The potential impact of new urban public transport systems on travel behaviour

Aoife Ahern

Centre for Transport Studies

University College London

Abstract

Predicting the potential impacts of new urban public transport on people's travel behaviour is very complex. A key aspect of travel behaviour is the choice of mode. It is particularly difficult to estimate the number of people who will use new urban public transport systems. Understanding modal choices related to these systems is especially important in view of concerns about the impact of the car on the environment, on quality of life and on congestion levels in towns and cities. In this thesis, the modal choices of potential users of two new light rail systems, Luas in Dublin and Tramlink in Croydon, are examined. The decision-making processes behind these people's modal choices are explored using a theory that has been borrowed from social psychology called the Theory of Planned Behaviour.

In order to apply the Theory of Planned Behaviour it is necessary to identify the attitudes, beliefs and perceptions of behavioural control of potential users. Hence, interviews have been carried out with potential users of Croydon Tramlink in the six months immediately prior to its opening. This thesis will describe those interviews, the analysis of them and the findings. In addition, follow-up studies were conducted six months after the opening of the system in order to examine how many of the interviewees had used the system. In Dublin, questionnaires were distributed to potential users of the new light rail system planned for the city. The questionnaires were distributed 2 years before the planned opening of the system.

The thesis concludes that the Theory of Planned Behaviour is an appropriate tool for understanding and explaining modal choices, particularly those modal choices that relate to new urban public transport. It is also concluded that both Luas and Tramlink are likely to be successful systems and will generate new trips.
The potential impact of new urban public transport systems on travel behaviour

CONTENTS:

Acknowledgements 18

Chapter 1 Introduction 19

Chapter 2 Investigating travel behaviour 24

2.1 Introduction 25

2.2 Manchester Metrolink 29

2.2.1 The history of Manchester Metrolink 29

2.2.2 The forecasting studies carried out for Manchester Metrolink 30

2.2.3 Conclusions on the forecasts used for Manchester Metrolink 35

2.3 Sheffield Supertram 36

2.3.1 The history of Sheffield Supertram 36

2.3.2 The forecasting studies carried out for Sheffield Supertram 39

2.3.3 Conclusion on the forecasts used for Sheffield Supertram 42

2.4 Travel behaviour and modal choices 43

2.4.1 Introduction 43
2.4.2 Using psychological methods and social science to study travel behaviour 45

2.4.3 An introduction to some psychological methods 48

2.5 Summary 55

Chapter 3 The Theory of Planned Behaviour: 57

3.1 Introduction 58

3.2 The evolution of the Theory of Planned Behaviour 60

3.2.1 Introduction 60

3.2.2 Attitudes 62

3.2.3 Subjective norm 64

3.2.4 Weighting 66

3.2.5 Factors not in the Theory of Reasoned Action 66

3.2.6 Control 67

3.3 The components of the Theory of Planned Behaviour 68

3.3.1 Introduction 68

3.3.2 Perceived behavioural control 70

3.4 Applications of the Theory of Planned Behaviour 72

3.4.1 Introduction 72

3.4.2 Non-transport related applications of the Theory of Planned Behaviour 73
3.4.3 Applications of the Theory of Planned Behaviour in transport

3.5 Summary

Chapter 4 Modal choices of car drivers

4.1 Introduction

4.2 Why do people use their cars?
  4.2.1 Introduction
  4.2.2 Analysis of the data
  4.2.3 Applying the Theory of Planned Behaviour

4.3 Summary
Chapter 5 Croydon Tramlink and Dublin Luas

5.1 Introduction

5.2 The History of Tramlink

5.2.1 Introduction

5.2.2 The starting point for Tramlink

5.2.3 Financing Tramlink

5.2.4 Construction of Tramlink

5.3 Tramlink Routes

5.3.1 Introduction

5.3.2 Croydon town centre

5.3.3 Sandilands to New Addington

5.3.4 Sandilands to Beckenham Junction

5.3.5 Sandilands to Elmers End

5.3.6 Reeves Corner to Wimbledon

5.4 Tramlink operations

5.4.1 Tramlink vehicles

5.4.2 Tramlink timetables and tickets

5.4.3 Tramlink publicity

5.5 History of Luas

5.5.1 The starting point for Luas
5.5.2 Financing Luas

5.6 Luas routes

5.6.1 Line A

5.6.2 Line B

5.6.3 Line C

5.6.4 Line D

5.7 Summary

Chapter 6 Methodology of study

6.1 Introduction

6.2 Recruitment of interviewees

6.2.1 Introduction

6.2.2 Purposive sampling

6.3 Qualitative Study of Croydon Tramlink

6.3.1 Introduction

6.3.2 Unstructured interviews

6.3.3 Conducting the interviews

6.3.4 Follow-up study

6.4 The Dublin Study

6.4.1 Introduction

6.4.2 Pilot stage
7.3.7 Beliefs of the respondents in the Dublin study 261
7.3.8 Conclusions 272

7.4 Summary 273

Chapter 8 Discussion, conclusions and further work 277
8.1 Introduction 278
8.2 Outline of work done 279
8.3 Factors that motivated people's modal choices 280
8.4 Describing the decision-making process using the Theory of Planned Behaviour 281
8.5 Using the Theory of Planned Behaviour to make predictions about modal choice 282
8.6 The potential impact of new urban public transport on travel behaviour 283
8.7 Conclusions and future work 283

References 288

Appendix A In depth interviews SDG 302
Appendix B Croydon recruitment questionnaire 311
Appendix C Croydon topic guide 315
Appendix D Croydon answer sheet 323
Appendix E Follow up study questionnaire 327
Appendix F  Pilot study questionnaire Dublin  330
Appendix G  Questionnaire Dublin  341

FIGURES:

Figure 3.1  The Theory of Reasoned Action  61
Figure 3.2  The Theory of Planned Behaviour  69
Figure 5.1  Tramlink routes  119
Figure 5.2  Luas routes  132
Figure 6.1  Section 1 of the interview  149
Figure 6.2:  Section 2 of the interview: interviewee intends to use Tramlink on work trips  152
Figure 6.3:  Section 3 of the interview: interviewee does not intend to use Tramlink on work trips  153
Figure 6.4:  Follow up study questionnaire  156
Figure 6.5:  Section 1 of pilot survey questionnaire  160
Figure 6.6:  Instructions to the respondent  161
Figure 6.7  Intention to use Luas  162
Figure 6.8  Attitude to using Luas  162
Figure 6.9  Outcome evaluation  163
Figure 6.10  Behavioural beliefs  164
Figure 6.11  Subjective norm  165
Figure 7.8 Probability of an intention score = -2 259
Figure 7.9 Probability of an intention score = -1 259
Figure 7.10 Probability of an intention score = 0 260
Figure 7.11 Probability of an intention score = 1 260
Figure 7.12 Probability of an intention score = 2 261

TABLES:

Table 2.1 Estimated annual Metrolink patronage by previous mode 33
Table 2.2 Data collected as part of monitoring study 41
Table 4.1 Purpose of the car trips analysed 88
Table 4.2 Reasons for using the car 89
Table 4.3 The alternatives mentioned by the car 90
Table 4.4 Weighted alternatives 90
Table 4.5 The events that drivers said would bring about a change to public transport 91
Table 4.6 Events to bring about a change to public transport vs. reasons for using the car 93
Table 4.7 Ranking system 97
Table 4.8 Main reasons for car use 98
Table 4.9 Events to bring about a change to public transport
transport vs. main reason for using the car 99

Table 4.10 Reasons translated in behavioural beliefs 101
Table 4.11 Reasons translated into normative beliefs 103
Table 4.12 Reasons translated into control beliefs 103
Table 4.13 Logistic regression analysis for all reasons 106
Table 4.14 Logistic regression analysis for main reasons 109

Table 5.1 Tramlink vehicle characteristics 125
Table 5.2 Tramlink frequencies on each route 127
Table 5.3 Times of first and last trams 128

Table 6.1 Characteristics that could influence the attitudes, subjective norms and perceived behavioural control of respondents towards Tramlink 142

Table 6.2: Response rate of companies in Croydon 143
Table 6.3: Questionnaires returned 144
Table 6.4: Sex and age characteristics of the sample 144
Table 6.5: Sex and household composition of the sample 145
Table 6.6: Car ownership of the sample 145
Table 6.7: Availability of parking of the sample 145
Table 6.8: Sex and intention to use Tramlink of the sample 145
Table 6.9: Present mode used on work trip

Table 7.1: Score system used for the interviews

Table 7.2: Sex and age of those who intend never to use Tramlink

Table 7.3: Scores for Group A

Table 7.4: Behavioural beliefs of Group A

Table 7.5: The referents mentioned by Group A

Table 7.6: Control beliefs of Group A

Table 7.7: Sex and age of Group B

Table 7.8: Scores for Group B

Table 7.9: Intention to use Tramlink for multiple trip types

Table 7.10: Attitudes of Group B

Table 7.11: Behavioural beliefs of Group B

Table 7.12: Scores for the subjective norm (1) and subjective norm (2)

Table 7.13: The referents mentioned by Group B.

Table 7.14: Perceived behavioural control on the different trip types

Table 7.15: Control beliefs of Group B

Table 7.16: Trip types of Group C
Table 7.17: Scores for Group C for all trips
Table 7.18: Attitude scores for Group C
Table 7.19: Intention of Group C to use Tramlink for multiple trip types
Table 7.20: Scores for Group C1
Table 7.21: Behavioural beliefs of Group C1
Table 7.22: Referents mentioned by Group C1
Table 7.23: Control beliefs of Group C1
Table 7.24: Scores for Group C2
Table 7.25: Behavioural beliefs of Group C2
Table 7.26: Referents mentioned Group C2
Table 7.27: Control beliefs of Group C2
Table 7.28: Scores for Group C3
Table 7.29: Behavioural beliefs of Group C3
Table 7.30: Referents mentioned by Group C3
Table 7.31: Control beliefs of Group C3
Table 7.32: Scoring system for intention
Table 7.33: Multiple regression analysis
Table 7.34: Multiple regression analysis using recalculated subjective norms
Table 7.52 Behavioural beliefs of the Dublin respondents
Table 7.53 Average normative belief scores for Dublin survey
Table 7.54 Average control belief scores for Dublin survey
Table 7.55 Behavioural beliefs multiplied by outcome evaluations
Table 7.56 Normative beliefs multiplied by motivation to comply
Table 7.57 Control beliefs multiplied by likely presence of obstacle
Table 7.58 Correlation between direct and indirect measures
Chapter 1:

Introduction
Car ownership levels are increasing in many cities in the world. The car offers people the freedom and independence to choose to live in less densely populated, more amenable areas and use their cars to carry out the daily commute to city centres and towns (Mackett and Edwards, 1998). This has led to increases in traffic in towns and cities. Some of the associated problems of increased traffic growth include environmental problems such as air and noise pollution, higher levels of accidents and increased congestion, particularly at the peak hour (Jensen, 1999). In the UK, congestion is forecast to grow by 15% in the next ten years (Department of the Environment, Transport and the Regions (DETR), 2000). According to the DETR (2000):

"In urban areas the biggest concerns are traffic congestion and the cost, convenience and reliability of public transport. Air pollution, safety and traffic nuisance also worry many. Traffic jams and polluted streets make towns and cities less attractive places in which to live and do business."

