If, as section 2.3 pointed out, he had had to negotiate for access to a car, this deficit of car availability might have acted as an added incentive to develop a new habit. Another individual with a different set of circumstances, for example, two cars in a household with two people where the second car is barely used, might consider selling the second car if they discovered that rail or bike-rail integration could fulfil their journey requirements.

The choice of origin stations in this intervention was dictated by the funds available but could be altered, particularly to serve stations east of Bristol Parkway such as Swindon where using Hourbike would be more beneficial. If the scale of this intervention was increased to a larger number of origin stations it could provide interesting and quantitative data to identify the rail journeys that seem to offer particular benefits relative to a car journey. Different messages to attract participants could be tested to see which resulted in the greatest response. On a larger scale it would allow a greater assessment of the access possibilities of walking versus cycling and the potential uptake of Hourbike. In addition, participants could be approached at intervals to see if they had in fact continued using rail with walking or cycling access post the trial.

This methodology could be applied by different employers in the area surrounding Bristol Parkway Station as part of the station travel plan. Equally it could be applied in reverse to households that live within walking and cycling distance of Bristol Parkway but commute by car elsewhere. Individuals living within the vicinity of a railway station do not necessarily

[34] the researcher and the UWE travel planner are discussing the possibility of expanding this trial with FGW and the Friends of the Severn Beach Rail Line but providing discounted rail travel, rather than free travel, over a longer period.

know the destinations that are served from the station nearest to their home as was the case for the Parsons Street participant. Information alone is unlikely to stimulate change (Section 4.2.4) but with perhaps a financial incentive, a free trial, and if everyone in the neighbourhood receives the same information, it might prompt discussion and deliberation.

The results have shown that for some journeys the rail option may not be a realistic option but, given the congestion problems around the University, there will be some car journeys for which bike-rail integration could confer benefit. In the longer term, this kind of information can be used to inform the routing and timetable of trains in order to better respond to the user's needs. The final section considers the development of the Bristol Parkway Travel plan which could perhaps act as a catalyst to stimulate other employers in the area to conduct similar exercises.

8.5 Conclusion

Chapters 4 & 5 illustrated the potential levers that can encourage individuals to make different travel choices and which can be applied in a variety of ways, at the level of a station or an institution like UWE and directly at the individual level, through personal travel planning. As was pointed out in Figure 5 Section 5.2, the individual is inextricably linked to their social and cultural context; there is constant interaction between all levels. Therefore, any intervention that attempts to address barriers at a number of different levels is likely to be more successful.

The two interventions discussed in this chapter are just two possible options to promote bike-rail integration using these levers. The implementation of Hourbike illustrated that governance issues can be a barrier. The choice of a model that tried to engage a number of stakeholders to cooperate and share the burden of funding made decision making cumbersome. The loss of one partner, the original supporting officer within BCC, was significant in the delay of the implementation and beyond the control of other partners. This was exacerbated by BCC winning the Cycling City demonstration funding that resulted in a decision making vacuum within BCC at a crucial time. On the other hand, sharing the responsibility across institutions does have the potential to use their internal networks to promote the use of the system and to ensure that all the possibilities of use are explored.

One conclusion could be that the unique model of engaging several stakeholders was a hindrance and that perhaps the model found in The Netherlands and Germany with one organisation, the rail operator, taking responsibility would be easier to implement in practice. The fact that the proposed London bike hire scheme is not designed to cater for the after-rail market suggests that there will have to be further experimentation with different models of governance to address the particular needs of bike-rail integration.

It is proposed to have cycle hire at the new cycle hubs planned at ten major rail stations in the UK (DfT 2009c) but is not yet clear how this will be managed. In theory at least, it would seem better to have one scheme across the UK rail network and across operators that could provide bicycles for rail users. However, the Bristol model in other towns and cities has the potential to cater for all journeys including the journey to and from a rail station but it requires political backing with the requisite funding and a governance structure across institutions.

Despite Bristol Hourbike's limited implementation, it has shown that individuals with varying levels of cycling experience will use hire bikes even in a very small network, just a few hire hubs, and that such a scheme has the unforeseen benefit of providing useful information about cycle journey patterns and the requirements of users. However, it is unlikely to be sustainable on such a small scale.

The intervention to attract individuals out of their cars has shown that some car drivers are willing to try alternatives. In this case, the results suggest that it may be largely a function of the overall transport context; the very heavy congestion acting as a 'prompt' for individuals to deliberate or respond to the opportunity to try an alternative. This suggests that targeting rail journeys in areas with heavy congestion where the balance of benefits between car and rail change would be beneficial.

The experience of using rail for the journey to work instead of a car was not sufficiently beneficial to change their behaviour beyond the trial, except possibly for one participant. The scale of this intervention is not sufficient to draw conclusions but it has shown a methodology to apply theory to practice and has the potential to be expanded and modified to include follow-up evaluation over a longer period. It is a model that can be built on to address one of the objectives of station travel plans, which is to increase the number of passengers using the station, not just to change behaviour towards more sustainable access.

The perceptions and experience of the new behaviour have provided useful insights into how the actual experience could be improved; what aspects of rail travel and access individuals find attractive or unattractive. The data suggests that targeting the effort towards car journeys where rail offers particular benefits would be advantageous.

Chapter 9 Overall Conclusion, recommendations and future research

9.1 Introduction

This chapter concludes this research project, which has shown that there are potential benefits that could accrue by increasing the incidence of bike-rail integration including the reduction of car dependence. The present national transport policy framework is favourable but the delivery has been slow with a few exceptions; the level of cycling and bike-rail integration remains low.

The level of bike-rail integration is inextricably linked to the low level of cycling in the UK and the dominance of the car. Overall, this research project has given some explanation as to why this might be the case through an exploration of the literature, the development of a conceptual model, a data-gathering exercise around existing bike-rail integrator behaviour and an action research phase to trial possible solutions and to explore how this situation might be changed.

Though the research was conducted in only two stations, the mixed methodological approach allowed a very in-depth picture of existing behaviour to be built including how existing facilities are being used which has relevance elsewhere. The action research aspect of the project has provided important insights into the individual and institutional barriers to bike-rail integration. New information has been contributed on:

- **the existing behaviour of bike-rail integrators** - the motivations and characteristics of bike-rail integrators and the types of behaviour in which they engage
- **the existing use of cycle parking facilities** - what this suggests about existing behaviour as well as how increasing availability might affect behaviour in the future
- **the propensity for rail users to consider cycle access**
- **the extent to which existing bike-rail integrators would consider bike hire**
- **preliminary usage data for the provision of a new facility, Hourbike** - the categories of cyclist that used the new facility, the journeys for which they anticipated using the facility and the kind of assistance required.

- **the extent of the data that bike sharing schemes can generate** to contribute to the existing gaps in cycling and bike-rail integrator behaviour.

- **the extent to which car drivers responded to messages to change their behaviour towards rail use with cycle or walking access** - the factors in that decision, the experience of the new behaviour and the insights provided to improve the experience.

The research has also developed some new tools:

- **A methodology to measure the use of extensive cycle parking facilities to improve the management of this resource.**

- **A conceptual model that can be applied to the design of interventions to promote bike-rail integration.** The two trials in this research illustrate how it can be applied.

- **An illustration of how this conceptual model could be applied to the new station travel plan agenda** - using the pilot Bristol Parkway Station Travel Plan as an example.

A summary of the data and insights gained answering the first five research questions in Table 1 Chapter 1 around the existing behaviour of bike-rail integrators have been covered in the conclusion of Chapter 7 (Section 7.8). These findings contribute to the main focus of this final chapter which is how 'soft measures' can effectively be applied in practice to increase the incidence of bike-rail integration, highlighting some of the practical and organisational barriers (Table 2 Chapter 1).

9.2 The dynamic nature of travel behaviour

Both the exploratory phase of the research and the action research phase have highlighted the efficacy of conceptualising travel behaviour as a dynamic ecological system as shown in Figure 5 Section 5.2. It postulates that each factor is constantly interacting with every other factor and this interaction continues over a life course as well as within a day. It is an interdependent system; individuals within this system choose different travel options depending on the different factors and the multiple interactions.

There are many illustrations of these interactions throughout this thesis showing the dynamic nature of transport decision making so that even within a day the interactions change and an individual is prompted to make different decisions. For example, one individual only combined cycling with rail at the peak hour, off peak he would drive the same journey. He might be categorised as a 'cyclists' at one hour but a 'driver' at another hour.

Two individuals within the same transport context and with broadly similar demographics may have very different perceptions about a journey time which affects their travel choice. This was the case for the two Bath participants in the intervention to attract car drivers to rail. One did not include the time spent on the rail network as 'journey time' but considered it as 'productive work time' whereas the other participant perceived it as wasted time and therefore considered the overall journey time by rail compared to a car journey too long. This suggests, as is put forward in Section 4.2.2, that framing a travel choice like bike-rail integration is as important as the actuality. The importance of perception is highlighted. Many individuals within the bike-rail integrator sample found it difficult to articulate the distance they had cycled to the station. It is likely that individuals without experience of cycling or knowledge of the local routes will find it even more difficult to make an informed judgement as to how long it would take to cycle to the station and this will influence their propensity to choose that option.

In Section 2.3 the availability of the car and its dominance was shown to overshadow an individual's ability to perceive alternatives to driving a car. This may be the case but as the results show this one factor cannot be isolated from the many other interacting factors as shown in the conceptual model. In a one car household with two drivers, one individual may be prompted to look for alternatives but whether they choose to cycle or bike-rail integrate rather than walk or use the bus is dependent on a number of other factors. Even those with sole access to a car may look for alternatives if the positive attributes of a car are removed by congestion or car restraint as has been shown in Section 8.4.

The results in Chapter 7 showed that even within one 'travel choice' - bike-rail integration - considerable experimentation and variation in the methods employed was taking place and individuals articulated the advantages and disadvantages differently. A similar level of experimentation and adjustment of travel time appeared to be taking place for those driving to Frenchay Campus at UWE (Section 8.4).

These results suggest that the adoption of a particular travel behaviour does not remain static, it is constantly being readjusted and as has been discussed and supported by the semi-structured interviews with the bike-rail integrators (Section 7.2.2) and the interviews with car drivers (Section 8.4), the social and cultural context is also important.

The conceptual model Figure 5 Section 5.2 supports the argument that a package of measures designed to impact several different factors is likely to be most effective. A package might include measures that address practical barriers but will also need to address perceptual barriers which are in turn influenced by an individual's experience as well as their social and cultural context.

Both interventions in this research used levers that were suggested by the conceptual model and showed that individuals could be persuaded to try a new travel but neither provided a scale that could show whether this change of behaviour resulted in an attitude change or could be sustained over time. Even if their behaviour did change, as the conceptual model suggests, it would probably continue to change depending on the interaction of the different factors. So, for example, without the congestion, it could be argued that some of the car drivers would not have considered alternatives and been willing to try a new behaviour.

In the intervention to attract car drivers towards rail with walking and cycle access, it may be that some of the participants were moved one stage nearer to using rail as a result of the intervention, but would not be 'counted' unless they participated. The Transtheoretical Model of Health Behaviour Change (Prochaska & Velicer 1997) (Section 5.4.1) contends that for an individual to change behaviour there is a process of change involving different stages. This incremental change also applies to the population, so for the diffusion of a new behaviour to spread throughout the population there is also a process by which different groups gradually adopt the behaviour (Rogers 2003) (Section 5.3). Given that these theories suggest that changes at the individual and community level are likely to be gradual, it is perhaps an unrealistic expectation to be able to show immediate increases in cycling or bike-rail integration.

Throughout this thesis there have been references to studies that have evaluated soft measures, travel plans, interventions to promote walking and cycling and studies looking at the importance of infrastructure relative to soft measures - Ogilvie et al. 2004, Jones 2008, NICE 2006, Bamberg & Moser 2008 - and the evidence is mixed. Bamberg and Moser (2008) would argue that many of the studies are poorly designed. This may be case but, in the light of this research, perhaps part of the explanation is that the delivery of the interventions is often slower than anticipated; only some measures and not others within a package are implemented and therefore the evaluation takes place before the outcomes of the programme are fully realised. Potentially, without the evidence, further investment is not forthcoming, yet the changing of a cultural or social norm is likely to take place over time and requires different 'measurement'.

The interventions have shown that the use of action research provides a useful methodology within transport studies that can capture important insights into the complexity of delivery and the institutional barriers that may prevent the intended outcomes. Action research acknowledges the dynamic aspect of travel behaviour change and works with it and is able to refine the delivery process to improve outcomes.

As a collaboration, the research design could not be controlled and consequently both interventions were to some extent overtaken by events beyond the control of the researcher. This more accurate picture of the 'real world' showed the extent to which the conceptual model itself has to be situated within the political and policy framework of transport policy in the UK as discussed in the next section.

9.3 The political and policy context

Politicians and civil servants who are engaged in policy making and delivery exist within that same social and cultural context of car domination as illustrated in Sections 2.3 and 4.4. The conceptual model (Figure 5 Section 5.2) implies that a package of measures acting at different levels, using a number of levers, is more likely to result in behaviour change. The evidence presented in Section 3.3, of the experience of promoting cycling elsewhere supports this, as does the considerable success in London (Section 3.4) with a combination of measures including car restraint through congestion charging which has increased cycling levels (though bike-rail integration levels have not been measured). In their international review of interventions to promote cycling, Pucher et al. (2010) also concluded that a package of measures rather than a single intervention was found most effective.