In order to reduce private car use, a range of measures can be introduced such as introducing traffic restraint measures, changing road capacity or providing alternative modes to the car (Jones, 1997). In this thesis, it is intended to look at the option of providing alternative modes to drivers.

Governments recognise that in order to induce people to give up using their cars, it is necessary to provide them with choices of how to travel. In the UK, the government’s 10 Year Transport Plan has pledged to provide money to build new light rail and tram lines (DETR, 2000). In the plan, money is provided to build another 25 light rail lines. It is recognised in the UK that light rail systems have a role to play in reducing congestion and pollution. In Ireland, a new light rail system will open in 2002 in Dublin, which it is hoped will reduce congestion in the city centre (Dublin Transportation Initiative, 1994).

Therefore, it is apparent that building and providing new public transport modes, in particular light rail, is seen as playing an important role in reducing congestion in city centres and towns. However, there can be problems in anticipating the effects that these new systems will have on people’s travel patterns (Mackett and
Edwards, 1998). According to a study of 25 new public transport systems in various countries by Mackett and Edward (1998) the commonest reason for the construction of these systems is to reduce traffic congestion. However, this same study showed that the systems met with varying levels of success in achieving this objective. Even systems that are successful, such as the Manchester Metrolink, do not always affect travel behaviour in the ways that were originally predicted. In the case of the Sheffield Supertram, the system did not attract as many people as forecasts had predicted. In the US, forecast levels of patronage on some light rail systems are much higher than those actually achieved (Pickrell, 1992; Mackett and Edwards, 1998). Investing in new public transport and building light rail systems can be expensive and governments and local authorities cannot risk wasting money on systems that do not perform. In the government’s Transport White Paper (1998), reservations were voiced about light rail and the associated costs (DETR, 1998):

“Light rail, and similar rapid transit systems, can have a role to play in delivering integrated transport in urban areas - particularly if planned as part of an overall strategy. The capital costs of light rail systems are, however, high - particularly in comparison to bus priority measures and more modest guided bus schemes which may offer a more cost-effective alternative.”

More recently, however, light rail systems are once more being seen as playing an important role in reducing traffic congestion. However, if they are to continue to find favour with governments and with local authorities some more accurate method of examining modal choices in relation to new modal alternatives is required.

Part of the reason that predictions of modal choices are poor is due to a lack of understanding about how people make modal choices, about the decision-making processes behind the choices and about the variables affecting those choices (Jones, 1997). According to Jones (1997) not enough emphasis is placed on understanding what factors play a role in determining a person’s attitudes and behaviour. Therefore, there is very little known about how people make modal choices in relation to new modes of transport.
In this thesis, it is intended to examine how modal choices are made in order to gain a greater understanding of the decision-making process with a view to being able to make more accurate explanations about people's modal choices in relation to new public transport use in the future. In order to do this, studies have been conducted of the modal choices of potential users of two new light rail systems in Dublin and London. It was decided to use a theory that has been selected from social psychology called the Theory of Planned Behaviour to look at their intentions. It is intended to show how this behavioural theory can describe people's decision-making processes in relation to using new modes. It is also intended to show how this theory can be used to make examine the impacts of new urban public transport on travel behaviour.

In summary, the objectives of this thesis are:

1. To contribute to and improve existing understanding of people's modal choices and the decision-making processes behind those modal choices, particularly in relation to new modes of transport.
2. To examine whether the Theory of Planned Behaviour offers a good framework in which to study modal choices and the decision-making processes behind modal choices.
3. To show that the Theory of Planned Behaviour can be used to make predictions about people's travel behaviour.
4. To examine the potential impacts of two new urban public transport systems on travel behaviour.

The thesis has been divided into seven chapters in addition to this introductory chapter. Chapter 2 describes the problems that are faced in trying to predict usage of light rail systems by looking at two case studies: Manchester Metrolink and Sheffield Supertram. Some psychological theories, which can be used to look at travel behaviour, including the Theory of Planned Behaviour, are also described. The Theory of Planned Behaviour is described more fully in Chapter 3 and the various concepts used in this theory are defined. Some studies that have used the Theory of Planned Behaviour are also described in this chapter. Chapter 4
describes the analysis of the modal choices of drivers and the application of the theory to this analysis. Chapter 5 describes the two systems where the studies were conducted: Croydon Tramlink and Dublin Luas. It also describes some of the problems that have faced these systems and could be expected to affect people’s modal choices and attitudes.

In Chapter 6 the studies are described: how the interviews were designed and conducted in Croydon and the design and distribution of questionnaires in Dublin. In Chapter 7 the results of the studies are analysed. Finally, Chapter 8 described the conclusions of the studies and makes some suggestions as to future work.

The main hypothesis of this thesis is that a better understanding of modal choices is required if the impacts of new urban public transport systems on travel behaviour are to be understood and predicted more accurately. In order to improve this understanding, it has been decided to examine the modal choices of potential users of new public transport systems in the future.
Chapter 2:

Investigating travel behaviour
2.1 Introduction

While the car has brought greater independence and mobility to people, increasing use of private cars in cities and towns is threatening that very mobility and freedom. Increasing dependence on the car has brought many problems for urban areas. These problems include increased pollution and noise, traffic accidents, reduced safety, more congestion, lack of parking and severance of local communities. They are widespread in European cities (ECMT, 1990). Approximately 500 billion ECU's are lost each year in the European Union due to congestion (Jones, 1993a). In addition, the environmental consequences of increasing car use are very serious: 25% of all CO₂ emissions in Europe come from transport, with 55% of that generated by private cars (Jones, 1993a).

These problems are set to increase as the proportion of the population living in cities and towns increases. Currently, 50% of the world's people live in urban areas and this figure is going up (Tolley and Turton, 1995). Levels of car ownership are also increasing. It is widely recognised that as incomes go up more people will buy cars (Glaister et al, 1998).

According to Jones (1993b), lives are becoming more dependent on cars. The car allows people to live the lifestyle that they want to live: in low-density areas with high activity rates (RAC, 1995). Cullinane's study (1992) of the attitudes towards the car of 2428 households in the UK found that 50% of all the households said that a car was essential to their lifestyle. When only households with a car were considered, 69% felt that a car was essential to their lifestyles. Similarly a study for the Royal Automobile Club found that 80% of people felt that the car was an essential part of their lives (RAC, 1995). The RAC (1995) says that 95% of those questioned in their survey felt that the car gave them more independence.

The advantages of car-use are very immediate to users so it is not difficult to see why they would have more positive attitudes to the car then towards public transport. However, the public are aware of the fact that car-use causes problems. Jones (1993b) points out that 80% of car drivers recognise that traffic-related problems are serious. About 95% are worried about air pollution resulting from
traffic and 70% are concerned about road safety. A study for the International Union for Public Transport in 1991 of the attitudes of people living in the European Union found that 59% of people find the city that they live or work in "unbearable" or "hardly bearable" (Blessington, 1994). Seventy-eight per cent felt that this was as the result of increased car traffic in the city. Cullinane's study (1992) also found that people are aware of the problems that are caused by cars: 85% of those surveyed felt that by the year 2000, roads would not be able to cope with the increased levels of traffic.

Therefore, it would seem that people are aware of the problems that are caused by car use and that a potential exists to encourage people to use alternatives to the car, such as public transport. In order to combat congestion and the associated problems of increased car use, governments and local authorities are looking to these alternatives. Between 1991 and 1998 the Department of the Environment, Transport and the Regions (DETR) made £18 million pounds per annum available to local authorities to build light rail projects (Glaister et al, 1998). In the DETR's annual report in 1999 the importance of providing alternatives to the car was stressed:

"The Government is determined to provide better, more convenient and more varied transport for everyone, no matter where they live. It is recognised that the impact of transport on the environment is crucial. Thus it intends to cut our dependence on the car."

It is recognised that reduced congestion and lower levels of traffic growth will only come about by reducing private car use. Providing better quality public transport is seen as one way of encouraging people to use their cars less. At the moment, public transport in many cities tends to be overcrowded in the peak hours and services at off-peak times can be infrequent (Tolley and Turton, 1995). It is perceived by people as being slow, infrequent and unreliable, especially when compared with the car (Jensen, 1999).

Jensen (1999) points out that the symbolic importance of the car is so strong that even when people are aware of the fact that their cars damage the environment they continue to use them. In Jensen's study (1999) 80% of people questioned in
a quantitative study of 1000 car drivers and public transport and bicycle users in Denmark saw the car as a symbol of independence. Among the car drivers in this group, 83% saw the car as a symbol of independence. A study of UK drivers by Stradling et al (1999) showed that 93% felt that the car gave them the freedom to travel widely. In the Royal Automobile Club’s (RAC) travel behaviour study of 1994, 80% of the respondents felt that car use was essential to their lifestyles and that they could not manage without a car (RAC, 1995). Studies by Tertoolen et al (1998), in the Netherlands support this: the advantages of car use are far more immediate and personal than the disadvantages so even though people know that the collective disutility of using a car is great they continue to use it. Steg and Tertoolen (1999), point out that car manufacturers have been far more aware of this emotional attachment to car use than transport planners, engineers and economists. Indeed, car manufacturers, in their advertising campaigns focus on trying to evoke emotional responses to the car (Wright and Egan, 2000).