At the heart of the slow progress to deliver higher levels of cycling and bike-rail integration in the UK is the lack of prioritisation relative to the car within the main delivery programmes - local transport plans. As pointed out in Section 3.4, the facilitation and promotion of cycling has been rather fragmented and is too often considered an optional extra. The implementation of any measures that involve the curtailment of car use, higher car parking charges, removal of car parking spaces or road space tend to hit a political barrier, a function of public acceptability.

However, as this research has shown there is a group of individuals who, despite the practical, social and cultural barriers, find that bike-rail integration confers sufficient benefit to overcome them. The question is then: How can this behaviour be promoted beyond this group? To a large extent the answer is known, as shown through the literature review in

Chapter 4 and 5 but what has been lacking in the UK is the political will, the financial resources and the implementation across institutions in a coherent way.

The factors within the conceptual model are themselves influenced by the political process and the existing governance structures go against the promotion of a package of measures implemented by different organisations to promote bike-rail integration. Currently, the responsibility for promoting cycling largely rests with the local authorities and national government and the responsibility for promoting cycle access to stations rests with the TOCs. The publication of 'Delivering a Sustainable Railway' (2007) has signalled to the rail industry the importance of managing the access to the rail network and the pilot station travel plans have for the first time provided a governance structure which could potentially enable the activities to promote bike-rail integration to be 'joined up'. However, the dominance of the car within society is so pervasive that even the decision makers within the rail industry, a competitor to the car, find it difficult to prioritise cycle access over the provision of car parking facilities at railway stations.

This is exacerbated by the institutional structure of the rail industry in terms of how the revenues are allocated. Car parking revenues flow directly to the station leaseholder whereas ticket revenues are divided amongst operators. At the level of the individual station, issues around car parking often generate complaint so there are demands for more car parking, as has been pointed out in Sections 2.4 and 3.5, and also resistance to removing parking to make way for cycle parking. Equally there are cultural barriers, for some individuals working within the rail industry, passengers with bicycles are seen as a group to tolerate rather than encourage, and bicycle and walking access are an afterthought[35].

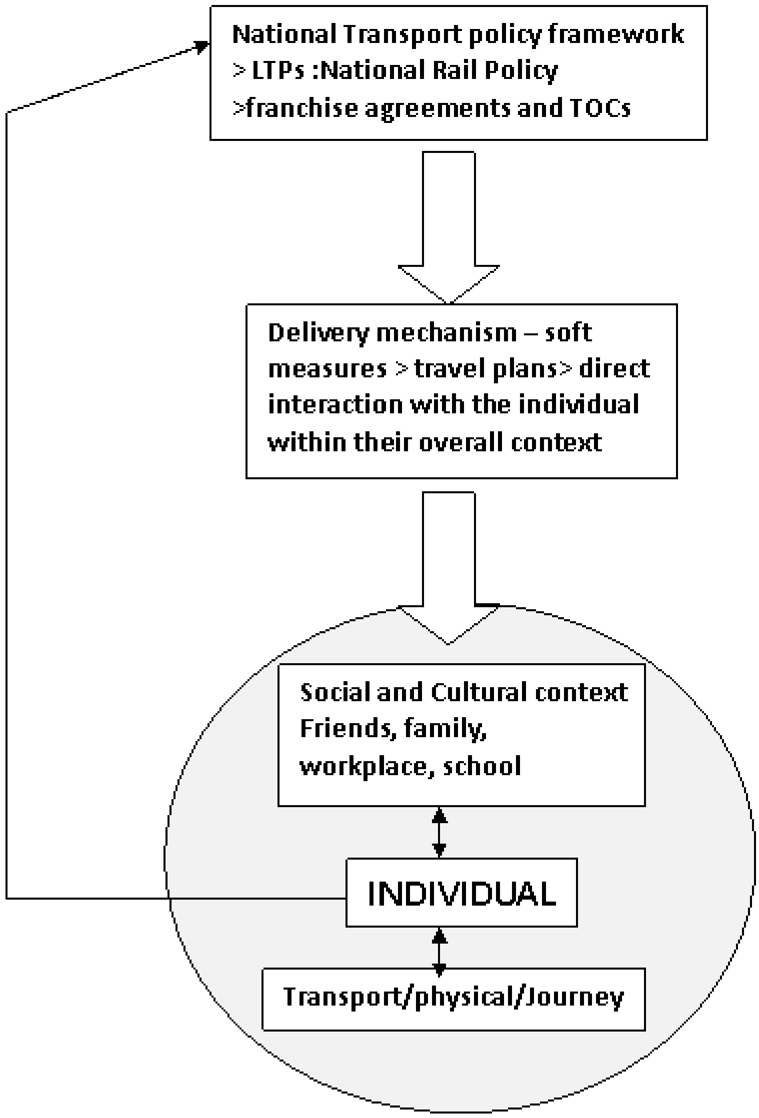
The lack of car parking is seen as a barrier to rail travel itself. This may be the case for certain groups but, as Table 5 Section 2.5 shows, currently only 20 per cent of rail passengers access by car or taxi. Yet, what little access investment is made by the rail industry is predominantly car parking (Lingwood 2009). Cycle access appears to provide a realistic alternative for approximately 30 per cent of rail passengers (61 per cent own a bicycle and around a half would consider using it to access the station (Section 7.5.1).

The case for the promotion of cycle access still has to be made within the rail industry itself. Figure 10 below puts the conceptual model (Figure 5 Section 5.2) within the delivery

[35] Potentially each bike parking rack space could be used by two passengers in a 24-hour period. This is unlikely to be the case for a car parking space as it is rare that individuals keep second cars at their destination station for their onward journey(although this is known in the far South West for second home owners).

context.

Figure 10 The relationship of the individual to the policy levels



The individual, with his or her characteristics, sits in the centre within the interacting and dynamic circle of the social, cultural, physical, transport and specific journey contexts. The interactions within this circle are influenced by smaller scale 'soft measures' at the institutional level including travel plans. An individual can be directly exposed to a message, a new facility like Hourbike or an event or activity to engage them in the consideration of behaviour change. These activities are influenced by the next level of policy, the framework of a local transport plan which can change the balance of the interacting factors, so for example, prioritising the removal of road space or the slowing down of traffic, both of which could improve cycling conditions. LTPs are in turn shaped by government guidance emanating from the overall national transport policy framework described in Chapter 2.

So, in the middle, the individual is making his or her daily travel choices which are inextricably linked to the social and cultural context, all of which is influenced by the different layers of ‘interventions’ or policies. This figure is an attempt, albeit simplistically, to encapsulate the political barrier. Theoretically, in Figure 10, the individual has the power to vote out those politicians responsible for making national transport policy and those delivering it at a local level[36].

The electorate in a car dominated society are unlikely to vote for curtailing their main form of transport (Chart 4 Section 2.3) unless there is more of an understanding of the negative impact of this car dominance and the positive aspects of alternatives. If the promotion of bicycling or bike-rail integration is not publicly acceptable because it is seen to impinge on the majority activity of car driving it becomes politically difficult if not impossible to implement. As a result, even if the knowledge of how to go about changing behaviour exists it cannot be delivered without political support. As Whitelegg (2007) (Section 3.4) argues, no progress will be made if, as was the case in Lancaster, cycling interventions can only be implemented if they do not impact car traffic capacity or adversely affect other modes. A car-centred world view at the individual, institutional and political level is probably the biggest barrier to the delivery of national transport policy as outlined in Section 2.4.

This car-centred view permeates the rail industry that continues to prioritise car access over cycle access and this is to some extent based on false assumptions: for example, the assumption that full cycle racks at Bristol Temple Meads are a result of abandoned bicycles or that bike-rail integrators have less income generating potential than other passengers. The information provided in this research project has been able to contradict both of these assumptions and also to show through the two interventions that there are methodologies that could be used to attract new users to rail with cycle access. In this way, research evidence may help to start a process of change within the rail industry towards taking cycle access seriously. But, as the next section shows, it is not just the actions of the rail industry that influences cycle access.

[36] In theory - as often at a national level it is the economy, health and education that dominate with transport policy rarely considered though at local level transport issues are more politically charged.

9.4 Transfer into practice

9.4.1 The Bristol Parkway Station Travel Plan (BPSTP)

The two interventions in this research have been incorporated into the BPSTP one of 24 pilot station travel plans in the UK[37]. The objective of the pilots is to monitor the outcomes of the various measures implemented to change station access behaviour and to use this information to develop a best practice guide. The researcher was involved in the design and implementation as a member of the stakeholder group[38] and the process started in the third year of this research project and is ongoing.

As explained in Section 8.3.1, the two interventions trialled in this research would be more effective as part of a coherent package of measures, a social marketing exercise of which the promotion of bike-rail integration was a part. Table 30 in Section 8.2 presents the potential levers and their theoretical underpinnings for the design of a Station Travel Plan. Figure 10 Section 9.3 shows that the LTP is a layer of influence on the decision making of an individual and, in the case of the BPSTP, it is the South Gloucestershire LTP that has the objective of restricting the growth in car traffic on the surrounding highway network. This is also one of the objectives of the BPSTP as shown in the text box below. (Also see Appendix VI for the full plan).

BRISTOL PARKWAY STATION TRAVEL PLAN - AN EXAMPLE OF A PACKAGE OF MEASURES – see Appendix VI

Bristol Parkway Station Travel Plan was launched on June 18th 2009 with the objectives of:

- Increasing the share of passengers accessing by cycling, walking, car sharing and motorcycling
- Increasing the number of passengers using the station
- Restricting the growth in traffic on the surrounding highways (also an objective in the South Glos. LTP, the mechanism by which the shift in transport policy is implemented as outlined in Section 1.4.)
- Improving satisfaction of the access/egress journeys

[37] The researcher persuaded FGW and South Gloucestershire to bid jointly to become a national station travel plan pilot.
[38] There was a project group to implement the plan and a wider stakeholder group including the researcher to assist in the design of the BPSTP

The process of designing and implementing the BPSTP had similarities with Hourbike (Section 8.3). There were many different organisations with their different management structures that had an influence on access to a station – the local authority, taxi companies, bus companies, the rail operator managing the station, the company managing the car parks and network rail. The individuals participating in the project supported the partnership working around a package of measures but they had to refer back to their managements which were not necessarily similarly supportive of the idea. Without a dedicated funding stream or a pooled financial resource allocated to the STP, the only budget available was through each organisation which meant that barriers requiring considerable investment were less likely to be implemented.

It is too early in the process to make any judgement as to the success of BPSTP or any other pilot. The text box below details the facilities for bike-rail integration that have been implemented as part of the BPSTP; Hourbike provided a new cycle access option and more covered cycle parking was provided with the additional benefit of being locked at night. This may allow those working near Bristol Parkway to park a bicycle overnight for their onward journey to work as is the case at Bristol Temple Meads (Section 7.3.9). The development of better cycle route links is ongoing.

BRISTOL PARKWAY STATION TRAVEL PLAN

Actions to promote cycling

1. Hourbike for those who don't have access to a bicycle, or don't wish to take their bicycle on a train or wish to reduce their journey time. It also provides a novel and visible presence of bicycles.

2. A 32- space covered cycle park (Picture 3 Appendix VI that is locked at night to prevent theft (Section 6.3.7) and also addresses the issue of bicycles being taken on trains for lack of secure parking (See Section 6.3.8) and allows passengers living outside Bristol to park overnight for their onward journey to work.

3. A "Parkway Travel Guide" has been produced showing onward journey options, with bus links, walking and cycling routes to key locations and businesses allowing individuals to assess a suitable access mode. The guide is available on stakeholder's websites to help passengers plan onward journeys in advance and a new onward journey information display with a large map and leaflets is prominently displayed in the station concourse.

ATOC did provide one funding stream solely for the monitoring exercise - the collection of baseline data to measure the changes post implementation. Even this may not be adequate as attempts made by the researcher to clarify who is responsible for monitoring the use of the new cycle parking facility at Bristol Parkway have been unsuccessful. Consequently, it would seem that an important opportunity will be lost to fill the gap in knowledge (Section 3.5.1 and 3.4), to determine the extent of 'new users' attracted by the facility. This is despite the fact that the purpose of STPs is to provide best practice.

Stations are at the core of an integrated transport system and the potential benefits of increased cycle access accrue across society, yet as a number of different institutions have the 'responsibility' to promote bike-rail integration even with the governance mechanism of STPs at the time of writing it was difficult to see how real progress can be made without a specific budget. If senior managers within the rail industry are not convinced of the benefits to their industry they will not make the necessary investments and this is also true of those within the local authorities. Without the necessary investment across institutions there is a risk that, as with other types of travel plans, there will be limited action and implementation, even where there is a good plan on paper (Enoch and Ison 2008). Without the funding to implement measures the STPs may have very little of measurable impact to contribute to a best practice guide.

9.4.2 Attracting new users

One of the objectives of the BPSTP is to increase the number of passengers using the station, but no clear strategy has been developed. The researcher developed the final intervention in this research as a way of filling this gap, to provide a social marketing exercise to attract individuals out of their cars to use rail with walking or cycling access. This model could be used at other stations but also by other employers around Bristol Parkway Station. An expansion of the small scale intervention to attract car drivers to rail with cycling or walking access is under discussion with FGW, Friends of Severn Beach Rail Line (a community rail partnership) and UWE, using discounted travel, rather than free travel, as a way of committing new users for a period of time e.g a discounted monthly season ticket or carnet to 'learn' the new behaviour (Flamm et al.2004) and perhaps develop a new habit (Section 4.2.3). The Railway Safety and Standards Board (RSSB) has expressed interest in funding such a trial.