Local authorities and governments are keen to improve the image of public transport by providing modern transport systems like metros and light rail systems. Light rail, in particular, is identified as a mode that can be very effective in densely populated cities where people live and work within short walking-distances of stops. These systems are built to increase public transport usage. However, the failure of some light rail systems, such as the Sheffield Supertram, to attract significant numbers of passengers in its early years of operation aroused doubts in the government about their ability to perform. In the government’s White Paper on transport, the significant costs of light rail systems were noted and it was pointed out that local authorities should consider whether bus systems could offer more cost-effective alternatives (DETR, 1998).

Support for light rail systems is, however, increasing again. Manchester Metrolink is considered a successful light rail system and Sheffield Supertram is beginning to attract more passengers (Arnold, 2000). Several cities are now exploring the use of light rail systems to encourage drivers out of their cars. Sheffield is considering a £240 million pound extension to the Sheffield Supertram. Nottingham is in the preliminary stages of building a light rail system. The Croydon system opened earlier this year. Other cities examining
light rail options are Bristol and Leeds. Newcastle and Birmingham are seeking to extend their systems. In all, the government’s Ten Year Transport Plan has promised the construction or extension of 25 light rail schemes (Lovelace, 2000). Under the plan, the government are providing up to £3 billion for these schemes. Therefore, local authorities are once more considering using light rail to reduce traffic growth and decrease car dependence. However, if these systems are to be successful and light rail is not to lose support once more, predictions about who will use them will have to be more accurate and the way in which forecasts are made about the effects that they will have on travel patterns will have to be more exact. Research by Pickrell (1990, 1992) showed that the forecasts used to justify the building of new urban rail systems in the United States were significantly wrong.

It is very difficult to make accurate forecasts about the impacts that new urban public transport systems will have on people’s travel patterns and modal choices. Modal choices involve many factors and variables and there is much uncertainty involved in making forecasts or in trying to explain people’s behaviour. In this thesis, it is intended to examine how these modal choices are made in order to gain a greater understanding of the decision-making process with a view to being able to make better predictions and more accurate explanations about people’s modal choices in relation to new public transport use in the future. In order to do this a theory called the Theory of Planned Behaviour has been selected to examine modal choices of potential users of new light rail systems. This chapter will describe how that theory was selected to examine modal choices.

The first two sections of the chapter will describe the studies that were conducted before the construction of two new public transport systems. These systems are Manchester Metrolink and Sheffield Supertram. The sections will describe the problems that were involved in trying to predict how many people and what type of people would use the systems and how they would impact on travel patterns. A description will be given of the studies that were conducted to examine the transport impacts of two light rail systems. In particular, special emphasis will be given to the analysis of modal choice and any attitudinal analyses that were carried out for the systems. The two light rail systems that will be discussed are
the Manchester Metrolink and the Sheffield Supertram. The third section of this chapter will describe some of the psychological theories that can be used to investigate the area of travel behaviour. This section will also introduce the Theory of Planned Behaviour and describe how it is intended to use this theory to provide insights into modal choices.

2.2 Manchester Metrolink

2.2.1 The history of Manchester Metrolink

Manchester is a city with a population of 451,000 people. Greater Manchester has a population of 2.5 million people. In the 1970s consideration was given to constructing an underground line between two main stations, Piccadilly and Victoria, called the Pic-Vic line. However, in 1983, Greater Manchester City Council decided to develop a light rail system which would link the two stations, provide rapid public transport access to the city centre, reduce road congestion and would stimulate economic regeneration in the city centre and other urban centres (Knowles, 1996). A scheme was submitted to the UK Government in 1985 for a capital grant of up to 50% under Section 56 of the 1968 Transport Act. There were delays to the decision concerning the new system due firstly to the deregulation of the bus services in 1986 and the need to plan a system that would run in competition with local bus services and secondly due to the need for non-user benefits to be provided in order to satisfy the government's tougher requirements, introduced in 1989. These stated that the non-user benefits needed to exceed the grant provided and that the private sector should be involved in financing the system.

In 1988, the bill seeking to build Metrolink received Royal Assent (Hall, 1993). The system is 31 km long, with 27 km consisting of converted rail tracks and 4 km on street in the city-centre. The Metrolink route runs from Altrincham interchange, south of Manchester, through the city centre, to Bury interchange in the north of the city. There is a link between Victoria Station and Piccadilly Station. There is also a link to Harbour City. There are 26 stops on the lines. Nineteen of these stations were previously old train stations, which were updated, and a further 7 were built. The main objectives of this system were...
To improve rail access to the city centre

To improve public transport in Greater Manchester

To link the city’s main railway stations

To provide a link between the north and south of the city

(Knowles, 1996)

The system was designed, built and operated by a private company but is owned by Greater Manchester Public Transport Executive (GMPTE). The system cost £149.4 million to build, of which £54.5 million was a grant provided under Section 56.

2.2.2 The forecasting studies carried out for Manchester Metrolink

A major study was conducted by Oscar Faber for the Department of Transport in order to predict beforehand and to assess afterwards the impacts of Metrolink (Oscar Faber, 1996a, Oscar Faber, 1996b). The aims of this study were to assess the impacts of Metrolink on transport, land use and the economic status of the area. The transport impacts involved looking at changes in travel behaviour, in particular modal shifts. This section of the thesis will focus on the forecasts of the transport impacts and will attempt to identify reasons why there were inaccuracies in those forecasts.

In order to study the effects of Metrolink on people’s travel patterns and travel behaviour, before and after household studies were conducted in Spring and Autumn 1991 and Spring 1993 (one year after opening) and Autumn 1994 (two years after opening) (Fairweather, 1991; Fairweather, 1992). These studies were conducted in the Metrolink areas as a set of panel surveys. Control areas, outside the Metrolink corridors, were also involved in the study in order to estimate how many of the changes were actually due to the presence of Metrolink and how many were due to external influences on travel behaviour. Passenger surveys were also conducted of bus, rail and Metrolink passengers. In addition, a before and after survey of rail users was conducted in November 1990 and November
1993 at 10 stations to measure the impact of Metrolink on rail users (Knowles, 1996).

Data was also collected on the traffic volumes, journey times and costs of travel by all modes. This data was used in the demand forecasting process. This thesis will examine how these studies were conducted, what forecasts were made and how well these forecasts tallied with actual Metrolink use.

In August 1994 patronage on Metrolink stood at 12.4 million passengers a year. This was slightly greater than the original forecast of 11.9 million. The model had predicted that weekly Metrolink patronage would stand at 241,046 but actual weekly patronage levels were 4.4% higher than this. It was somewhat surprising that Metrolink was attracting more passengers than originally predicted, given that this was at a time of economic recession, when unemployment had risen by 49% in Manchester. In particular, off-peak patronage levels had increased more quickly than expected. It was apparent that people were more impressed by the 6-minute service interval and the ability of the system to penetrate to the centre of the city than had originally been expected. In these circumstances, it would be expected that passenger levels would be higher than those forecast.

The follow-up study, in May 1994, also showed that the types of trips that were being made were quite different to those forecast (Oscar Faber, 1996b). Trips to the city centre on both lines were lower than expected: on the Bury line they were up to 23% lower than expected for some stations and trips on the Altrincham line to the city centre were between 12% and 14% lower than expected for some stations. Trips within the Altrincham and Bury corridors, however, were significantly higher than expected.

The forecasts had predicted that more people would use the system at peak times than were actually using it. On the Bury line this could partly be explained by the fact that during the conversion of the rail track between Bury and Manchester from heavy rail lines to light rail lines there was no rail service. Instead, a very cheap and efficient bus service operated and is still in operation (Knowles, 1996). This service attracted many British Rail users to it (Oscar Faber, 1996a).
Table 2.1 shows the estimated Metrolink annual patronage (in millions) by previous mode. This table is based on the findings of the ‘After’ rail survey in November 1993. In this survey, respondents were asked what mode they had used to make the same trip in 1990. It was found that the modal shift that took place was quite different from what Manchester Metrolink had originally forecast. The predicted transfer from bus to Metrolink was developed from modelling work (Oscar Faber, 1996b). Stated preference studies were carried out to assign weightings to variables, such as wait time, in-vehicle time and frequency. After this, an aggregate revealed preference model was developed using these weightings. Bi-nomial logit models were created to forecast peak and off-peak modal choice. The forecasts assumed that all current rail users would switch from rail to Metrolink when it opened. It will be seen later in this chapter that lengthy closures on the Bury and Altrincham line caused problems for these forecasts. The forecasts of transfer from car to Metrolink were based on stated preference studies.

The table also shows the estimates for annual patronage on the Bury/Altrincham lines if the British Rail services had been maintained. The Metrolink impact is found by subtracting the control situation from Metrolink actual.

The table shows some surprising results. The number of bus passengers and rail passengers who transferred to Metrolink were well below the forecasts. This is partly due to incorrect representation of the supply conditions at the time of opening: there had been an 8 month gap between the closure of the British Rail line and the opening of the Metrolink line on the Bury line and a 6 month gap on the Altrincham line. This gave former rail users the opportunity to become accustomed to using alternative modes, including a very cheap and efficient replacement bus service. This is an obvious example of exogenous factors and incorrect representation of the supply variables playing a role in reducing the accuracy of the model’s forecasts.
The differences in the forecasts for transfers from car to light rail and the actual transfers is, however, more difficult to explain. It is surprising that more car users decided to use Metrolink than originally forecast, as fewer park and ride sites were made available than originally planned. The Department of Transport and GMPTE felt that Oscar Faber’s study had underestimated the actual transfer from car to Metrolink and so the differences in the forecast modal shift and actual modal shift were even greater than those shown in Table 2.1 (Oscar Faber, 1996b). In the study, adjustments had been made to the results of the “After” study to allow for the fact that some former bus and car users who used Metrolink in 1993 would have transferred to the previous British Rail service anyway. No adjustments were made to allow for the fact that some British Rail users would have switched to bus or car, which the Department of Transport viewed as causing Oscar Faber to underestimate the number of people who transferred from car to Metrolink and from bus to Metrolink.
The forecasts for modal transfer from car to Metrolink shown in Table 2.1 were based on stated intention studies carried out in the Metrolink corridors and on an analysis of the fare reductions on patronage levels in London.