9.4.3 Who to target?

Many of the elements in a station plan to promote cycle access can be implemented at relatively low cost and be promoted to existing users capitalising on existing databases within the rail industry. For example, customer databases could be spatially plotted showing the existing catchment areas and targeting customers who have the potential for cycle access.

If a constant housing density is assumed (and does not consider the effort and time costs of cycling[39]) then the potential number of bike-rail integrators will increase according to circle theorem: each unit distance of radius will include a proportionately greater surface area and cyclist population. Therefore by encouraging bike access to stations by existing users and encouraging new users who currently travel the whole journey by car, it is possible to increase the potential number of customers for rail without the need for more car parking. The catchment area depends on cycling speeds and for the purposes of this research a 15 km per hour speed has been used which means a 10 fold increase in catchment area over walking as shown in Table 37 below.

Table 37 Station Catchment area for walking and cycling

	Average speed	**Distance Covered in 10 minutes**	**Catchment area**
Walking	5 km per hour	0.8 km	2 kms^2
Cycling	15 km per hour	2.5 km	20 kms^2

As has been discussed in Chapter 5, it may not be cost effective to attempt a very detailed market analysis in terms of behaviour and attitudes, as these may change in different contexts and at different times. So, for example, one respondent in the Bristol bike-rail integrator sample was a ‘bike-rail integrator’ at peak time and a ‘car driver’ off peak for the same journey. It may be better to enable individuals to try a behaviour, experiment with it, customise it to suit their purpose and perhaps change their attitude to that behaviour.

[39] Which in practice will of course increasingly deter integration via the railway station at the centre of the area.

As the results in Chapter 7 also show, there are a number of different motivations for bike-rail integration: it offers the possibility of building exercise into a daily routine and, where the train leg substitutes car use, creates time to do other things - thinking or reading, without having to concentrate on driving. Though the intervention to change the behaviour of car drivers was on a small scale, and the results short-run, it has provided a methodology that could be modified and scaled up. Further work is needed to test the efficacy of the different messages and to ascertain the strength of the congestion deterrent relative to the offer of a free trial, exercise or time to read. Different aspects of this choice need to be promoted, but perhaps on a journey by journey basis, and the actual journey experience needs to be related to the message. In the trial there was not time to read on the particular journey because of the short duration and necessity to change trains. So, for example, there may be an optimum length of rail journey in terms of creating enough time to work or do other things. For those motivated by exercise, a shorter length of rail journey would nonetheless be a feasible attractor.

This research has provided a starting point for trialling different messages, built from the motivations articulated by respondents, and disseminating them to a much wider group from which new users can self-select. It has been argued that the paucity of previous activity to promote this type of behaviour suggests that there are groups that can be reached without investment in segmentation using attitude and behaviour surveys. The following groups could be targeted:

- travellers who are already using one of the modes for at least some journeys: cyclists who do not use rail and rail users who do not currently cycle. Initial targets could include those already using the station and parking their cars, season ticket holders (regular commuters), and existing cyclists who do not use rail but live within cycling distance of a railway station.

- Householders living in areas known to have clusters of existing rail users (using booking and season ticket holder databases), within cycling distance, offering some kind of trial or discount on rail travel with information on potential destinations (ideally personal travel planning, though this is likely to be too costly).
- those who are new to a job or have moved to the area (Section 2.3 Habit) through employers and estate agents

9.5 Insights drawn from the data and recommendations

The results in Chapter 7 concerning existing bike-rail integrator behaviour suggest that there may be suppressed demand for cycle access but also that decisions will have to be made to prioritise the encouragement of the different methods of bike-rail integration - bicycle carriage, folding bicycles, fixed frame bicycles, secure parking and/or bike hire.

This research has concentrated on providing information around the provision and use of cycle parking and bike hire and would recommend that this is where the initial investment should be made. In addition, the research findings point to concentrating efforts to promote bike-rail integration at stations in areas with traffic congestion giving bike-rail integration an advantage.

The data gathered in this research around the existing use of cycle parking has suggested the following ways in which cycle parking capacity can be increased:

9.5.1 Tighter management of existing cycle parking

This research has shown that at one station, 10% of bike parking capacity was being taken up by abandoned bicycles, therefore a more frequent cull process would release parking capacity (Section 7.3.9). Secondly, the internet survey suggested that at least 10% of those carrying bicycles onto trains did so as a result of the lack of secure parking at their origin station (Section 7.5.1). Making existing cycle parking more secure could create more capacity on trains for those who have no alternative but to take the bicycle with them.

9.5.2 Creation of new cycle parking

Clearer criteria need to be developed for the type and placement of cycle parking at the station level, with shelter and security being of primary importance, and, at the network level, a prioritisation of those stations with existing problems but also those with the most potential. The function aspects, the positioning and therefore the ease of access but another consideration is the visibility, if it is placed inconveniently and hidden away it suggests it is unimportant.

The research has shown that it is important to understand whether there are likely to be two groups of cycle parking users, those who require a bicycle at their destination and those that require it at their origin. To some extent this can be determined by the passenger flows at the station but it will also be a function of the location of the station, the distance from residential areas and destinations and the topography.

Security and location are the key issues for users but there are other issues that need to be taken into consideration including the needs of other passengers trying to move around crowded stations. Space is very often at a premium in and around stations. For example, in the case of Bristol Temple Meads, though the cycle parking is within the station and secure, those bringing their bicycles into the station have to queue and buy their tickets holding their bicycles at the ticket window or propping them up in a congested ticket area. Their movement through the manual barriers alongside those with pushchairs and luggage also creates delays for bike-rail integrators and other passengers.

There are feasible options in terms of technology and Smart ticketing that could allow swipe card entry at a separate entrance to stations for those with bicycles, or secure cycle parking outside the station with swipe card entry. There are double-decker cycle parking units that can be used to resolve some of the space issues but, as has been shown by this research, there is the potential that it will fill with bicycles that are used infrequently.

9.5.3 The provision of bike-hire

The experience of public bicycle schemes and the trial of Hourbike in Bristol has shown that, if swipe-card hire bikes are provided, individuals will join the scheme (225 individuals joined Hourbike Section 8.3.4). The small network implemented in the North Fringe with 3 hubs, two at the University and one at the Bristol Parkway, attracted more than 17 users in a six month period. A system that is provided across the rail network and across operators would be the optimum so that rail passengers, whatever their journey, would have the option to hire a bicycle wherever they are travelling if they joined the scheme.

If, as is suspected, the lack of provision for bicycle carriage suppresses bike-rail integration, the provision of bike-hire could free up existing space, so that some existing users switch to bike hire, and others who are not currently bike-rail integrating might take up the vacated space. As has been discussed in Section 7.3.9, bike-hire can make more efficient use of existing bicycle parking space too. In the case of the ‘Ov Fiets’ system in The Netherlands it was integrated into a system of manned bicycle parking areas. The lack of any existing system in the UK offers an opportunity to implement a scheme using new technology that does not require laying wires or employing labour and can therefore be used at unmanned stations with 24 hour availability.

A Bristol model would have wider benefits and require less financial support from the rail industry than the Dutch Model but it would require national government backing to fund a demonstration project of sufficient scale. One organisation, preferably the local authority, needs to take on the leadership and possibly provide some financial incentive for other organisations, local businesses, to join by offering matched funding for any contribution that an employer makes towards the scheme. The provision of hubs could also be made a condition of planning permission.

There are numerous ways that such a scheme could join up existing initiatives to promote cycling in a number of different organisations. For example, before the delays in Hourbike, a number of organisations including Hourbike joined together to offer employees a range of cycling options to cater for different groups, existing cyclists as well as novices - training, bike hire or a discounted bicycle through Cyclescheme – see Figure 11 Cycling Workforce flyer in Appendix VII.

9.5.4 Information and wayfinding

The intervention to attract car drivers to rail showed that non-users were unaware of even basic information about the services offered, the location of the station and the cycling or walking routes to it. A first step to remove this barrier is to provide clear information about rail services as well as the opportunities for bike-rail integration - availability of cycle parking, cycle carriage policies, cycle routes. It would be helpful for all stations to have an onward journey map available at the station (standard at London Underground stations) and on the web that also shows cycle routes.

9.5.5 Profile raising

The lack of priority within the rail industry for cycle access also suggests that raising the profile of cycling and the benefits of cycle access within the rail industry itself is important. The collaboration with FGW in this research involved piloting a station bike event at Paddington. A section of the station was cordoned off to allow refreshments to be served and to provide information and advice about bike-rail integrating and an opportunity to trial folding bicycles (a way of addressing the image problem 7.3.5 iii). It created a visible sign that cycling was important enough to warrant such an event. The preparation for the event involved discussions between Network Rail (the station manager) and FGW around issues of cycle access generally that had in the past been difficult.

9.6 Further Research

The promotion of bike-rail integration is a relatively new area of research in the UK and there are considerable gaps in knowledge. This research has attempted to bridge the gap between theory and practice using action research. It has yielded some interesting insights but requires further refinement with a longer time frame and greater resources to be able to produce a robust evaluation of the outcomes.

Further research is required to obtain:

- A better understanding of the needs of the individuals using bike-rail integration for less regular journeys and particularly of those for whom cycling at one end is the purpose of the journey. This has implications for the management of the limited capacity of bicycle carriage and also for ticketing systems, so for example, there is no financial incentive to bicycle one way and take the train on the return journey. As Section 4.3 showed there is a also a group without access to a car and a low income group (not necessarily associated) who are using rail for leisure journeys NRTS (DfT 2007); the implications of this need to be more fully explored.
- A spatial investigation of bike-rail integration, and the interaction of the suburban rail network and the intercity network around the Bristol area, to investigate the extent to which the 'local rail traffic' is using the strategic routes rather than the local routes, furthering their decline. This may also be relevant elsewhere. Local rail offers a means for substituting shorter car journeys but, as the intervention (Section 8.4) made clear, in some cases it would require changes to the way that the trains are routed and scheduled. Improvements in the suburban network could release capacity on the strategic routes.
- As has been mentioned there is a funding gap and there is little evidence as to the individual's 'willingness to pay' for cycle facilities. In addition, new ways need to be explored to prioritise funds for cycle access investment within the rail industry, either through the franchise agreements or some other mechanism. There may be potential for developing some kind of financial incentive within the ticketing structure to reward those who access by bicycle. In terms of tighter management of cycle parking, users within secure cycle parking units could be asked to register and would be give a barcode so that their bicycle could be identified in the racks (eliminating the laborious exercise to establish derelict bicycles used in this research). This system could be trialled.

- Testing the social diffusion model, the results in Chapter 7 point to the importance of social influence and the participants in the intervention at UWE were aware of their colleagues' travel behaviour – social networks could be used to trace 'diffusion'.
- The costs and benefits of interventions to promote bike-rail integration, including cycle parking, still need to explored to build the case for further investment, particularly the extent to which it attracts new users to rail. This is in the context of other investments for access i.e. car parking.
- One participant in the second intervention did not want to buy a folding bicycle because she wanted to use her bicycle for recreation at the weekend. This raises the important point that not all potential cyclists have the income or storage facilities for more than one bicycle. During the face-to-face survey it became clear that many bike-rail integrators have a 'station bicycle' which they are less concerned about being stolen and one or other bicycles for recreation which are more valuable to them. TOCs making folding bicycles through hire for commuters allows those with only a fixed frame bicycle to bike-rail integrate without taking that bicycle on the train which frees capacity for others. Apart from the cost, this research found a considerable image barrier for the use of folding bicycles and this needs to be further explored perhaps with trials.

9.7 Researcher's reflections

This research has been conducted in one area, Bristol, and as the Conceptual Model Figure 5 Section 5.2 implies, the processes described in this thesis are very context driven, therefore the results are unlikely to be replicable elsewhere. However, within the conceptual model framework they are generalisable but the extent of the different bike-rail integration methods and the 'choice architecture' nudging the individual will vary from station to station and operator to operator.

As explained in Section 6.4 the researcher's worldview cannot fail to have influenced how this research subject was approached and perhaps her desire to see action may have resulted in a rather overambitious attempt to bridge the gap between theory and practice. Over the three years of this research project, in the view of the researcher (based not on research evidence but on observation) there has been a perceptible change in the profile of cycling in the national media, which may stem from the success of policies in London to promote cycling. Senior politicians, the Mayor of London, the Leader of the Conservative Party and even fashion models have been seen to be bicycling in London. The majority of those involved in the national media are based in London and media outlets appear to have picked up the 'story' of bicycling which has contributed to its increased visibility and which may in time influence its public acceptability and therefore its political acceptability.

The process of implementing changes in infrastructure can be slow but the pace of social change can be relatively fast, which can in itself create the public support that will push for further improvements (as was suggested in the case with Call-a-bike in Germany Section 8.3.2).

Bike-rail integrators are a visible group and, as was discussed in Section 4.4.2, the image of a travel choice is important, as is whether or not someone wants to be identified as a bike-rail integrator. As was discussed in Sections 4.4 and 5.3, if cycling and bike-rail integration were considered less of a marginal activity and a culture of cycling were to be developed, any interventions to facilitate bike-rail integration would be more effective.

The present government's CDT policy, concentrating resources in a few places, will perhaps build a culture of cycling to the point where a 'critical mass' of cycling is reached (Rogers 2003 p25) at which point the process of social diffusion becomes self-sustaining. Once cycling becomes a less marginal activity in society it will require less extensive decision making for the potential cyclist to become a cyclist and for the decision maker to support the promotion of cycling or bike-rail integration. One of the objectives of CDTs is to build the case for further investment in cycling. An equivalent programme could be set up, concentrating resources at a few stations with the greatest potential for cycling perhaps using the station travel plan framework.

In 2004 half a million pounds was allocated by the DfT for cycle parking facilities at railway stations. At the end of this project in 2009, £14 million was allocated not just for bicycle parking but also cycle hubs at stations which it is expected will include bike hire (Section 2.5). If funding is an indication of prioritisation, there is clearly greater emphasis on improving the facilities for cycle access to rail but it is not clear exactly what the cycle hubs will incorporate and how this relates to the 24 pilot STPs.

As discussed in Section 8.2, a scheme like Hourbike can attract new users to bike-rail integration and each new user potentially becomes an advocate for this kind of behaviour and lobbies for better provision. Hourbike provided both existing and potential bike-rail integrators with an additional practical option, something 'new' which could engage a different group of people and promote a different image of cycling. The implementation of Hourbike showed that there are individuals of varying cycling experience who are willing to use this service but the small scale, including the limited number of hire stations implemented to date, has limited the wider benefit of greater visibility. Such a scheme could provide a ‘stepping stone’ - a way of trying cycling without having to invest in a bicycle. If the experience is positive, the new cyclist in turn becomes an agent for change by discussing the experience with peers who in turn may try it, gradually changing social norms and the cultural context.

The ownership of a bicycle is currently seen as a necessary pre-requisite for cycling. This is changing with the advent of bike sharing schemes (Section 8.2.1), and to some extent it is changing with car clubs and car sharing schemes. In the longer term, perhaps within urban areas, there will be hubs offering bicycles, electric bicycles and electric cars for hire, making individual car ownership superfluous, or at least less of a necessity therefore unravelling car dependence. There could be a blurring of public and private transport towards a system whereby different individuals choose a suitable transport mode or combination for their particular journey, and an individual is neither defined as a ‘cyclist’ nor an intervention as a ‘bicycle project’. Any measure is part of an interconnected transport system which reflects a re-balancing of the priorities within transport policy and programmes away from the car.

For individuals to perceive cycling as a realistic transport option necessitates a gradual process of changing the social and cultural norm away from car dominance. So, for example, in the 1950s it might have been socially acceptable to drink and drive but gradually it has become less so. It may become less acceptable socially to use a car for all journeys. This process of change has to start somewhere; new facilities might attract a few more individuals who choose to cycle and bike-rail integrate (Section 5.2) and through social diffusion may contribute to changing social norms.

A process of cultural change also needs to take place within the institutions that have the power to make changes and this is where better evidence of the existing behaviour and potential intervention designs is useful as a way of making the case for more investment. Some might argue that the existence of higher levels of cycling and bike-rail integration in other Northern European countries is evidence enough (Section 3.3). The review of the cycling and bike-rail integration literature in Chapter 3 showed that countries with higher levels of cycling and bike-rail integration also had a transport policy based on the principle that providing facilities for cycling and bike-rail integration is as important as providing facilities for cars. To some extent, it is known how to change behaviour, but what it is needed is the political will, and therefore the resources, to prioritise cycling and bike-rail integration in the UK.

The discussion in Sections 2.3 and 2.4 makes clear that cycle access to the rail network relative to motorised access can reduce the environmental impact of that journey. However, it is the less direct impacts of cycle access that in the long term may undermine car dependence. Cycle access provides a more seamless journey and reduces the overall journey time, making rail travel more attractive relative to making the whole journey by car. In addition, cycling on its own can substitute for many car journeys but, in combination with rail, has the potential to replace additional car journeys which in the longer term could lead to a reduction in car ownership or enable a car free lifestyle. Bike-rail integration is one sustainable transport solution among others that can reduce car dependence and as more sustainable options become more easily available gradually the car could become less of a necessity.

ABBREVIATIONS

ATOC	Association of Train Operators
BERR	Business Enterprise and Regulatory Reform
BCC	Bristol City Council
BPSTP	Bristol Parkway Station Travel Plan
CfIT	Commission for Integrated Transport
CDT	Cycling Demonstration Town
DfT	Department for Transport
DETR	Department for the Environment, Transport and the Regions
FGW	First Great Western
GBST	Greater Bristol Strategic Transport Study
GWR	Great Western Research
ITM	Individualised Travel Marketing
NSMC	National Social Marketing Centre
NCN	National Cycle Network
NS	Nederlandse Spoorwegen (Dutch National Railway Company)
ODPM	Office of the Deputy Prime Minister
PTP	Personal Travel Planning
RAC	Royal Automobile Association
RSSB	Railway Safety and Standards Board
STP	Station Travel Plan
SRA	Strategic Rail Authority
SWARMMS	London to the South West and Wales Multi-Modal Study

TCRB	Transit Cooperative Research Programme
TPB	Theory of Planned Behaviour
TOC	Train Operating Company
TfL	Transport for London
UKERC	UK Energy Research Centre
UWE	University of the West of England

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Appendix I Sample Size Spread of interviews

Those who cycle to or from a railway station represent a small percentage of rail passengers and this presents sampling difficulties and also there are issues about the accuracy of existing data. For example, even large surveys like the FGW customer satisfaction survey April 2006 to February 2007 with a sample size of 20,431 have to be treated with caution. The Bristol stations are included within the central area heading of the Table 38 below (along with several other smaller stations). Hence, differences in the importance of bike-rail integration between stations in a group cannot be identified from the rail industry data.

Table 38 Percentage of Passengers with bikes by South West Area and journey purpose

Percentage of Passengers by area with	Central	East	West
Bicycle Parked at or near the station where they boarded the rail network	2% (*2%*)*	2% (*1%*)	1% (*1%*)
Bicycle taken onto train	1% (*1%*)	1% (*1%*)	1% (*1%*)
Percentage of passengers by journey purpose with	Commuter	Business	Leisure
Bicycle Parked at or near station	3% (*2%*)	2%*(1%)*	1% *(1%)*
Bicycle taken onto train	2% *(2%)*	*% *(*%)*	1% *(1%)*

Source Data from FGW customer satisfaction survey April 2006 – February 2007 (N=20,431)

**The figures italicised in brackets are the percentage of the overall sample that parked a bike or used a bike to leave the rail network/rail station where they finished their rail journey on the day they were surveyed. It would be expected that these figures would match for those taking a bicycle on the train but not for those who parked their bikes at the origin station only. It is possible that if you include the people who have bikes parked at both ends and those who have a bike parked at the egress station only they could match*

Another potential source of more local data is the West of England Rail Survey Report (West of England Partnership 2007) conducted annually by the four local authorities in the West of England sub region but the response rates are around 6% with small total sample sizes so, for example, 10% is suggested as the figure for bike access at Bristol Temple

Meads but the absolute sample count was just 7 cyclists whereas it is 5% at Bristol Parkway which was derived from 20 cyclists[40]

Table 39 Spread of face-to face interviews

Date and Time	6AM	7AM	8AM	9AM	10AM	11AM	12PM	1PM	2PM	3PM	4PM	5PM	6PM	
MON 1ST				1								1		
TUES 2ND			2	1	5		1	1	1	2	3	1		
WED 3RS				3	1	1						1	2	
THUR 4TH	1													
FRIDAY 5		2	2	1	2				2	2				
SUN 7TH						1	3	3		1				
MON 8TH			2											
TUES 9TH	1	1						1						
WED 10TH				4		1							1	
THUR 11			4	2			1							
MON 15		1	2											
WED 17		6	4	1										
THUR 18		4	3	2										
FRIDAY 19									3	5	3	1		
SAT 20										2	4	2		
MON 22				6	1									
NO DATE		2												
	2	16	19	21	9	3	5	5		12	10	6	3	117
MD	19													135

[40] Given that there are more passengers at Bristol Temple Meads this result is initially surprising but the survey is administered independently by each local authority and it may be that the data gathering was less efficient at Bristol Temple Meads where flows are higher.

Appendix II Face-to-face survey of cyclists at stations

Centre for Transport & Society

UWE BRISTOL Faculty of the Built Environment

This survey is part of a research project on bike-rail integration for the Centre for Transport and Society at the University of the West of England. All information that you give will be kept confidential.

For further info. contact Henrietta.Sherwin@uwe.ac.uk 0117 328 3066

Date Time of Day MALE ☐ FEMALE ☐

Your journey to Bristol Temple Meads/Bristol Parkway Station ?

1. How far have you cycled to the station today? **………………………..**

Can you give me the postcode of the place from which you have cycled so the exact distance can be calculated?

3. If you don't know your postcode can you give an address?

4. Is this your ?

Home	
Friend or relative's home	
Workplace	
Business meeting location	
Other – please specify	

PURPOSE OF YOUR JOURNEY

What is the purpose of your journey today?

(please tick relevant boxes)

Journey to workplace	
Journey for education	
Journey home	
Journey for your employer's business (or business you own)	
Journey for personal business (dentist/doctor)	
Social- visiting friends and family	
Shopping	
Day out – leisure	
Other please specify	

.

THE OTHER END OF YOUR RAIL JOURNEY

6. Which other railway station are you travelling to or from ?

7. How will you complete your journey from this station?

On foot ☐

Bicycle ☐

Bus/Coach ☐

Taxi ☐

Get a lift ☐

Car ☐

Other

……………………..

8. How far is your final destination from this station?

9. Are you able to give us the postcode of your destination?

Or address? ……………………………………………………………

10. Is this your ?

Home	
Friend or relative's home	
Workplace	
Business meeting location	
Other – please specify	

11. How often do you make this particular journey by rail?

CYCLE ACCESS

12 If you are bicycling to either station, which of the following words describes how often you use your bicycle for this journey

Always

Mostly

Sometimes

Rarely

13. What might be the reasons for not cycling to the station on a particular day?

14 What other alternatives do you use to get to or from your home or destination station if you don't cycle? Or if you always cycle, what do you consider are the feasible alternatives to and from these stations for you?

	Home Station	**Other station, destination station for this journey**
On Foot		
Car parked at or near station		
Get a lift		
Bus/coach		
Taxi		
Other please specify		

15. Do you own a car? **Yes** ☐ **No** ☐

If No, go to question 16

15a) If Yes, could you have used a car today to reach the station from

your home today?

Yes ☐ No ☐

If, Yes Why didn't you use the car today?

………………………………………………….

If, No Why couldn't you use the car today?

………………………. ………………………..

15b) Would you have considered using the car for the whole journey?

Comments?

16. What do you consider are the advantages or disadvantages of

cycling to the station?

Advantages/benefits

Disadvantages/difficulties

17. If you cycle from your home to the station do you have any difficulties accessing or leaving the station?

18. If you also cycle to complete your journey the other end, do you have any difficulties accessing or leaving the station?

19. Have you ever had a bicycle stolen or vandalized at a railway station?

Yes ☐ No ☐

21. Have you ever taken a bicycle or folding bicycle onto a train? (*If travelling with a bike on the train please specify whether it is full size or folding below*)

Yes ☐ No ☐

If Yes, Which type of bicycle – folding ☐ or non-folding ☐ or both ☐

What was your experience?

If No,   Any particular reason why you haven't taken a bicycle on the train?

22. If you do not have a folding bike, have you every considered owning one?

Yes ☐   No ☐

If Yes, What are you reasons for not buying a folding bike?

23. Have you ever considered have a bike at both ends of your rail journey?

Yes ☐   **No** ☐   **comments?** ....

24. Do you have a bike parked at any other stations besides your home station and the station mentioned above?

Yes ☐   **No** ☐   **If Yes, which stations?** ....

25. New technology has allowed the possibility of hire bikes being available 24 hours at stations that can be unlocked using a swipe card. Would you consider hiring a bike at the station where you complete your journey if it was possible at reasonable cost?

Yes ☐ **No** ☐

Comments?

CYCLING GENERALLY

26. What other journeys APART from to and from the station, do you make on a bicycle?

None	
Journey for education	
Journey to workplace	
Journey for your or your employer's business	
Journey for personal business (visit to the bank/dentist/doctor)	
Social- visiting friends and family	
Shopping	
Day outs – leisure	
Short Breaks or Cycling holidays	

Other, please specify	

If you ticked short breaks or cycling holidays, do you take your own bicycle?

Yes ☐ **No** ☐

If Yes, How? On the train ☐ or by car ☐ other ☐……………….

27. Do you own more than one bike?

Yes ☐ **No** ☐

Comments? – types, different bikes for different journey purposes

Further Details

28. Would you mind giving your date of birth? …………………….. …

29. Which of the following best describes your job status?

Employed (full-time)	
Employed (part-time)	
Self-employed	
Student	
At home or caring for family	
Retired	
Unemployed	
Other (please specify):	

30. Which of the following best describes your HOUSEHOLD income?

up to £7,000	
£7,001 to £12,500	
£12,501 to £17,500	
£17,501 to £35,000	
£35,001 to £50,000	
£50,001 to £75,000	
over £75,000	

Would you willing to be interviewed further by telephone or in person on the subject of integrating cycling with rail? If so could you give your me your contact details

Name ……………………………………………………………………..

Address**………………………………………………………………..**

Telephone……………………….. **Email**…………………………………

THANK YOU VERY MUCH FOR COMPLETING THIS QUESTIONNAIRE

Appendix III Semi-structured interview prompts

If you have time, there is a list of 'prompts' on the following page and I'd be very interested to hear your reactions/answers and personal experiences

Underlying this research, apart from more fully understanding the existing behaviour of bike rail integrators, is the search for ways of encouraging more people to cycle as a means of transport. Important to this, is a good understanding of why people who are already cycling, started cycling.