In addition to the stated intention studies, a smaller-scale stated preference study was carried out to develop an alternative model to forecast the number of car users transferring to Metrolink (Oscar Faber, 1996b). Interviews were carried out in the Metrolink corridors. Only car users whose final destination was Central Manchester were interviewed. There were 680 interviews carried out. The early models that were developed based on this data were very poor (Oscar and Faber, 1996b). The modellers felt that it was apparent that the interviewees were making choices that were irrational or could not be understood. It was decided to conduct a post-survey rationality test to eliminate respondents who were making irrational choices. It seemed that some people were being forced to choose Metrolink as a mode in the experiment as the cost of car use was unrealistically high. It was found that the forecasts produced by the stated preference study significantly overestimated the number of people who transferred from car to Metrolink on within-corridor trips and slightly underestimated the number of trips that transferred from car to Metrolink for trips to the city centre (Oscar Faber, 1996b).

In the stated preference study, only car users travelling to the city centre were interviewed. People were more likely to choose to use Metrolink on city centre trips because car parking in the city centre was very expensive. This led to overestimation of the cost of using the car on within corridor trips. This partly explains why the stated preference model predicted that 4 times as many drivers would switch to Metrolink for within corridor trips than actually did transfer.

Another surprising fact to note from Table 2.1 is the low number of new trips generated by Metrolink. It would be expected that Metrolink, with its high levels of frequency and its extensive network would generate more new trips. It is difficult to understand why the impact has been so small.
2.2.3 Conclusions on the forecasting procedures used for Manchester Metrolink

The original Metrolink forecasts predicted that there would be 11.9 million passengers a year using the service by 1994. The actual figure stood at 12.4 million passengers a year, only slightly above the forecast. However, as shown in the detailed discussion above, the composition of those passengers is quite different from what was originally forecast. Fewer rail and bus users than predicted had transferred to Metrolink while the stated intention study had resulted in an underestimation of the number of car drivers who would switch to Metrolink. The forecasts over predicted trips to the city centre and under predicted within corridor trips.

Some of the differences in the forecasts and the actual use of Metrolink can be explained by changes in the supply conditions at the time of Metrolink's opening. In particular, the closure of the Bury and Altrincham lines led to an overestimation of the number of rail users who would transfer to Metrolink. However, poor understanding of travel choices may also have led to some errors in the forecasts. In particular, the underestimation of the number of car users who would switch to Metrolink is difficult to explain. This is particularly true when it is taken into account that fewer park and ride sites were made available than originally planned. It is apparent that the low cost and high frequency service had a greater effect on the choices of car users than was originally expected.

To examine the impact of exogenous factors on the forecasts, the model was re-run replacing the original incorrect assumptions with the ouuturn factors (Oscar Faber, 1996b). These assumptions had been that the competing bus services would remain constant, that there would be 12 trains an hour in peak periods and 6 trains in off-peak and that the effects of closure of the lines would be minimal. In actuality, a very efficient and cheap express bus service was introduced on the Bury corridor, there were 10 trains an hours in peak and off-peak periods and the Bury and Altrincham lines were closed for 8 and 6 months respectively (Knowles, 1996).

When the model was re-run, it was found that the forecasts of trips to the city centre were close to the actual number of trips made for the Bury corridor.
However, in the Altrincham corridor, the actual number of trips was still up to 20% lower than the new forecasts for some stations. In addition, the new forecasts for in-corridor trips were not altered and the actual corridor trips were still much higher than the new forecasts (Oscar Faber, 1996). Therefore, the revised forecasts using actual fare levels, service frequencies and bus competition led to better predictions of the number of trips to the city centre but the estimation of the number of within corridor trips was still underestimated. This would imply that not all the problems with the forecasts were due to incorrect representation of the supply conditions. The developers of the model have stated that one reason for the incorrect estimation of the number of within corridor trips could be the result of a poor understanding of the modal choices behind these trips (Oscar Faber, 1996b). Very broad assumptions were made about people’s behavioural responses and modal choices on these trips. The importance of these trips to people was underestimated.

While the impact of exogenous factors on the accuracy of forecasts should not be ignored, this thesis will focus on whether poor understanding of travel choices can play a role in resulting in inaccurate forecasts. In Manchester, the impact study identified that some exogenous factors did play a role in the inaccuracy of forecasts. However, when the model was re-run, using new data in 1994, there still remained significant errors in the forecasts produced. In particular, the number of trips that transferred to Metrolink on non city-centre trips was underestimated. In addition, while the errors in the forecasts of the number of people transferring from bus and rail to Metrolink may in some part be explained by the closure of the rail lines for long periods of time, the underestimation in the stated intention study of the number of car trips which transferred to Metrolink is harder to explain.

2.3 Sheffield Supertram

2.3.1 The history of Sheffield Supertram

Sheffield is a city in the north of England with a population of half a million. The last trams to run in the city were decommissioned in 1960. However, in the 1970s there were suggestions of re-introducing the trams in order to reduce
traffic congestion (Boak, 1995). In 1976, the Sheffield and Rotherham Land Use Transportation Study was published which proposed the construction of a new light rail system in Sheffield (Haywood, 1998).

In 1978, the South Yorkshire Passenger Transport Executive published its Transport Plan for the county in which they recommended the construction of a light rail system (Hill, 1995). However, feasibility studies were not carried out until the 1980s and a Parliamentary Bill was promoted in 1985 to obtain powers to build the first line. Line 1 runs from Middlewood in the North to Halfway in the South, via the city centre. However, when South Yorkshire County Council was abolished in 1986, the scheme needed the support of Sheffield City Council in order to succeed. In order to obtain this support, a new route, Line 2, was proposed. This route runs through the Lower Don Valley, an economically deprived and de-industrialised area, into the city centre and to the new Meadowhall shopping and leisure centre. The primary objective of this line was to promote economic regeneration of the Lower Don Valley and the poorer areas of Sheffield. Parliamentary approval was granted to Line 1 in 1988 and to Line 2 in 1989. Line 2, however, was the first line to be built. Line 1 is 22 km long and Line 2 is 7 km long.

The funding for Supertram was agreed in 1990 and construction commenced in 1991. The final cost of the system was £240.6 million, of which £6 million was provided by private developers and £12 million was provided by the European Union (Parkhurst, 1997). The Department of Transport provided funding for Supertram under Section 56 of the 1968 Transport Act, which meant that the scheme had to provide substantial benefits for non-users of the system.

South Yorkshire Supertram was set up to construct, operate and maintain the system. This is a wholly owned subsidiary of the Passenger Transport Executive. Supertram became fully operational in October 1995. It is 29km long with 3 branches and 2 short spurs (Topley and Smith, 1995).

Sheffield Supertram has faced many problems in its construction and in the first few years of running. These problems have been well detailed in existing literature (Hill, 1995; Parkhurst, 1997). However, it is worth recalling some of
these problems here as these led to negative attitudes towards the use of Supertram among the public and potential users of the system.

One of the first problems faced by Supertram was its delay in getting permission and funding. Originally it was hoped that the routes that had been selected would benefit the Student Games held in Sheffield in 1991 (Haywood, 1998). However, as the system only fully operational in 1995, this was not the case. In fact, from an economic point of view, these games were a disaster for Sheffield, which lost a lot of money hosting them (Haywood, 1998).

There were many criticisms of the routes chosen for Supertram. These routes only serve 20% of the population in Sheffield (Parkhurst, 1997). They pass through areas of economic deprivation and there is no alignment with the richer suburbs where car-ownership is high. In addition, the routes did not pass near the main hospital in Sheffield. Many members of the public felt that they had not been consulted adequately about the plans for Supertram.

During construction of the system, people in Sheffield endured many inconveniences. Construction took four years and the fact that the on-street nature of much of Supertram led to road closures and traffic jams did not win it support amongst the public (Hill, 1995).

When the system opened in 1995, it faced stiff competition from the bus services in Sheffield, which were very cheap, very efficient and very reliable. In the first year patronage levels were 66% less than what had been expected (Parkhurst, 1997).

The system had been meant to bring more people into Sheffield’s city centre and to promote economic development. However, during construction many traders lost business and some even shut down. In addition, once Supertram had opened, it provided greater access to Meadowhall, a large shopping complex outside of the city and traders in the city centre reported loss of business (Parkhurst, 1997; Haywood, 1998).
2.3.2 The forecasting studies carried out for Sheffield Supertram

The forecasts for the Supertram were prepared by MVA Consultancy. When it became obvious that there were discrepancies between the original forecasts and the actual patronage figures, South Yorkshire Passenger Transport Executive (SYPTE) commissioned Wootton Jeffreys Consultants (subsequently taken over by WS Atkins) to compare forecasts of the patronage for Supertram with the actual patronage (WS Atkins, 2000). The original forecasts predicted that 22 million passengers a year would use the system in its first year of operation, with 17 million using Line 1 and 5 million using Line 2. It was predicted that the majority of these passengers would be ex-bus users. In addition there would be 4.5 million passengers from new developments and 1 million from the park and ride sites. It was forecast that 800,000 passengers would be ex-car users.

In actual fact, data collected between 1995 and 1996 showed that only 6.3 million passengers a year were using Supertram. In addition, the times of day that people were using the system were different to what had been expected: highest use of the system was in the middle of the day and lowest use was during the peak hours. Therefore, there were very few commuters using the system. There was an unexpectedly large number of non-work type trips on Supertram, with 45% of all trips being shopping trips (WS Atkins, 2000). At the same time, only 20% of the trips made by Supertram were work trips. Modal abstraction was also very different to what had been expected with fewer ex bus users and more car users than predicted using Supertram.

As stated, MVA Consultancy produced the original forecasts. Following from the discrepancies between the forecasts and the reality, MVA were requested to conduct a Passenger Reappraisal in 1996, to examine the effects of unexpected exogenous factors. Wootton Jeffreys Ltd, who are now part of WS Atkins, carried out the monitoring study. This study was set up to examine what the actual impacts of Supertram were and to compare these to the forecasts and to the Passenger Reappraisal. The monitoring study involved the studies shown in Table 2.2.
Using the results from the Passenger Reappraisal and taking into account changes in the exogenous factors, WS Atkins (2000) produced revised forecasts for patronage levels and modal abstraction. They were able to predict the actual aggregate patronage more accurately. Their reviewed forecast predicted that 7 - 8.6 million passengers per year would use the system and, in actual fact, 6.3 million used it per year. This revised forecast was based on re-calculating the patronage, while allowing for the changes to the bus system, the fact that some park and ride sites had not been realised and changes in land use. However, the actual patronage of 6.3 million passengers per annum, measured in Autumn 1996, still lies outside the revised range. It has been suggested that one reason for the continuing discrepancy between the forecasts and the actual figures is that the impacts of Supertram marketing on people’s travel decisions was not well understood (WS Atkins, 2000). These impacts may have been overemphasised in the original model. It is not clear whether this is due to poor publicity or poor understanding of how publicity impacts on people’s travel decisions. Therefore, there is a greater need to understand how publicity may alter affect people’s decision-making process in relation to new modes of transport.

In addition to looking at the aggregate forecasts that were made, it is possible to compare the forecasts for modal abstraction with the actual modal abstraction. The original forecast produced by MVA stated that 14.9 million boardings on Supertram would be abstracted from bus. In fact only 1.2 million boardings on Supertram were abstracted from bus (WS Atkins, 2000). The revised forecasts produced by WS Atkins, which allowed for changes in exogenous factors, predicted that 4.5 million boardings would be abstracted from bus. While the original inaccuracies in the MVA forecasts may be explained by the fact that it had been assumed that the bus service would be complementary to Supertram and was in fact a competitive service, the revised forecasts were based on a fully competitive bus system being in operation. Therefore, it is more difficult to assess why the revised forecasts were still significantly higher than the reality.

The revised forecast of how many people would switch from private car to Supertram was very significantly wrong. The original model had predicted that 0.8 million people would switch from private car to Supertram annually. In the
revised model, it was predicted that 0.4 million people would transfer from car to Supertram annually. In fact, 1.2 million passengers switched from car to tram annually. It has been suggested that some of the discrepancy between the revised forecasts and the reality may have arisen from the fact that some car abstraction trips may have been forecast as trips from new developments or trips from park and ride sites. There is also a suggestion from WS Atkins that the number of forecast Supertram boardings from car may have been much more than expected because of poor understanding of modal choices (WS Atkins, 2000). The impacts of the less quantifiable, "softer" factors involved in modal choice between car and public transport may not be sufficiently accounted for in the generalised cost mode choice model, which was used to produce the forecasts.

<table>
<thead>
<tr>
<th>Survey type</th>
<th>Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Household interview surveys (panel)</td>
<td>Autumn 1993 and Autumn 1995</td>
</tr>
<tr>
<td>Stated preference surveys (household panel)</td>
<td>Autumn 1993 and Autumn 1995</td>
</tr>
<tr>
<td>Qualitative interviews (household panel)</td>
<td>Autumn 1993 and Autumn 1995</td>
</tr>
<tr>
<td>Survey of bus passengers</td>
<td>Autumn 1993 and Autumn 1995</td>
</tr>
<tr>
<td>Survey of Supertram passengers</td>
<td>Autumn 1995</td>
</tr>
<tr>
<td>Changes in bus and rail services</td>
<td>Autumn 1993 and Autumn 1995</td>
</tr>
<tr>
<td>Travel time survey by volunteers</td>
<td>Continuous</td>
</tr>
<tr>
<td>Automatic traffic counts</td>
<td>Continuous</td>
</tr>
<tr>
<td>Roadside interview surveys</td>
<td>Autumn 1991 and Autumn 1995</td>
</tr>
<tr>
<td>Junction surveys</td>
<td>Autumn 1995</td>
</tr>
<tr>
<td>Journey time surveys</td>
<td>Autumn 1993 and Autumn 1995</td>
</tr>
<tr>
<td>Car park cost and inventory surveys</td>
<td>Autumn 1993 and Autumn 1995</td>
</tr>
<tr>
<td>Development data</td>
<td>Continuous</td>
</tr>
</tbody>
</table>

*Table 2.2 Data collected as part of monitoring study (Source: WS Atkins (2000))*
2.3.3 Conclusions on the forecasts for Sheffield Supertram

The forecasting model in Sheffield was a simplified version of the traditional 4-stage model. In this simplified version, the trip generation and distribution stages were omitted. The modelling package, VIPS, was used to assign trips between different origins and destinations, with the cheapest mode and route being selected. There was not a separate modal choice model included in the forecasting model. Instead, modal choice was incorporated into the assignment model.

It is apparent that there were deficiencies in the modelling procedure used in Sheffield. The original forecasts predicted that 22 million people would use Supertram per year, while only 6.3 million users were actually recorded in 1996. Much of the overestimation was due to changes in exogenous factors, which is apparent by the fact that revised forecasts which allowed for changes in land use and changes in bus competition produced better predictions of patronage at an aggregate level. This problem had also been encountered in Manchester and there may be a need for transport modellers to concentrate on providing better predictions of the supply variables in order to provide better predictions of the patronage levels.

However, in Sheffield, as in Manchester, even when allowances were made for changes in supply variable, there were still significant differences in the forecasts of modal abstraction. It has been suggested that part of the reason for the deficiencies in the disaggregated forecasts may be due to the inability of the conventional generalised cost model that was used to allow for users to make irrational choices concerning modes (WS Atkins, 2000). The qualitative interviews and household studies carried out as part of the monitoring study conducted in Sheffield pointed out that people had made modal choices based not only on time and cost of the mode but also on less well-defined variables such as comfort, convenience, style and image (WS Atkins, 2000). People had chosen to use certain modes on the basis of their own attitudes, personal memories and the information, which was not necessarily accurate, that was available to them. It was pointed out that the contribution of these factors to people’s decision to use the system was not well understood.
The monitoring study pointed out that there was also a need to examine the impact of marketing and publicity on people’s decision-making processes (WS Atkins, 2000). It was suggested that part of the overestimation of patronage levels on Supertram may have been due to an overestimation of the impact of publicity on people’s travel choices. It is not clear whether this was due to poor publicity or poor understanding of how publicity impacts on people’s travel behaviour. In addition, the study pointed out that the links between attitudes and behaviour and how they affect each other need more research. It was suggested that alternative approaches to modelling which looked at these issues could improve forecasts of patronage levels.

2.4 Travel behaviour and modal choices

2.4.1 Introduction

Despite extensive before and after studies in both Manchester and Sheffield, there were inaccuracies in the predictions of patronage levels and types on both systems. Partly this was due to changes in the exogenous factors, such as land use and competing bus services. This has been outlined in the sections above. It is apparent that patronage forecasts are very sensitive to exogenous factors. In both Manchester and Sheffield, the revised forecasts, which allowed for changes in external factors, produced better forecasts of the aggregate patronage levels on the systems. This would point to the need for modellers to try to provide better predictions for the exogenous parameters in order to improve the accuracy of aggregate forecasts.

However, not all the problems with the forecasts were due to incorrect representation in the models of the supply conditions as the time of opening. In both Manchester and Sheffield it was found that the revised forecasts disaggregated by patronage source and time of day for trips were still significantly different from the reality. In assessing the impacts of new urban public transport systems, neither study examined the motivations behind people’s choices to use or not to use the system and it was found that attitudes to the Sheffield system in particular were much poorer than had been expected. It was pointed out in the monitoring study of the Supertram that a better understanding
is required of people’s perceptions and attitudes to modes and that a better knowledge of the behavioural processes of people’s modal choices is required if better predictions are to be produced. The qualitative interviews in Sheffield showed that people had made modal choices on the basis of the easily and conventionally measured factors such as time and cost, but only in terms of “softer”, less easily-defined and measured variables, such as attitudes, personal memories, perceived constraints, comfort, style, image and convenience (WS Atkins, 2000).

It is also hypothesised in this thesis that a better understanding of people’s reasons for using new public transport systems could allow better predictions of trips types, modal shifts and patronage levels on the systems. Therefore, the studies of potential users of the Dublin and Croydon systems will focus on looking at people’s decision-making processes with regards to the systems. The objective of this thesis is to examine the potential impacts of new urban public transport systems and to find out how decisions are made with regard to new public transport systems. In both Manchester and Sheffield there had been some evidence that people’s attitudes to the system and their perceptions of comfort, convenience and other “softer” attributes of a mode had a role to play in people’s decision-making processes. Both studies had pointed out that there had been broad assumptions made about the behavioural responses to the new modes (Oscar Faber 1996b; WS Atkins, 2000). Therefore, it was decided to try to examine the behavioural responses of potential users to new public transport systems by using ideas from psychology. Other researchers (Polak, 1998; Garling, 1998a; Stradling et al, 1999) have also identified that ideas from psychology can play an important role in assessing why people make certain travel decisions and there are several examples of other studies in the areas of travel behaviour and modal choice looking towards psychology and the “softer” sciences (Stradling et al, 1999).

In this section, there will be a short review of the use of some psychological methods in travel behaviour research and of how these have been used in the past. There will also be an introduction to the method that has been chosen for this study and a description of why this method was selected.
2.4.2 Using psychology and social science methods to study travel behaviour

The application of psychological methods to travel behaviour research has been quite widespread in the past (Dix, 1981). Some researchers recognise that attitudinal measures can provide transport planners and operators with a greater in-sight into people’s reactions to new modes (Michaels and Allaman, 1981). Timmermans (1991) argues that choice behaviour should be examined by looking at people’s attitudes and preferences: it is insufficient to consider behaviour as the result of a utility maximising decision-making process. Timmermans (1991) states that there is no attempt to examine the psychological agents that determine the decision-making process and people’s travel choices.

Garling (1998) also states that the utility maximisation approach to modelling travel choice is not always correct. In particular, it fails to account for changes in preferences over time, does not specify what utility is and does not describe how it is maximised (Garling, 1998). Garling et al (1996) state that a psychologically meaningful definition of utility is required. They suggest that goal utility and process utility need to be distinguished. Goal utility is the utility acquired from attaining a goal through participation in an activity whereas process utility is the utility acquired from participating in an activity per se. Goal utility, according to Garling et al (1996) is consistent with the current definition of utility in decision theory. Experiments by Garling et al (1996) show that both goal utility and process utility have a role to play in travel choices and therefore, a clearer definition of the distinction between these utilities is required.