There are clearly practical reasons why people don't cycle but there are probably a number of other factors including social factors. The following list of 'prompts' may stimulate your thoughts.

1. Your Cycling History

What started you cycling? What was the trigger? Was it circumstance? Did a boyfriend or girlfriend cycle? Did your parents cycle? Is it just a continuation of what you have always done since learning to ride a bike as a child?

2. Is cycling a conscious choice?

Do you bicycle out of necessity and for practical reasons or is it a conscious choice – something that you want to do, something that you like doing, something that makes a statement about you as a person? If someone asked you why would you make the choice to cycle, how would you respond?

3. Social context, image of cycling

Do other members of your family cycle? Do your friends cycle? Do they think you are unusual cycling? Do they worry for your safety? How do you think they perceive cyclists?

4. Spectrum of cyclists

There are a number of words used to describe or categorise cyclists – fair weather, utility, leisure, sports etc, how would you categorise yourself? What words would you use?

5. Attachment

Are you very attached to your bike? Does your interest in your bike go beyond the purely functional attributes? Do you have several bikes? Would you be happy with a hire bike?

Appendix IV Internet Survey

This is a draft questionnaire for use in the First Great Western - E-Survey (examining Access and Egress modes).

This questionnaire is provided in word format for easy distribution etc. The final version will be an on-line survey and will differ in overall design/ layout.

There are some issues over who is eligible for this survey – e.g. do we not include those who walk to the station, are there geographic limitations. Questions screening out these individuals can be included if required.

Please answer the following questions, thinking about the journey they have just booked (FGW to advise how this applies to respondents linking via the Evans Website – have they necessarily booked a rail journey?).

Q1 Your age:				Q2. Are you:		Q3. Are you:	
16– 25	1	50 – 54	5	Male	1	Working full time	1
26– 35	2	55 – 59	6	Female	2	Working part time	2
36– 45	3	60 – 64	7			Not working	3
46– 49	4	65+	8			Retired	4
						Full time student	5

Q4a Please tell us who else lives with you?

Partner	1

Children aged 5-15	2
Children aged 4 or under	3
Other adult 16+	4
No one else/ just me	5

Q4b. Please write in the number of children aged 5-15 travelling with you on the journey you have just booked

Q4c. Please write in the number of children aged 4 or under travelling with you on the journey you have just booked

Q4d. Please write in the number of adults aged 16+ travelling with you on the journey you have just booked

ALL ANSWER

Q5. What is your home postcode: :

Please answer the following questions, only thinking about the outward journey that you have just booked (please do not include the return leg if you have booked this at the same time)

Q5b What time are you due to catch your first outward train on this trip?

to depart? (Please use 24hr clock) :

Q6a At which station will you board the first outward train on this trip?

(PLEASE WRITE IN FULL):

Q6b And at which station will you be getting off of the final train (after making any connections etc) for this outward leg of the trip? (12)

(PLEASE WRITE IN FULL):

Q7 What is the main purpose of the trip you are due to be making?

Daily commuting to/ from work/ college/school	01	Shopping trip	06
Less regular commuting to/ from work/ college/school	02	Travel to/ from holiday	07
On company business (or own if self employed)	03	A day out	08
On personal business (job interview, dentist etc)	04	Sporting event	09
Visiting friends or relatives	05	Other leisure trip	10

Q8 And how often do you travel on First Great Western train services for the same purpose as you are travelling on this trip?

5 or more times a week	01	2-3 times a month	04	Every 6 months	07
3-4 times a week	02	Once a month	05	Longer than every 6 months	08
1-2 times a week	03	Once every 2-3 months	06	First time today	09

Q9 How long will this outward journey take?

Less than 1 hour	1	1 hour or more	2

Q10a What other types of journeys have you made with First Great Western, in the past 12 months?

Daily commuting to/ from work/ college/school	01	Shopping trip	06
Less regular commuting to/ from work/ college/school	02	Travel to/ from holiday	07
On company business (or own if self employed)	03	A day out	08
On personal business (job interview, dentist etc)	04	Sporting event	09
Visiting friends or relatives	05	Other leisure trip	10
		No other types of trip made	11

Q10b And how often have you made these other journeys on First Great Western train services over the last 12 months?

5 or more times a week	01	2-3 times a month	04	Once in last 6 months	07
3-4 times a week	02	Once a month	05	Once in last 12 months	08
1-2 times a week	03	Once every 2-3 months	06		

Q11 Which of the following best describes you as a rail traveller?

Frequent rail user	1
Regular rail user	2
Occasional rail user	3
Very occasional rail user	4
First time rail user	5

Q12 Will you be travelling in first or standard class on this train?

First Class	1
Standard Class	2

Q13 What type of ticket have you purchased for your journey?

(30)

Open	01	Monthly Season ticket	22
Day	02	Annual Season ticket	23
Saver	03	Rover/ Ranger	12

SuperSaver	04	Britrail Pass	13
Cheap Day	05	Inter-rail Pass	14
Peak Day Travelcard	06	Staff pass	15
Off Peak Day Travelcard	07	Other Advance Purchase (PLEASE WRITE IN)	16
Business Saver	19		
Firstminutefare	20		
(leisure/ business advance)			
Weekly Season ticket	21	Other (PLEASE WRITE IN)	17

Q14 Did you use a Railcard to buy your ticket? If so, which one?

(31)

Did not use a Railcard	01	Network Railcard	06
Young Person's/Student Railcard	02	Forces Railcard	07
Senior Railcard	03	Devon & Cornwall Railcard	11
Family Railcard	04	Cotswold Railcard	12
Disabled Railcard	05	Other Railcard	09

WE WOULD NOW LIKE TO ASK SOME QUESTIONS REGARDING THE METHOD OF TRANSPORT YOU PLAN TO USE TO GET TO THE STATION WHERE YOU WILL BOARD THE TRAIN FOR THE OUTWARD LEG OF THE JOURNEY

Q15 Which methods of transport did you use to get to the train station where you will board the first train on the outward leg of this journey?

On foot/ walked (no other mode used)	01	Bus/ Coach	04	Taxi	07
Bicycle	02	Tram/ Light Rail	05	Car parked at or near station	08
Motorbike	03	Underground train	06	Car – dropped off	09
				Other (please write in)	10

____

Check if close to On foot/ walked

Following sections based on method taken

If used Bicycle

Q16 Will you use a folding bicycle or one with a solid frame to access the origin stations?

Will use a solid framed bicycle	1
Will use a folding bicycle	2

Q17 Will you park your bicycle at or near the station or will you take it onto the train?

Will park the bicycle in Cycle racks provided at the station	1

Will park the bicycle near the station (but not in racks provided)	2	
Will park the bicycle at or near the station but not sure where	3	
Will take the bicycle onto the train with me	4	

Q18 When travelling by train, how frequently do you take the bicycle onto the train with you?

Always take my bicycle onto the train	1	Go to Q20
Most of the times I travel by train	2	
Only very infrequently	3	
Never take my bicycle onto the train	4	

Q19 Why don't you take you bicycle onto the train? Please write in as much detail as possible

Q20 Do you ever do any of the following?

Keep a separate bicycle at my destination station for onward use	1
Hire a bicycle at my destination for onward use	2
None of these	3

Q21 Would you ever consider doing any of the following in the future?

Keep a separate bicycle at my destination station for onward use	1
Hire a bicycle at my destination for onward use	2
None of these	3

If using a bus

Q22 How frequent is your bus service?

Very frequent	Quite frequent	Quite infrequent	Very infrequent	Not sure
1	2	3	4	5

Q22 How long do you have to walk to the bus stop?

1 – 5 minutes	6 – 10 minutes	11 – 15 minutes	16 – 20 minutes	Longer
1	2	3	4	5

Q23 Is there a sufficient bus service early in the morning/ later at night?

No, I must use alternative transport early in the morning	No, I must use alternative transport in the evening	I would only use the bus in the morning and the service is sufficient	I would only use the bus in the evening and the service is sufficient	The service is sufficient whenever I need to use it
1	2	3	4	5

If using a car

Q24 Do you anticipate parking in the station car park?

Yes	1
No	2
Depends if there are spaces left at car park	3

Q25 Where do you think you might park if not at the railway station?

A side street near to the station	1
Multi-storey car park	2
Another car park	3
A friend's/ relative's house	4
Other (please write in):	5

____

Q26 Do you anticipate paying for car parking (wherever you park)?

Parking at station and expect to pay	1
Parking at station and do not expect to pay	2
I expect to pay for parking (not at station)	3
I do not expect to pay for parking (not at station)	4
Not sure if I will have to pay at station or elsewhere	5

Q27 Do you know how much it will cost to park at station?

Yes	1
I have an estimated idea	2
No	3

Q28 Do you know how much it will cost to park elsewhere (other than station)?

Yes	1
I have an estimated idea	2
No	3

Access by lift

Q29 Do you have the option to take a lift with someone?

Yes, with a friend on their way to/ from work	1
Yes, with a family member on their way to/ from work	2
Yes, as a favour from a friend/ family member	3
No, I do not have the option of a lift	4

Access by taxi

TBC

ALL ANSWER:

Q30 How many people are there with a driving license in your household?

None	One person	Two people	Three people	Four people	More than four people
1	2	3	4	5	6

Q31 How many cars are in your household?

None	1
One car	2
Two cars	3
Three cars	4
Four cars	5
More than four cars	6

ONLY ASK OF THOSE WHO WILL NOT DRIVE TO THE STATION BUT HAVE A CAR IN HOUSEHOLD:

Q32 Do you have access to the car for your journeys to the station?

Yes	1
No	2

ASK THOSE WHO HAVE A CAR AVAILABLE BUT CHOOSE TO TRAVEL BY TRAIN:

Q33 Why will you choose to travel by train instead of the car?

Faster journey time	1
Want to avoid congestion on the roads	2
Don’t want to find a parking space	3
Rail travel will be cheaper	4
I can work on the train	5
Too far to drive	6

ALL EXCEPT THOSE WHO ACCESS BY BICYCLE

Q34 Do you own a bicycle?

Yes	1
No	2

Q35 How would you classify your bicycle usage?

Leisure cyclist	Leisure and utility* cyclist	Utility* cyclist
1	2	3

*Definition of a utility cyclist is someone using a bicycle for a reason e.g. getting to work

Q36 Would you ever access the station using a bicycle?

Yes	1
No	2

Q37 Why would you not consider accessing the station by bicycle?

Station is too far away	1
I need to go to work in suit and tie/ smart clothing	2
No facilities to change/ shower at work	3
Nowhere to park a bicycle at station	4
There is no safe route to take	5
Do not trust the weather	6
Other (please write in):	7

Q38 Have you accessed your local railway station by any other means before?

Yes	1
No	2

Q39 Please rate any other methods that you are likely to consider using to access your local station?

	VERY LIKELY TO CONSIDER	FAIRLY LIKELY TO CONSIDER	NEITHER/ NOR	FAIRLY UNLIKELY TO CONSIDER	VERY UNLIKELY TO CONSIDER	NOT AN OPTION

On foot/ walk	1	2	3	4	5	6
Bicycle	1	2	3	4	5	6
Motorbike	1	2	3	4	5	6
Bus/ coach	1	2	3	4	5	6
Tram/ Light Rail	1	2	3	4	5	6
Underground train	1	2	3	4	5	6
Taxi	1	2	3	4	5	6
Car parked at or near station	1	2	3	4	5	6
Car – dropped off	1	2	3	4	5	6

If you would be willing to be contacted for further research,

please tick the box and write in your contact information:

EMAIL ADDRESS:

Appendix V Goodness of fit Chi-squared test

Is there a significant difference between what we observed and what we expected?

$$\chi^2 = \sum \frac{(Observed - Expected)^2}{Expected}$$

RATIO O F MALES TO FEMALES

Null Hypothesis H_o: The ratio of 69% males to 31% females that exists in the cycling population is the same as in the bike- rail integrator sample. On H_o, the expected frequency is shown in the table below using Yates' continuity correction as it is a 1 x 2 contingency table with only one degree of freedom.

	Observed	**Expected**	**Observed-Expected – 0.5 (Yates' continuity correction)**	**(observed – expected)2**		
	Freq. BRI	Freq. Cyclists				
Male	94	91	3 – 0-5	$(2.5)^2$	6.25 /91	0.068
Female	38	41	-3 – 0.5	$(-2.5)^2$	6.25 /41	0.152
	132	132				0.220

Testing at the 95% level of significance Chi Squared with one degree of freedom χ^2 = 3.84 and using the Yates' continuity correction (applicable to one degree of freedom) in this calculation it was found to be 0.220 lower than the critical value and therefore the Null Hypothesis is not rejected as there is no different between the ratio of males to females in the general population of cyclists as compared with bike-rail integrators.

NUMBER OF INDIVIDUALS THAT FALL WITHIN AGE BANDS

Null Hypothesis H_o: The numbers of individuals who fall within the particular age bands within the cycling population is the same as in the bike- rail integrator sample. On H_o, the expected frequency is shown in the table with 5 degrees of freedom.

Age Bands	**Observed**	**Expected**	**Observed-Expected**	**(observed – expected)2**	
16-20	5	9	-4	16	1.8
21-29	24	22	2	4	.18
30-39	55	32	23	529	16.5
40-49	32	31	1	1	.03
50-59	14	20	-6	36	1.8
60+	4	19	-15	225	11.8
					32.11

χ^2 = 1.8+.18+16.5+.03+1.8+11.8 = 32.11 df 5

Testing at the 95% level of significance Chi Squared with five degrees of freedom χ^2 = 11.07 and in this calculation it was found to be 32.11 higher than the critical value and therefore the Null Hypothesis is rejected. A significant difference between what the proportion of individuals fell into each of the age bands in cyclist population in general compared to the Bristol bike-rail integrator was found.

NUMBER OF INDIVIDUALS THAT FALL WITHIN INCOME BANDS

Null Hypothesis H_o: The numbers of individuals who fall within the particular income bands within the rail population is the same as in the bike-rail integrator sample. On H_o, the expected frequency is shown in the table below with 6 degrees of freedom.

Income Bands	**Observed**	**Expected**	**Observed-Expected**	**(observed – expected)2**	**/expected**
	Freq. BRI	Freq. rail			
<7,000	8	9.1	-1.1	1.21	.13
7,001-12,000	9	10.4	-1.4	1.96	.18
12,001-17,000	13	11.70	1.3	1.69	.14
17,001-35,000	32	39	-7	49	1.26
35,001-50,000	37	28.6	8.4	70.56	2.47
50,000-75,000	19	19.50	-.5	.25	.01
>75,001	12	11.70	.93	.86	.07
					4.26

Chi Squared χ^2 = .13+.18+.14+1.26+2.47+.01+.07 = 4.26 df =6 .

Testing at the 95% level of significance Chi Squared with five degrees of freedom χ^2 = 12.59 and as 4.26 is lower the Null Hypothesis still stands as there is no significant difference between the numbers of individuals within each income band in the rail passenger population compared with that found in the bike-rail integrator sample. The calculation (see table below) was repeated removing those who were surveyed on the weekend in the bike-rail integrator sample (-16) (4 missing data) N=115 and the Null Hypothesis was again not rejected.

Income Bands	Observed	Expected	Observed-Expected	(observed – expected)2	/expected
	Freq. BRI	Freq. rail			
<7,000	6	8	-2	4	.5
7,001-12,000	8	9	-1	1	.11
12,001-17,000	12	13	-1	1	.08
17,001-35,000	27	34	-7	49	1.44
35,001-50,000	33	25	8	64	2.6
50,000-75,000	18	17	1	1	.06
>75,001	11	10	1	1	0.1
	115				4.89

χ^2 = .5+.11+.08+1.44+2.6+.06+.1 = 4.89.

JOURNEY PURPOSE

Null Hypothesis H_o: The numbers of individuals making journeys for particular purposes in the rail passenger population is the same as that within the in the bike-rail integrator sample. On H_o, the expected frequency is shown in the table below with 2 degrees of freedom.

N=119	Observed	Expected NRTS	Observed-Expected	(observed – expected)2	/expected
	Freq. BRI	Freq. Rail			
Commuting	82	75	7	49	.65
Business	23	19	4	16	.84
Leisure	14	25	-11	121	4.84
					6.33

Testing at the 95% level of significance Chi Squared with two degrees of freedom χ^2 = 5.99 and in this calculation it was found to be 6.33 higher than the critical value and therefore the Null Hypothesis is rejected there is a significant difference between what the proportion of individuals that fell in the journey purpose bands in rail population compared to the Bristol bike-rail integrator. This difference is even more significant if the figures for the South West only are used (see table below) where the value is 23.61. There is a significant difference between the proportion of bike-rail integrators making journeys for different purposes relative to all rail passengers in the South West.

N=119	Observed	Expected NRTS SW	Observed-Expected	(observed – expected)2	/expected
	Freq. BRI	Freq. Rail			
Commuting	82	57	25	625	10.96
Business	23	28	-5	25	.89
Leisure	14	34	-20	400	11.76
					23.61

JOURNEY FREQUENCY

Null Hypothesis H_o: The numbers of individuals making journeys at a particular frequency in the rail passenger population is the same as that within the in the bike-rail integrator sample. On H_o, the expected frequency is shown in the table below with 6 degrees of freedom.

N=117	**Observed**	**Expected NRTS SW**	**Observed-Expected**	**(observed – expected)2**	**/expected**
Frequency	Freq. BRI	Freq. Rail			
5 or more	67	61	6	36	.6
2-4 days	15	17	-2	4	.23
Once a week	3	7	-4	16	2.3
1-3X month	8	9	-1	1	.11
Less than once a month	16	12	4	16	1.3
First Time	8	10	-2	4	.4
					4.94

Testing at the 95% level of significance Chi Squared with five degrees of freedom χ^2 = 11.07 and the calculated value of 4.94 is lower so that the Null Hypothesis still stands and there is no significant difference between the numbers of individuals within each frequency band in the rail passenger population compared with that found in the bike-rail integrator sample.

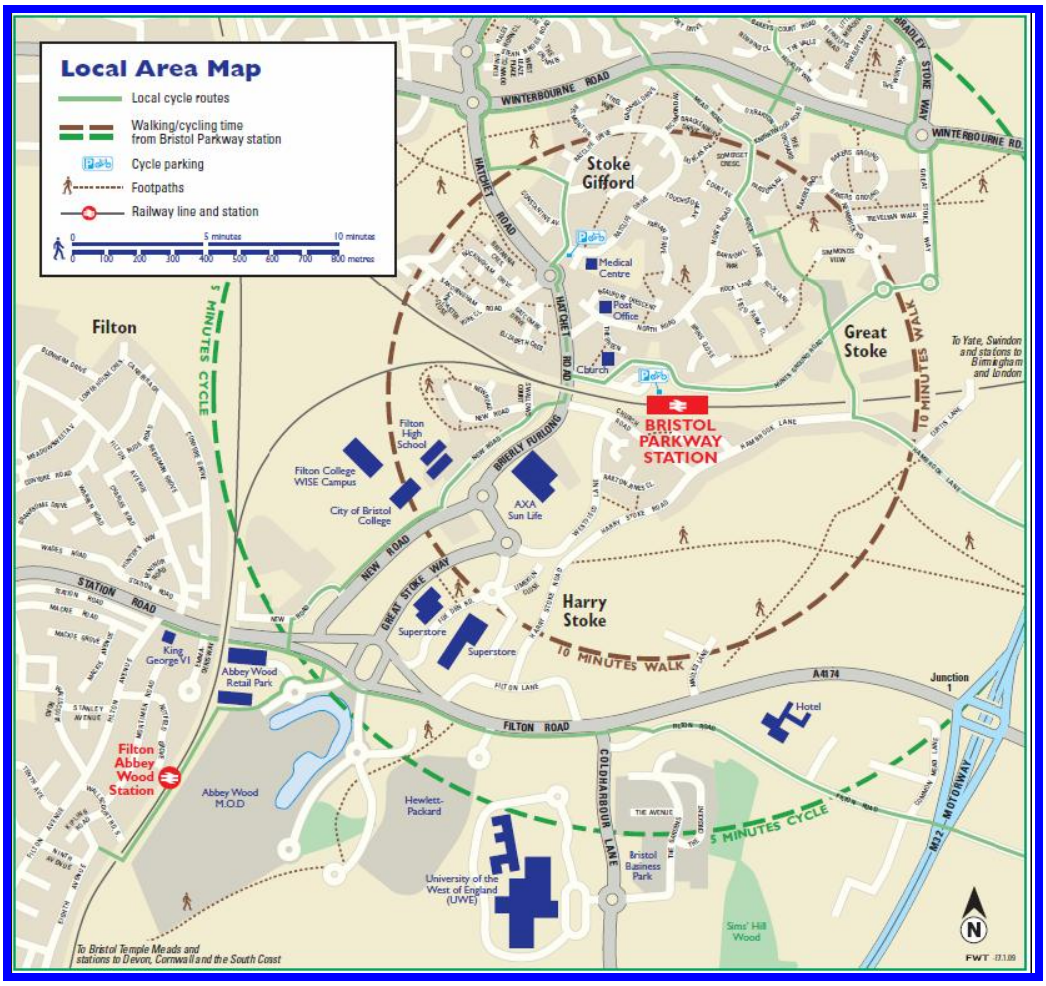
Appendix VI Bristol Parkway Station Travel Plan

Context

Bristol Parkway is the third most used station in the West of England sub-region (after Bristol Temple Meads and Bath Spa). Approximately, 8350 people use the station each day and there has been a 33.5% growth in passengers in the last 5 years (source: 2007 West of England Rail Survey Report). It was opened in 1972 as the pilot for the 'parkway' concept of stations.

Located in the North Fringe which is north of the urban area of Bristol, Parkway is both an origin and destination station. Half hourly train services are provided to Swindon/Reading/London; South Wales; and Cheltenham/Birmingham/the north. There is an hourly local service to Yate/Cam and Dursley/Gloucester; Bath and Westbury; and Weston-super-Mare. There is also an hourly service to Taunton/Exeter/Plymouth. There are a significant number of employers located within a few miles of the Station for example, Axa, the MOD and the University of the West of England (UWE). The aerospace industry is also a key employer. The area has experienced significant employment and residential growth in the last 20-30 years.

The station has had a number of improvements in recent years including, a new station building (in 2002); a dedicated bus interchange (in 2003); and a new platform (opened in 2007). There are plans to introduce a fourth platform shortly to ease congestion.



These local bus routes serve Bristol Parkway

73/73A/73B Cribbs Causeway - City Centre

312 Thornbury - Fishponds

318 Cribbs Causeway - Keynsham

319 Cribbs Causeway - Bath

517 Emersons Green - Avonmouth

518 Emersons Green - Shirehampton

581 Chipping sodbury - Hanham

625 UWE - Severn Beach

Need for a travel plan

A travel plan can be defined as a strategy for managing the travel generated by an organisation, with the aim of reducing its environmental impact, typically involving the promotion of sustainable modes of travel (such as walking, cycling, public transport, and car sharing) as alternatives to single occupancy car use.

Growth in passengers using Parkway station and growth in employment and housing in the North Fringe has led to congestion around the station, particularly at peak times and pressure on the station car park. The car park reaches capacity between Tuesday and Thursday during the day and there is pressure on local residential streets from overspill parking.

Developing a station travel plan for Bristol Parkway has also provided an opportunity to show clear linkages between the station and key projects in South Gloucestershire including, the Greater Bristol Bus Network (GBBN) and Cycle City. These projects have brought major funding to improve the transport infrastructure around the station.

Policy context

The White Paper 'Delivering a Sustainable Railway' (2007) suggested that travel plans could be introduced at national rail stations, with the aim of improving station access and reducing traffic on the road network. The Association of Train Operating Companies (ATOC) on behalf of the Department for Transport (DfT) invited Local Authorities and Train Operating Companies to propose stations to include in a national pilot programme for station travel plans. Bristol Parkway was chosen as one of 24 pilots across England and Wales selected to be part of the national programme.

The aim of the Bristol Parkway station travel plan is to tackle congestion and improve accessibility by improving access by sustainable modes of transport to/from the station. This matches the shared priorities of the Joint Local Transport Plan which aims to tackle congestion and improve accessibility with the following objectives:

- Promote use of alternatives to the private car;

- Encourage more sustainable patterns of travel behaviour;

- Manage the demand for travel by the private car;

- Improve accessibility for all residents to educational services; health services and employment

Description of the process

The process of developing a station travel plan for Bristol Parkway has been lead by South Gloucestershire Council with First Great Western as the principal partner and support from the West of England Partnership. A small project group was responsible for preparing and producing the travel plan and a wider stakeholder group has been consulted along the way. Members of the Stakeholder Group are representatives from:

- University of the West of England
- Atkins (an Aztec West employer)
- Rolls Royce
- West of England Partnership
- Severnside Community Rail Part'ship
- First Bus
- Wessex Connect *
- FGW customer panel *
- Bristol Parkway Taxis Consortium
- Sustrans
- The British Transport Police (BTP)
- South Gloucestershire Council
- First Great Western
- Arriva Cross Country *
- Network Rail
- APCOA

* kept informed about the Travel Plan

The following steps summarise the approach taken to developing the travel plan:

Analysis of data and information

The West of England Rail Survey and the national baseline data as well as ticket information and First Great Western customer surveys were used to establish the existing situation.

Site Audit

An audit of existing information and facilities at the station was carried out by the project group to act as a baseline from which change can be measured.

Development of aim and objectives

The aim and objectives were developed, embracing wider policy objectives and incorporating the findings of the data analysis and site audit. Where possible the objectives were given SMART (Specific, Measurable, Attainable, Realistic, Timebased) targets.

Development of Action Plan

An action plan was devised with specific tasks, with timescales and responsibilities, to enable the targets to be achieved.

Implementation

The action plan will be implemented during 2009/10 and 2010/11, during which progress will be regularly reviewed.

Monitoring

Regular monitoring of progress towards implementing the action plan and meeting targets will take place.