Other researchers have made suggestions of alternative methods for looking at travel behaviour which examine the impacts of both “soft” and “hard” variables on people’s travel choices. Brog (1982a) advocates the use of the “situational approach”, a policy-oriented decision-making model, in travel choice modelling, rather than a utility maximisation approach. This approach recognises that decisions are sometimes irrational and cannot be explained by utility maximisation (James et al, 1999). Brog and Erl (2001) argue that travel decisions are very complex and involve objective and subjective variables, which must be taken into account. Every individual perceives the world in a subjective fashion and has an incomplete or distorted view of the world (James et al, 2001).
Brog (1982b) developed the situational approach in order to look at individuals’ decisions and choices. Each person has a specific amount of freedom granted by the environment within which they can carry out actions. This personal freedom is influenced by the transport infrastructure and modes that they can access, the constraints and options of the individual and his or her social values and norms (James et al, 2001). Brog (1982b) states that people experience these objective situations in different ways which means that they have different subjective situations. The subjective situations differ from the objective situations due to an individual’s perceptions and they will differ by varying amounts for individuals. People make their decisions to carry out an action in the subjective situations.

Brog (1982a) states that it is necessary to re-create the chain linking objective circumstances, personal perceptions, subjective situation and individual decision-behaviour to understand travel behaviour. Different policies and changes in external factors will have different impacts on different parts of the chain and hence will bring about changes in travel behaviour. The situational approach also recognises that not all decisions are made rationally and that there may be a subjective logic to people’s travel decisions, which a planner or traffic engineer might not understand (James et al, 1999). James et al (1999) state that travel decisions are influenced strongly by individual perceptions of mobility, by attitude and by people’s values and that these factors must be studied if travel behaviour is to be understood.

Therefore, there has been recognition amongst travel researchers for many years that there is a need to examine the decision-making processes of trip makers. It is recognised that attitude can play a role in determining modal choice and travel behaviour (Brog, 1982a). However, predictions of behaviour from attitude are not always accurate and some researchers suggest that a better method of examining decisions is to look at the link between intentions and behaviour (Garling, 1998). There may also be other factors involved in decision-making which are overlooked by conventional attitude-behaviour models. Garling (1998) suggests areas where psychological insights and methods can improve the forecasting power of travel choice models and help in identifying these factors. All travel choices involve the acquisition of information and how this
information is collected, used and represented is rarely considered in travel-choice modelling (Garling, 1998). In addition, the role of uncertainty and risk in people’s decisions is overlooked (Garling et al, 1997b). Psychological methods could also provide in-sight into the role of selfish and social motives in decision-making (Garling, 1998). According to Garling (1998), people consider individual consequences of their choices, collective consequences and the individual outcomes of collective consequences. Depending on whether the individual has a pro-social or a pro-self orientation, different consequences will play more or less important roles in the travel choice.

While advocating the use of psychological theories, some researchers recognise that in the past there has been very low correspondence between attitude and behaviour (Garling and Fujii, 1999b). In order to improve the predictive validity of psychological theories in travel choice modelling, it is suggested that methods that look at the relationship between intention and behaviour are used (Garling et al, 1997a; Garling et al, 1997b; Garling et al, 1998b; Gillholm and Fujii, 1999). This includes models such as Ajzen’s Theory of Planned Behaviour.

Gillholm and Fujii (1999) state that behaviour is closely linked to intention and it is pointed out by several researchers that intention predicts behaviour better than attitude (Garling et al, 1998b).

Garling (1998) states that the area where attitude theories and psychological theories can play the greatest role in understanding travel choice is in examining the planning process that is necessary for any trip. According to Hayes-Roth and Hayes-Roth (1979):

"Planning is the predetermination of a course of actions aimed at achieving some goal."

All trips and all travel choices involve a plan, and planning is an important component of formation of intention according to Gillholm et al (1999). Planning to perform a behaviour will improve memory for the goal intention, will increase commitment to the behaviour and will encourage people to consider the spatio-temporal constraints on the behaviour (Garling and Fujii, 1999). This will lead to better prediction of people’s behaviour from their intentions.'
This section has outlined that some psychological methods that have been used in the past by travel behaviour researchers. There is recognition that these methods can provide greater in-sight into the motivations behind people's modal choices.

2.4.3 An introduction to some psychological methods

From the discussion above, it is apparent that transportation researchers recognise that understanding of travel behaviour can be helped by attempting to examine the motivations behind people's choices. Several researchers have attempted to look at the decision-making processes behind people's modal choices (Garling, 1998; Brog, 1982; James et al, 1999). It is also recognised that a better understanding of decision-making processes could help in the forecasting of modal choices of new urban public transport systems (WS Atkins, 2000). In both Manchester and Sheffield, there were inaccuracies in the patronage forecasts.

There are several theories from psychology that could be used to look at the behaviour and responses of potential users of new systems. In this section, only a few of those theories will be described and the reasons for choosing one of them will be given. The methods which will be described here are the Theory of Planned Behaviour, Triandis' Behaviour Theory and the Problem Behaviour Theory.

The Theory of Planned Behaviour states that all behaviour is determined by the intention to carry it out. According to Ajzen and Fishbein (1980) behaviour is goal directed. If people wish to carry out an action, they will carry it out. Therefore, the basic tenet of the Theory of Planned Behaviour is that intention is the immediate determinant of behaviour and, therefore, may be used to predict behaviour (Ajzen, 1985).

In the theory, intention is determined by 3 factors, called attitudes, subjective norms and perceived behavioural control (Ajzen and Fishbein, 1980). Ajzen and Fishbein (1980) describe attitude as:
Attitudes to an action are functions of behavioural beliefs, and of outcome evaluations. The person has certain beliefs about what will be the outcomes of using a mode. These are his or her behavioural beliefs. The person’s attitude to using the mode is determined by what these beliefs are and how importantly he or she rates the outcomes. Travel researchers in the past have identified that attitudes can play a role in determining travel behaviour, although the link between behaviour and attitude has been somewhat tenuous. In the Theory of Planned Behaviour, however, attitude determines the intention to carry out a behaviour, rather than the actual behaviour and it is only one of three factors involved in determining intention.

The second component of the decision-making process, according to the Theory of Planned Behaviour, deals with the influence of the social environment on intentions. It is called the subjective norm and it refers to the person’s beliefs that most people whom are important to him or her think he or she should or should not perform the behaviour in question. These beliefs are his or her normative beliefs. The person’s subjective norm will then depend on whether he or she wants to do what these people think is right. This factor is a very important part of the theory and is one that may not have been explicitly defined by more conventional methods of looking at travel behaviour. In Sheffield, it was noted that the effect of the SYPTE’s publicity on people’s decisions to use Supertram had been less than expected when it originally opened up (WS Atkins, 2000). Therefore, the use of the Theory of Planned Behaviour may highlight whether or not council publicity actually has an impact on people’s decisions and modal choices.

Perceived behavioural control is the amount of control someone feels that they have over carrying out an action. It is the perceived ease with which a person believes that they can perform the behaviour in question. It is determined control beliefs (Ajzen, 1988). These are the beliefs that certain obstacles and facilitators will hinder or help a person to use a mode. If a person thinks that he or she is likely to encounter these obstacles or facilitators this will affect his or her
intentions to carry out an action. In traditional travel choice models, these could correspond to travel constraints. However, the impact of travel constraints on people's travel decisions is very complex. Therefore, the use of the Theory of Planned Behaviour may offer a framework in which it is possible to define more explicitly the impacts of control factors on people's decisions.

The Triandis model of attitude-behaviour relations is a psychological theory that can be used to predict travel behaviour. It was originally developed by Triandis in 1980. It states that the probability of carrying out an action is a function of habit, the intention to carry out the action and facilitating conditions. Intention to carry out an action is stated to be a function of social factors, affect and the perceived consequences of the behaviour. The theory is based on 2 equations:

\[ P_a = (w_H H + w_I I)PF \]  \hspace{1cm} \textit{Equation 2.1}

Where:

\[ P_A \] = Probability of an action being carried out

\[ W_H \] and \[ W_I \] = Weights

\[ H \] = Habit

\[ I \] = Intention. This is the instructions that the individual gives themselves

\[ P \] = Physical arousal. Magnifies of the probability of a response

\[ F \] = Facilitation condition. This is a measure of the constraints imposed by the external environment.

\[ I = w_S S + w_A A + w_C C \]  \hspace{1cm} \textit{Equation 2.2}

\[ W_S, W_C \] and \[ W_A \] = Weights

\[ S \] = Social factors. This is a measure of how a person's normative beliefs, their role beliefs and their personal norm play a role in their intention.

\[ A \] = Affect. This is the emotional response to the behaviour.
C = Consequences of carrying out the behaviour and how highly valued those consequences are.

In comparison to the Theory of Planned Behaviour, Triandis’ theory allows for the effect of an individual’s personal norms on his or her actions to be accounted for. The Theory of Planned Behaviour has been criticised in the past for not taking this into account (Eagly and Chaiken, 1993). However, few studies have used the Triandis method in its entirety to make predictions about behaviour due to its complexity (Forward, 1994). It is not as clearly defined as the Theory of Planned Behaviour and the standard measurements for its components are very weak.

Another theory that can be used to predict and change behaviour is the Problem Behaviour Theory. Originally developed by Jessor and Jessor (1977), it is a very complex theory that comprises 50 variables. It is based on 3 systems. These are the personality system, the perceived environment system and the behaviour system. The personality system looks at the effect of people’s attitudes, beliefs and values on behaviour. The perceived environment system examines how the opinions of peers and family can affect a decision and the behaviour system looks at the interaction between conventional and problem behaviours. Each of these systems is composed of several variables. All of the work using the Problem Behaviour Theory has focused on problem behaviour and youth. It would require significant modification to be applied to a wider range of behaviours and age groups. The theory could be used to look at modal choice, if one were to view car use as “problem behaviour”. However, due to the large amount of variables involved in using the Problem Behaviour Theory it can be difficult to use.

The Theory of Planned Behaviour, Triandis’ Theory and the Problem Behaviour theory are all based on an expectancy-value model of decision-making. They focus on the collection and processing of information and it is assumed that behaviours will be carried out if the outcomes are positive. An alternative method of looking at the decision-making process involved in travel choices is the heuristic method. This method assumes that people are “cognitive misers”. That is, their capacity is limited and they use information they already have to
make decisions (Forward, 1994). Garling (1998) argues that the decision-making processes involved in many travel choices are heuristic. People's choices are based on the data they have, which may not be complete. They make decisions based on only a few salient beliefs. There are 3 types of judgemental error that this can lead to:

1. **Availability heuristic:**

   Judgements are based on what people know of recent past events. Future events are correlated with past events. People make too much use of information that is easy to acquire.