Aims, objectives and targets

The overall aim of the Bristol Parkway travel plan is: *to tackle congestion and improve accessibility by improving access by sustainable modes of transport to/from the station.*

The following objectives and targets will be used to achieve the overall aim and will be used to monitor and evaluate the travel plan:

Objective:

Increase share of passengers cycling, walking, car sharing and using motorcycles

Targets:

[1] Double to percentage of cyclists (to at least 4%) by March 2011

[2] Increase walking share to 20% by March 2011

[3] Double the percentage of commuters and business travellers car sharing (to

2%) March 2011

[4] significantly increase the amount of secure motorcycle parking available by

March 2011

Objective:

Increase bus patronage

Target:

[5] Increase bus patronage by 2.3% by March 2011

Objective:

Increase number of passengers using station

Target:

[6] Increase footfall by 2% (or 50,000 passengers) by March 2011

Objective:

Restrict growth in traffic on surrounding highway network (this is also an objective also in the Joint Local Transport Plan)

Target:

[7] Restrict traffic growth to 12% by March 2011

Objective:

Improve Satisfaction with the access/egress journey

Target:

[8] Improve satisfaction with the access/egress journey by March 2011

Action plan highlights

Improved cycle facilities at the station

A new enclosed cycle cage will be provided right outside the station entrance providing

32 extra cycle parking spaces. This is a quick win which will be in place by April 2009, funded by South Gloucestershire Council, with space provided by First Great Western. Existing cycle parking will also be replaced with updated stands.

The Hourbike hire scheme is also being piloted at the station with hire bikes available outside the station entrance and at the University of the West of England.

Improved onward journey information

Another quick win has been the production of a Parkway Travel Guide which is now available at the station and shows onward journey options, with bus links, walking and cycling routes to key locations and businesses. Business travellers planning their journeys will be able to look at the walking and cycling map which provides context with time contours. This will be available on the First Great Western website to help passengers pre-plan the onward journey.

A new onward journey information display with a large map and leaflets will be prominently displayed in the station concourse.

Improved cycle and pedestrian routes to/from the station

Four of the Cycle City routes hinge around Parkway. Over the next two years these cycle and pedestrian routes will be upgraded. There will be new finger post signage which will benefit pedestrians as well as cyclists.

Improving bus services

A review will be undertaken of bus reliability and there will be a review of timings. Work will be undertaken with operators to address issues and maximise interchange opportunities. We will seek to improve publicity including providing a rail logo on buses serving the station.

Encouraging motorcycling to the station

A survey of motorcyclists will establish their priorities. Improved parking facilities will then be provided and if capacity allows, free motorcycle parking at the station will be promoted.

These are just a few highlights. Other actions will happen throughout the life of the travel plan. These include encouraging car sharing, taxi sharing and improvements to bus routes to the station. The full action plan can be found in Appendix 2.

Monitoring

Regular monitoring of progress will take place throughout the life of the travel plan, as follows:

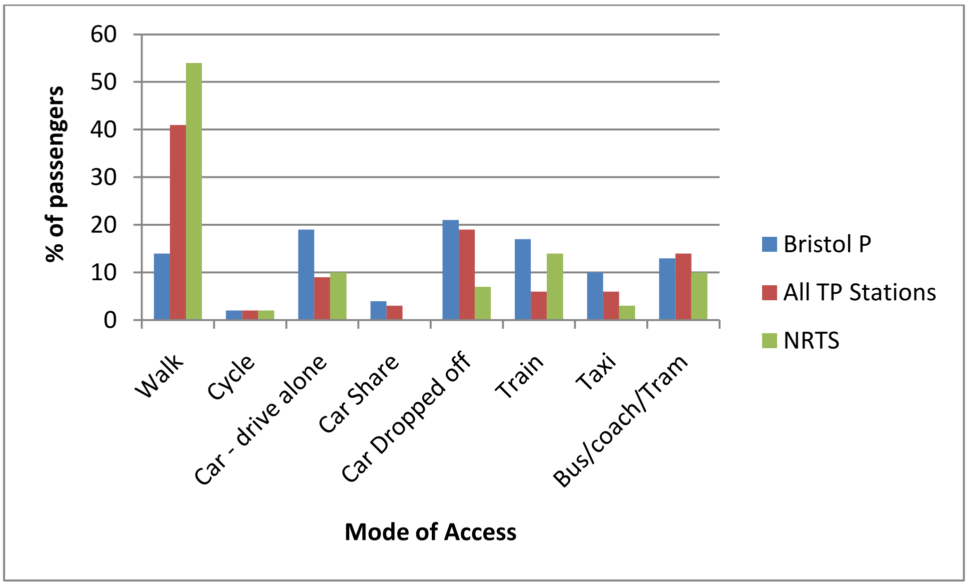
- Using First Great Western customer surveys in relation to customer satisfaction
- Using the annual West of England Rail Survey to assess modes of travel
- Using the national pilot evaluation at the end of the plan period
- Regular meetings of the project and stakeholder groups will review implementation and reassess the action plan, as appropriate.

Researcher’s reflections on the process

The area around Bristol Parkway is heavily congested with available parking at capacity. It is interesting to note that the station audit shows that car parking has been increased at Bristol Parkway Station with another tranche proposed. If this parking was not provided and a travel plan introduced it could act as the ‘stick’ outlined in the discussion in Section 2.5 to help promote more sustainable access modes including cycling.

As a parkway station you would expect motorised access to be higher relative to other stations and this is confirmed by the baseline data collected for the station travel plan pilots shown in Chart 43. The data at Bristol Parkway is compared with other travel plan pilots and the National Rail Travel Survey (DfT 2007a). In terms of this research and travel planning the target groups would be those that access by car, or are dropped off by car or come by taxi as well as those making the whole journey by car who could be attracted to rail.

Chart 43 Comparison of Bristol Parkway Access Mode Pattern with all Station Travel Stations as a benchmark and the NRTS data



From observation at Bristol Parkway station, there can be up to a forty-minute wait for a taxi, and given the traffic congestion in that area, it may prompt consideration of alternatives like Hourbike particularly with maps available showing the various destinations in the area provided in the new Parkway Travel Guide. The representative for the taxi companies at one of the stakeholder meetings had explained that he had experienced individuals getting into the taxi who were simply using the service for wayfinding only to discover that their destination was a five minute walk from the station.

The first draft of the onward journey map provided by South Gloucestershire Council to the stakeholder group had information about bus connections and it was clear that the information needed for walking and cycling had not been considered. The researcher suggested its importance and asked for the distance bands shown in the map above so t newcomers could make a mental calculation as to how long it would take them to arrive at their destination if they walked or cycled.

The only funding made available by any organisation for the pilot station travel plans was from ATOC for the monitoring exercise - the collection of baseline data and data to measure the changes post implementation. This lack of an earmarked budget was a major barrier to implementating measures to promote more sustainable access specifically cycling. Funding had to be found within the budgets of the participating institutions, so for example, a funding source would need to be found within a local authority budget to improve cycle access or within the FGW or Network Rail budget to finance cycle parking.

Apart from the lack of finance, there no clear lead organisation, a lack of political will within each organisation and the absence of the equivalent of a travel plan co-ordinator as might be the case in an employer travel plan. A travel plan within one institution has an element of social pressure for individuals to comply. In the case of stations, travel plans 'belong' to a loose partnership of institutions to whom rail users or potential rail users have no allegiance.

The BPSTP has been fortunate in that the more difficult and costly aspects of promoting bike-rail integration, the provision of safe cycle routes will be partially covered by funding from the Bristol City Cycling Demonstration funding. Individuals present at the project and stakeholder meetings might support the station travel plan concept, but in order to proceed with any implementation they needed to go back to their own institution and make a case for support which was time consuming and not always successful (similar difficulty arose with the implementation of Hourbike Section 7.3.5). In addition, some organisations were less willing to participate than others and at Bristol Parkway there was some difficulty with communication with the bus companies hence increasing bus use was not one of the overall objectives of the BPSTP. South Gloucestershire willingly provided an in-kind design of a cycle route and signage within the station but could not action the design as the land belongs to Network Rail and the work would have to be funded by FGW or Network Rail who struggled to determine who was responsible.

At Bristol Parkway there were some measures that would have made a considerable difference to sustainable access but were considered too expensive and this is related to the perception of walking and cycling. As Lingwood (2009) (Section 2.5.2) pointed out there is an overestimation of the importance of car parking customers yet as was found in this research the income levels of bike-rail integrators are similar to rail passengers generally (Section 6.2.1)

Section Sections 1.5 and 2.5 also showed how the fragmented nature and current revenue structures within the rail industry can prevent measures from being implemented. One example to illustrate this point at Bristol Parkway was that lack of safe walking or cycling access from the south of Bristol Parkway station. It is very hazardous as the only access is via a very narrow bridge under the railway line supporting two way car traffic and a very narrow pavement. None of the organisations participating in the travel plan had the budget to rebuild this bridge. An alternative at least for walking access would be to extend a footbridge over the railway line that currently stops in mid-air[41]. An extension of this footbridge would make a significant contribution to improving walking access from the south of station. In costs terms it might be comparable to providing additional parking and may attract as many new users. However, car parking generates revenue for the station leaseholder in this case First Great Western, whereas the revenue from additional new customers who walk is divided between all rail operators using that station.

A case needs to be made that provides clear evidence that an equivalent investment in making a station more accessible to walkers and cyclists attracts the equivalent number of new users in the same way that it is assumed that the provision of increased car parking will attract new users or release suppressed demand. It requires a huge shift in thinking within a car dominated society fearful of taking any steps that might be construed as reducing car access (Whitelegg 2007).

The conceptual model shows that an individual has a number of choices for a particular rail journey: not to travel at all; to drive the whole way; to drive to the railway station or use a more sustainable access mode. It is difficult to assess the level of available parking or parking charge regime that discourages those who could walk and cycle to the station but does not deter those who would otherwise drive the whole journey. As had been pointed out in Section 2.5.2 distance is a barrier to rail travel itself as well as walking and cycling access but it is one of the many factors in the decision making (Figure 7 Chapter 4).

In terms of reducing the CO_2 impact of rail travel itself, the loading of trains is very important (Section 1.2) but as is the case at Bristol Parkway and many other stations, the car park is full by 8.30 am possibly deterring off peak travellers who may be more likely to travel in groups. Within the current governance structure at railway stations (Section 2.5.1) a measure that would achieve the goals of a travel plan may not be implemented because the financial incentives are distorted. In some cases it may be a lack of detailed information to make the economic case for a particular measure relative to the upfront investment. For example, if spaces were reserved for multi-occupancy space off peak this might generate more revenue for the TOCs than a one peak fare from a single occupancy vehicle at peak. In order to justify making a revenue expenditure to enforce car sharing parking bays or bays only available off peak the TOC would need to know whether four passengers in a car off peak generated the equivalent revenue to one peak passenger. A new car parking regime was discussed at Bristol Parkway to encourage car sharing and there were three institutions

[41] There is some dispute as to why it was never completed to reach the other side, some claim South Gloucestershire would not allow it because it conflicted with the road layout the other side, others suggest that the station operator did not want to allow access from both sides of the tracks because it would involve increased manning and security.

involved in the travel plan who had staff who could play a role in the enforcement - the police, APCOA who control the parking and FGW – but none would take the lead to implement an enforcement regime as it would require considerable management and revenue funding which could only be found if each institution contributed. Car sharing bays were quietly placed in the medium to long term measures within the travel plan with a few words ‘continue to seek ways to increase car sharing’.

The car parking regime is important in terms of promoting cycle access, and there is a danger that the most difficult measures but possibly the most effective in terms of discouraging single occupancy car access and limiting parking availability that might prompt the consideration of more sustainable alternatives will be sidelined.

Bristol Parkway is not unique in its difficulties, other station travel plan pilots have had difficulties with contentious issues, public engagement, acceptability of the measures and turnover of individuals within the partnership (ATOC 2009). The importance of a clear vision, political support and involvement of all relevant stakeholders has been stated by other pilot plans.

Picture 1 Launch of Bristol Parkway Station Travel Plan

Picture 2 Hourbike hub at Bristol Parkway Station

Picture 3 New Cycle Parking at Bristol Parkway Station

Appendix VII Hourbike

Table 40 Milestones in the Development of Hourbike

October 2006 – October 2007	Researcher had a series of discussions with individual partners eventually leading to meetings of all partners together to work towards a common design
15th July 2007	Paris Velib System launched
25th October 2007	Partnership Meeting - BCC council officer took the Chair and reported that his meeting with the relevant executive member at BCC about the scheme had been very positive though there was some concern about the escalation of cost. Detailed discussions of sites, the design of hire stations, redistribution of bikes and maintenance, planning permissions required, notification of the police, integration of Hourbike information into partner organisation's networks and for BCC mapping and journey planning. The details of the package including tariffs that would be offered to organisations joining the scheme and ideas around promoting Hourbike through health networks at gyms, leisure centres, private health clubs.
November 2007	Researcher had informed Cycling England of the initiative and received an email saying "The scheme you are developing sounds extremely interesting – it's fantastic that you have pulled together so many partners to make it happen. As you may know Cycling England's remit ends in March 2008. We are currently awaiting the outcome of the Comprehensive Spending Review, as well as a review of our performance as a non-departmental public body by the DfT. Until this has taken place, and we find out whether Cycling England will continue in its current (or similar) form and has a budget for the next spending round, we are not in a position to consider new projects or financial commitments. As an organisation we would endorse such an initiative, and also endorse users considering cycle training"
19th December 2007	Partnership Meeting - Bike design finalized, agreed to order a sample
27th February 2008	Partnership Meeting - to discuss the marketing of Hourbike through different partners, concerns about the expectations of the scheme and the ability to deliver with such a small network.
April 2008	A key participant in the development of Hourbike Bristol, the City Council officer left to go to another employer, having co-written the Bristol City Cycling Bid
17th June 2008	Bike Breakfast as part of bike week, several partners tried the sample bike. Partnership Meeting to discuss a number of issues including the final adjustments to the bike design to feed back to the manufacturer

19th June 2008	Announcement that Bristol had won its bid as the Cycling Demonstration City with the aim of doubling the number of regular cyclists in Greater Bristol, which would mean 100-150,000 more people cycling regularly across the urban area by 2011. This provides an extra £11.4 million in funds which will be matched by Bristol City Council and South Gloucestershire Council making a total of £22.8 million. The announcement had considerable emphasis on Hourbike which appeared to catch the imagination of the media and public.
June/July 2008	Email exchanges about the implications of the bid for Hourbike - should the implementation be delayed - too great an expectation had been created for what had originally been conceived as a pilot. The media interest had generated 150 pre-registrations.
31st September 2008	Meeting of Henrietta Sherwin (as the initiator of the scheme) Tim Caswell and Jo Kyne of Hourbike with the acting project manager for Cycling City to understand where the Council stood re Hourbike. Outcome was that they would continue to support it at the level originally agreed but it appeared that the support was rather half-hearted, it was an inherited scheme and there was no clear understanding of the potential synergy with the aims of Cycling City
31st October 2008	Hourbike was launched in the North Fringe. BBC's report said "Hourbike's first phase, part of the £11.4 government cycle city scheme, sees 10 bikes kept at the University of the West of England......and Bristol Parkway station and the scheme will be used to decide how best to develop the city-wide service"
March 2009	Cycling City Project Manager Ed Plowden appointed
May 2009	Jon Rogers re-elected Executive Member for Transport and Sustainable Development
4th June 2009	Partnership Meeting - at Bristol City Council for update on different sites ready or nearly ready, issues of permission, land ownership, removing existing bike parking space. BRI stand implemented, Wine Street and Explore about to follow. Interest of Destination Bristol wanting to have hire bikes available for tourists – a system independent of Hourbike. Purpose was for Council Officer to take away update and messages to the new Cycling City Project Manager
2nd July 2009	Proposed press launch of city centre hubs was postponed twice partly because Jon Rogers the new political lead on transport got cold feet as a result of negative publicity about Hourbike on the GreenBlog which is widely read amongst local cyclists. The researcher continued to send information and background to both Jon Rogers and Ed Plowden Cycling City Project Director and spoke to them on the telephone
28th August 2009	Researcher sent an email to Jon Rogers saying that unless there was a decision to move forward with

	Hourbike, it should be discontinued. It was made clear that this was not what was desired but still no action. Various emails from Jon Rogers wanting clarification about the scheme and security issues
16th Sept 2009	Hourbike's scheme in Blackpool was launched, a scheme aimed at tourists with full council support had surpassed expectations more subscribers than the Bristol Scheme within four months. Philip Darnton the Chair of Cycling England saw the scheme, met Tim Caswell and heard of the situation in Bristol. Having seen the scheme in action he agreed to lobby Bristol to make a decision as the main funder of Cycling City.
Oct 2009	Tim Caswell Hourbike and Ed Plowden Cycling City finally met and a proposal for additional sites was requested. A decision is awaited.

Picture 4 Detail of Hourbike design

Picture 5 Henrietta Sherwin, Steve Ward UWE Travel Planner and Tim Caswell Hourbike at the Hourbike Hub at Brecon Court UWE Student Accommodation

Picture 6 New keypad for Bristol City Centre Hubs – modular design

Figure 11 Joining up 'soft measures' Hourbike and employer travel plans

cyclingworkforce

Getting Bristol on bikes

delivered by:

cyclescheme.co.uk hourbike Life Cycle UK

Issue 1 June 2008

Cyclescheme, Hourbike and Lifecycle have come together to make cycling more accessible to those working within Bristol.

Invitation

Challenge us to help increase the number of your staff cycling to work; and benefit from Bristol's status as the UK's first Cycling City.

For a Short Time

From late summer, Hourbike, the Pay-as-you-go bicycle network will be rolling out across the City Centre and North Bristol.

'We are delighted to have Hourbike on our Campuses this Autumn, supporting staff and students alike.'

Steve Ward, Travel Planner, UWE

Add a docking station to your premises, you could offer free membership, free minutes – there are many ways to get your staff on bikes! Visit www.hourbike.com and pre-register in time for our 2008 launch.

For Ever

Cyclescheme work with a network of local, independent bike shops supplying employees with tax-free bikes and cycle accessories.

Once your business is signed up, simply apply for your tax-free bike package using a secure voucher and the details can be easily checked and approved online by human resources.

'The Cyclescheme team has responded superbly, we are very impressed with the level of service'

Richard Williamson, Head of HR Policy, Forestry Commission

cyclescheme	hourbike	Life Cycle UK
01225 448933	01483 741349	0117 929 0440
info@cyclescheme.co.uk	info@hourbike.com	post@lifecycleuk.org.uk
www.cyclescheme.co.uk	www.hourbike.com	www.lifecycleuk.org.uk

Appendix VIII Email to attract new users to bike-rail integration

OPPORTUNITY FOR FREE RAIL TRAVEL

— Fancy some exercise as part of your daily routine?

— Want to catch up with your reading on the journey to work?

Dear Fellow Staff Member,

I'm writing to you to let you know that I have some free rail tickets for UWE staff who would like to try travelling to Frenchay campus by train who live within walking or cycling distance of their home railway station and would be willing to be interviewed about their experience.

As part of the UWE travel plan we would like to understand more about how people get on with rail travel and there is a possibility that in the longer term we can offer a discount on rail travel for UWE staff. In the course of her research on bike rail integration at the Centre for Transport and Society at Frenchay, Henrietta Sherwin has discovered that several staff members are already choosing this option to catch up on their reading and to build exercise into their day.

"I like the fresh air, it was a conscious decision to use my bike with the train, I feel more awake. I used to drive the whole way everyday but I felt lethargic" — UWE staff member

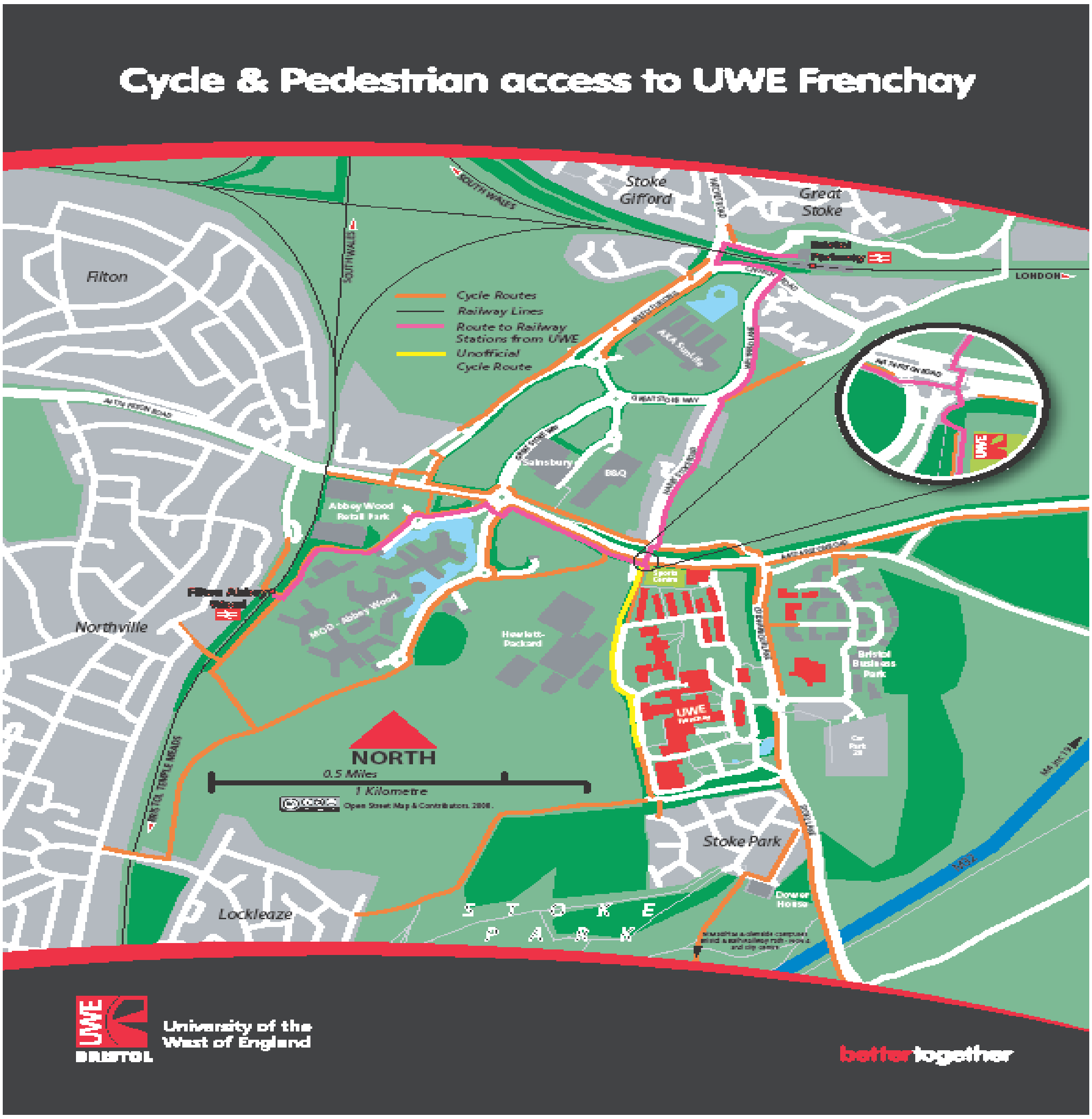
Bristol Parkway station is a 20-25 minute walk via the Harry Stoke Road route and if you prefer to cycle you can try out a bicycle free from Bristol Parkway Station to Frenchay using the new pay-as-you-go bike hire scheme Hourbike. Filton Abbey Wood station is a 15 minute walk to campus.

If you are interested, **please contact Henrietta Sherwin** Henrietta.Sherwin@uwe.ac.uk who can explain the details and how to get your free rail tickets and card for bike hire.

Yours Sincerely,

Steve Ward
Travel Planner
University of the West of England
Frenchay Campus
Coldharbour Lane
Bristol BS16 1QY
Tel: 0117 32 81542

Appendix IX Frenchay campus access map



Appendix X Post bike-rail experiment interview prompts

Proposed Interview Topic Guide post free rail trial

I. Interview of about 1/2 hour in person

II. Confidentiality

1. Material used from the interview will be used in the PhD thesis – quotes from interviewees may be used, and these will be non-traceable and completely anonymous → it may say things like "Male".

III. Right to leave at any time during the interview

IV. No right or wrong answers – just want thoughts and opinions. If there are any questions you prefer not to answer, you are free to do so.

V. Any questions?

VI. Are you still happy for the interview to be recorded? I might also take some notes.

VII. Give them the project information sheet and ask them to sign consent form

VIII. Let's start.

1 Could we start with a bit of information about how you normally travel to UWE?

- How long have you worked at Frenchay?
- Are you full time or part time? How often do you travel to Fenchay? Every weekday?
- As you have a parking permit do you drive every time you come to campus?
- Do you use the car for meetings for work off campus?
- How many people are living in your household and how many cars are there – in other words establish whether there is always a car available to the interviewee for their journey to work or does there have to be some negotiation?

- What other modes of transport, if any, do you sometimes use to get to or from UWE?
- What sort of time flexibility do you have in terms of arrival or leaving time?
- How long does your normal journey take?
- How much does the journey time vary – morning and evening – different times of day?
- How much time do you spend looking for a parking space?
- How often have you had to drive to another car park?
- What do you like most about your present journey
- What do you like least?
- How would you describe your journey to work?
- Have you ever car shared? What do you feel about it?
- Have you interventioned with different ways of getting to campus?
- Do you discuss with colleague how they get to work?
- Is it your impression that most of them drive to campus?

2 What prompted you to take up this offer?

3 Details of your journey

- How did you find travelling by train?
- Was it your first time using rail to campus?
- If Yes did you have any difficulty finding your way or the route from the station to campus? (or indeed did they know where their local station was).
- How did you make the journey – walk/cycle either end?
- How close is the station to your home?
- How did you find walking/cycling at either end – did it feel further than you had thought or less? Was it pleasant/onerous?
- Do you use rail for other journeys? ....general experience of rail travel
- If No....
- Do you know how to buy tickets....what is available in terms of season tickets, web information etc...
- How long did the journey take door to door?

- How does that time compare to your normal car journey?
- Does the time matter?
- Was it what you expected?
- Would you consider travelling by train again?
- If Yes Why
- If No Why not
- If you had to name a single thing that would encourage you to travel to UWE by train, what would it be?

4 Experience of bike-rail integration

Which method?

Enough room on the train

Any problems?

5 Experience of Hourbike

Did you find it easy to use?

Did you have any problems? (seat adjustment/not a slot to park/not a bike there/raining)

6 Experience of Cycling (ask if they biked)

Do you have a bike at home? (how many bikes do you have i.e)

If Yes for what types of journeys do you use it? (what other journeys do you make by bicycle)

If No have you ever ridden a bike?

Do any of your colleagues, friends or family ride a bike?

7 Travel behavior history

Ask if they could give a potted history, when they learnt to drive, acquire a car, stopped cycling, do they remember how they decided to travel to Frenchay, did they do much research.

Age? Date of birth?

6 End of the interview

- Do you have any questions or anything you would like to add to what you have said already?

- Thank you for taking part in the interview