2. **Representation heuristic:**

   Judgements are based on what is typical of past events.

3. **Anchoring heuristic:**

   This means that an individual will tend to hold onto an initial hypothesis and will interpret evidence and information in such a way as to support that hypothesis.

The Theory of Planned Behaviour, Triandis Theory and the Problem Behaviour Theory are not based on a heuristic approach to decision making. Therefore, they cannot provide insight into choice heuristics.

In this section, some theories that can be used to look at and predict behaviour have been described. This is not a comprehensive review of psychological method in transportation research but it introduces some of the theories that could be used, such as the Theory of Planned Behaviour, Triandis' Theory, Problem Behaviour Theory and the heuristic approach to decision-making.

In this study, the Theory of Planned Behaviour has been selected to examine the modal choices of potential users of two new light rail systems. Evidence from Manchester and Sheffield pointed to the fact that some of the discrepancies in the forecasts of patronage on these systems could not be explained by changes in the supply conditions. In both forecasting studies, it was admitted that the
behavioural response to the modes was not well understood and had been simplified (Oscar Faber, 1999b; WS Atkins, 2000). WS Atkins (2000) suggest that the impacts of the less quantifiable, "softer" factors involved in modal choice between car and public transport may not be sufficiently accounted for in the generalised cost mode choice model, which was used to produce the forecasts in Sheffield. For this reason, the exploration of the motivational factors involved in decision-making and modal choices would seem warranted.

There is strong empirical evidence that shows that attitudes, subjective norms and perceived behavioural control can be used to predict intention and some of these studies will be described in the next chapter (Forward, 1994). Some of the studies that have used the theory to examine behaviour, including travel behaviour, show very strong relationships between people's beliefs, attitudes, subjective norms and perceived behavioural control and their actions. The theory can also offer the opportunity to examine how constraints and social norms can play a role in decision-making. In particular, the use of the Theory of Planned Behaviour in designing the interviews in Croydon allowed the role played by social norms in people's modal choices to be highlighted. This will be discussed in more detail in Chapter 7. Therefore, using this theory will achieve the major objective of this thesis. That is, the theory will describe how decisions are made and will address the important question of what motivates people to use new, urban public transport systems. However, other theories also offer valid approaches to travel behaviour research and can provide in-sights where the Theory of Planned Behaviour cannot.

The Theory of Planned Behaviour is a very simple theory and has been criticised in the past for not examining the effect of personal norm on people's behaviour (Eagly and Chaiken, 1993). Triandis' theory, however, does examine the impact of personal norm and also of habit on travel behaviour. However, Triandis' theory is very complex and the measurements that should be used for the various components of this theory are not clear.

There are other disadvantages, however, to using the Theory of Planned Behaviour in travel behaviour research. The theory explains choices and decisions in terms of subjective variables. The corresponding objective units,
such as the level of attributes (such as costs and travel times) measured in physical units, are not analysed.

In addition, beliefs are a very important part of this model. They are the determinants of attitudes, subjective norms and perceived behavioural control. However, the motivations behind these beliefs or the selection of salient beliefs have not been examined (Held, 1981).

In the past, the Theory of Planned Behaviour has largely been used to look at behaviour such as voting behaviour. This behaviour is simpler to model than travel behaviour. It is usually carried out only every 4-5 years and often involves only a binary choice, in particular in American Presidential elections where is has been used extensively to predict voting behaviour. Travel choices, on the other hand, are more complex and can become habitual. However, the Theory of Planned Behaviour has been used to model more complex behaviour than voting behaviour where choices are more extensive and it is possible to add components to the theory in order to improve its accuracy. As will be seen in the next chapter, Forward (1998b) added habit to attitude, subjective norm and perceived behavioural control, as a determinant of intention.

It is recognised by many researchers that the Theory of Planned Behaviour is one of the most influential theories in attitude and behavioural research (Gillholm et al, 1999). It identifies the close relationship between intention and behaviour (Garling et al, 1998b). It is also a simple theory, which can easily be applied to a wide range of behaviours (Forward, 1994) and while it cannot provide in-sights into every area of the decision-making process, it allows the researcher to examine the impacts of attitudes, social norms and constraints on travel choices. In particular, it is intended to show in this study that the Theory of Planned Behaviour can help to examine the modal choices involved in deciding to use a new mode of public transport. It will allow the link between attitude and intention and attitude and behaviour to be explored. It will allow the impact of social norms and the publicity of councils and promoting bodies on travel behaviour to be examined. This is particularly of interest due to the unexpectedly poor impact of publicity on mode choices in Sheffield (WS Atkins, 2000). It is
also hoped that it will allow an explicit examination of constraints affect modal choices to be carried out.

2.5 Summary

In this thesis, the main objective is to look at why people choose to use or not to use new public transport systems. In this chapter, some of the traffic problems that are widespread in cities today were described and it became evident that new public transport systems is very important if private car use is to be reduced. However, it was pointed out that while governments in the UK and in other European countries are in favour of providing new public transport systems, there have been problems encountered by these systems in the past. It is difficult to ascertain how many people will use these systems, when they will use them and what types of trips they will make on the systems. Even when they are successful, as was the case with the Manchester Metrolink, there have still been errors in the predictions of how people will use them.

Therefore, it is clear from the literature that there is a need for an examination of people's modal choices in relation to new public transport systems. In order to do this, studies were conducted of the intentions of potential users of two planned light rail systems. The potential impacts of these systems were examined in these studies and it was hoped to address the important question of the motivational basis.

The Theory of Planned Behaviour was selected as an appropriate method to examine travel behaviour and modal choice and to achieve the objectives originally set out for this thesis. It is hoped that the use of this theory will help to improve understanding of the motivations behind modal choices. However, it is recognised that there are problems involved with using theory. In particular, it is a simple theory that may overlook some variables involved in decision-making and modal choices that other theories, such as Triandis' Theory, would take into account.

In the next chapter, the Theory of Planned Behaviour is explained in detail and some studies that have used this theory to examine and predict behaviour are described in order to reinforce that it is an appropriate methodology to use to
examine travel behaviour and modal choice. Chapter 4 will show how the theory was used in this thesis to understand the modal choices of car drivers. This part of the work carried out for the thesis had two objectives: firstly, to test the application of the Theory of Planned Behaviour to travel behaviour analysis and secondly, to examine the opinions that car drivers had of existing public transport systems and what they wanted from new urban public transport systems. In Chapters 6 and 7, the application of the theory to the studies in Dublin and Croydon will be described and the insight it gives into people’s motivations for their travel behaviour and modal choices will be explained.
Chapter 3

The Theory of Planned Behaviour:
3.1 Introduction:

Forecasting travel behaviour decisions is very complex. One aspect is modal choice. People, when choosing what mode to use on a trip, take into account many factors. They think about how using this mode will benefit them. They assess how easy or difficult their trip will become if they use a mode. Some people may feel pressure to use certain modes over others. For example, they may feel that society will think better of them if they use modes that are perceived as being more environmentally friendly, like cycling or walking. Others may feel pressurised by peer groups to travel by modes that offer greater status, such as the car.

Therefore, when a person makes the decision to use public transport, he or she is basing that decision on factors such as whether public transport is easy to use, whether the advantages outweigh the disadvantages and whether they perceive public transport as being socially acceptable or socially desirable. Providing good quality public transport will obviously influence some of the variables that are involved in choosing a mode. However, this will not bring about changes in everyone’s travel patterns. It is essential to examine all the factors relating to modal choice.

To identify the factors involved in the modal decisions under scrutiny in this thesis, the Theory of Reasoned Action and the Theory of Planned Behaviour have been borrowed from social psychology (Ajzen and Fishbein, 1980; Ajzen, 1985). The Theory of Planned Behaviour has been briefly described in Chapter 2 and definitions of the components of the theory have been given. This chapter, however, will describe in more detail how the theory came about and how it is used.

The Theory of Planned Behaviour looks at how people come to a decision. Both the Theory of Reasoned Action and the Theory of Planned Behaviour have been used in the past to look at behaviours as diverse and as complex as family planning decisions, weight loss and alcoholism (Ajzen and Fishbein, 1980) and also at people’s willingness to walk or cycle (Forward, 1998a, 1998b).
Both theories state that whether someone carries out an action is dependent on whether or not they have formed the intention to carry out this action (Ajzen and Fishbein, 1980). Therefore, in order to know if a person is going to use the bus for a trip, for example, it is necessary to know whether he or she intends to use the bus. In the words of Ajzen and Fishbein (1980) intention to perform an action is the determinant of that action. According to the Theory of Reasoned Action and the Theory of Planned Behaviour it is, therefore, important to understand how a person forms the intention to carry out an action. According to the Theory of Reasoned Action, a person forms an intention or decides to carry out an action based on personal factors and social factors.

When deciding to use a mode a person weighs up the advantages and disadvantages that are associated with using it. This will determine how he or she feels about using it or what his or her attitude to using it is. For example, when a person decides to use his or her car for a trip, this is after he or she has looked at all the advantages and disadvantages associated with car use. Therefore, he or she may have considered the cost of using the car, the convenience of car use, and the environmental damage caused by the car and the comfort of car use. He or she decides to use the car if he or she feels that the benefits of car use outweigh the disbenefits.

In addition, social pressures play a part in determining a person’s intention to carry out an action (Ajzen and Fishbein, 1980; Ajzen, 1985). The Theory of Reasoned Action calls this the subjective norm and it is what people believe those around them want them to do.

The Theory of Reasoned Action assumes that behaviour is under a person’s complete control. Ajzen (1985) terms this volitional behaviour. However, there are many cases where behaviour is not completely under the control of a person. In order to allow for this, the Theory of Planned Behaviour was developed (Ajzen, 1985; Ajzen, 1988; Ajzen, 1989). Again, people’s intentions to carry out actions are based on personal and societal factors. In addition, control factors are considered to affect people’s intentions (Ajzen, 1989). People may want to use a mode but if they
feel that it is beyond their control to do so they will not use it. The amount of control
people feel they have over an action is, according to the Theory of Planned
Behaviour, their perceived behavioural control.

In the following sections, the components of each theory will be described. There
will also be a description of some areas where the Theory of Planned Behaviour has
been applied, including in the study of travel behaviour.

3.2 The evolution of the Theory of Planned Behaviour

3.2.1 Introduction

This section will describe the components of the Theory of Reasoned Action, which
is the precursor to the Theory of Planned Behaviour. Figure 3.1 illustrates the
various components of the Theory of Reasoned Action.
Beliefs that behaviour will have certain outcomes and the evaluation of these outcomes

Attitude to the Behaviour

Beliefs that society wants him or her to carry out the behaviour and his or her motivation to comply

Subjective Norm

Intention

Behaviour
3.2.2 *Attitude*

Each action is associated with a number of outcomes. An attitude towards an action is determined by how likely an outcome is believed to be if the action is performed and how positively or negatively that outcome is viewed. Thus, attitude is determined by beliefs called behavioural beliefs. This is best illustrated with an example. A person may believe that using the car saves him or her time on the commute to work. This is his or her behavioural belief. He or she then evaluates the outcome that he or she will save time by using the car. If he or she sees the time saving as very positive this belief will lead to a positive attitude to car use.

Obviously, a person’s attitude to car use will not be determined by this single belief. He or she will have many beliefs regarding car use and he or she will evaluate all of these beliefs. His or her attitude will only be positive if the majority of his or her beliefs are positive.

It is possible to measure the factors that have led to this attitude. A person is asked to express agreement with a belief. For example:

*I believe that using the car saves me time when I commute to work.*

3 2 1 0 -1 -2 -3

3 = Agree strongly, -3 = Disagree strongly

Then he or she is asked to evaluate this outcome:

*Saving time when I commute to work is:*

3 2 1 0 -1 -2 -3

3 = Extremely good, -3 = Extremely bad

According to the Theory of Reasoned Action, belief strengths and outcome evaluations determine attitude. Thus, multiplying the outcome evaluation score by
the belief strength score will give an indication of attitude. If a person says that they agree strongly with the belief above (3) and they rate this as very good (2) then the product of this (6) indicates that this will lead to a positive attitude.

Using a bipolar scale means that disagreement that a negative outcome will result from an action will contribute positively to the attitude. For example, a person who says that damaging the environment is extremely bad (-3) but disagrees that using the car damages the environment (-3) will have a positive attitude to the car. The product of the belief strength and the outcome evaluation scores is 9, which is positive.

This concept can be quite difficult to understand and is not entirely intuitive. For example, if a person believes that a car damages the environment (3) but does not believe that this is a serious outcome and gives this a score of 1, the attitude score will be 3. Therefore, this is a positive attitude to using the car. At first, this may seem wrong: if a person feels that the car damages the environment, then it would be expected that they would have a negative attitude to car use. However, the Theory of Reasoned Action would argue that people might recognise that car use damages the environment but if this is not a serious concern to them it will not cause them to have a negative attitude to car use nor will it affect the amount that they use the car. Other studies would seem to support this: as was mentioned in Chapter 2, more conventional attitudinal studies show that even when people are made aware of the damage done by the car to the environment or of the health benefits of walking or cycling, they still continue to drive.

As a person is likely to have much more than one belief about an action, the above process can be repeated for each belief and outcome evaluation pair. It is then possible to sum the products. If the sum is positive then the attitude should be positive, if it is negative the attitude is negative. The more positive the sum is, the more favourable the attitude is.

In studies involving the Theory of Reasoned Action or the Theory of Planned Behaviour, it is usual to include a direct measure of attitude in addition to the above
method (Ajzen, 1988). Usually, the respondent is asked to rate how desirable they believe the behaviour to be. The strength of the relationship between the direct measure and the belief-based measure of a person’s attitude is calculated using the correlation coefficient. Correlation coefficients take values between -1 and 1 and describe the strength and direction of the relationship between two variables. The greater the magnitude of the correlation coefficient the stronger the relationship. A correlation coefficient above 0.3 or below -0.7 is considered to be signify a moderate relationship and a coefficient above 0.5 or below -0.5 is considered to be very strong (Ajzen and Fishbein, 1980). It is also usual to report the statistical significance of the correlation. If the correlation is significant at the 95% level, this means that the likelihood of this correlation occurring by chance alone is less than 5 in a hundred. If it is significant at the 99% level, the likelihood of the correlation occurring by chance alone is less than 1 in a hundred. Most studies using the Theory of Reasoned Action or the Theory of Planned Behaviour show very good, positive correlations that are statistically significant between the direct measure and the belief-based measure of attitude (Ajzen and Fishbein, 1980).

The behavioural beliefs that a person holds are the result of many factors: previous experience, direct observation and information from external sources are some examples.

3.2.3 Subjective norm

Subjective norms reflect a person’s perceptions of social pressures. They are determined by beliefs called normative beliefs. Normative beliefs are the beliefs that certain individuals or groups approve or disapprove of the action. The subjective norm is determined by how much it is believed an individual or a group wishes the action to be performed and by how much the person wishes to comply with this individual’s or group’s wishes. These individuals and groups are called “referents” and there may be more than one referent for an action.

As with attitude, it is possible to measure the factors that have led to subjective norm. A person is asked to express agreement with a normative belief. For example:
My children think that I should cycle to work

3 = Agree strongly, -3 = Disagree strongly

Then they are asked how motivated they feel to comply with this referent.

Do you want to do what your children want you to do?

3 = Strongly, -3 = I want to do the opposite

According to the Theory of Reasoned Action, subjective norm is determined by the normative beliefs and people’s motivation to comply with referents. Thus, by multiplying the belief strength by the motivation to comply score this should give an indication of subjective norm. If a person says that they agree strongly with the belief above (3) and they wish to do what their children believe that they should do strongly (3) then the product of this (9) indicates that this will lead to a positive subjective norm. Again a bi-polar scale is used.

As a person is likely to have much more than one referent, this process can be repeated for each belief and motivation to comply. It is then possible to sum the products. If the sum is positive then the subjective norm should be positive, if it is negative then the subjective norm is negative.

As with attitude, it is usual to try to measure subjective norm directly in any study involving the Theory of Reasoned Action or the Theory of Planned Behaviour in order to ensure that the belief-based method of measuring a person’s subjective norm is valid. This is usually done by asking the person what it is that most people would approve of them doing (Ajzen, 1988). Studies usually show very high, statistically significant correlations between the two measures. Some examples of this will be given below.
Hence, subjective norm is a measure of how people perceive what those who are important to them think they should do. If they believe that many people whose opinions are important to them wish them to carry out the action, they will do so. On the other hand, if they believe that those people close to them disapprove of them performing the action they will not carry it out (Ajzen, 1989).

### 3.2.4 Weighting

Both subjective norm and attitude determine intention. However, the relative strength of these factors will differ in various cases as will become apparent in Chapter 7 (Ajzen and Fishbein, 1980). For some types of behaviour, attitude towards the behaviour will be more important than subjective norm or vice versa.

For example, when choosing to use the bus for a trip the attitudes a person holds about bus travel may have a greater influence than what he or she believes his or her friends think he or she should do. On the other hand, when deciding what type of car to buy, the opinions of other people, such as a spouse or peer group, may have quite a strong influence.

In addition, the relative strength of attitude or subjective norms will vary depending on a person’s individual characteristics. These may be demographic characteristics or personality traits. For instance, a young man may place more importance on the opinions of his friends than an elderly woman when deciding what car to buy. A very confident, self-sufficient personality may make decisions, which depend very little on what those around him or her think.

The Theory of Reasoned Action allows for the differing relative importance of attitude and subjective norm in different situations (Ajzen, 1989).

### 3.2.5 Factors not in the Theory of Reasoned Action

The Theory of Reasoned Action does not allow for any direct effect by demographic variables or personality traits on behaviour and intention. According to the Theory of Reasoned Action, they can only have an indirect effect (Ajzen and Fishbein,
They will affect the types of behavioural beliefs that are held, the strength with which these are held, the normative beliefs that are held and the desire to comply with various referents.

For example, a piece of research might show that women are less likely to walk at night than men are. The Theory of Reasoned Action would argue that this was because women differ from men in terms of their behavioural beliefs about walking at night, or the strength with which these beliefs are held. For example, women may believe more strongly than men may that walking after dark is dangerous.

### 3.2.6 Control

The Theory of Reasoned Action assumes that all behaviour is under a person’s complete control (Ajzen and Fishbein, 1980). It has been used with some success in predicting and explaining behaviours where people have complete control. However, there are many instances where behaviour is not completely under a person’s own control but is dependent on external factors. One such example is that of travel behaviour. Many factors outside a person’s control will affect the travel decisions that they make.

The amount of control that is held may be affected by both internal and external factors (Ajzen, 1985). Internal factors include the types of skills a person has. Will power may also play a role: a person may intend to use his or her car less often but if he or she is unable to resist the temptation of using the car then this intention will not be fulfilled.

External factors include the amount of time that is available to complete an action. For example, a person may intend to use the train to travel to work but if the train timetable does not allow for this, then he or she will not be able to do so. The person still wants to use the train but they cannot do so.

Hence, there are limitations to the Theory of Reasoned Action. It does not allow for the fact that a person may be prevented from performing a behaviour due to circumstances that are outside his or her control (Eagly and Chaiken, 1993). In order
to circumvent the problem the Theory of Reasoned Action was altered in order to create the Theory of Planned Behaviour (Ajzen, 1985).

3.3 The components of the Theory of Planned Behaviour

3.3.1 Introduction

Figure 3.2 shows the components of the Theory of Planned Behaviour. As with the Theory of Reasoned Action, intention to attempt an action is the direct determinant of attempting it. Intention is, therefore, the central feature of the Theory of Planned Behaviour (Ajzen, 1988). However, three factors, rather than two factors determine intention. In addition, one of these factors may directly influence behaviour.

The first two determinants are attitude and subjective norm, as in the Theory of Reasoned Action. The additional factor is perceived behavioural control. The determinants of perceived behavioural control are control beliefs. Perceived behavioural control reflects how easy a person feels it is to carry out an action. The dotted line in Figure 3.2 shows that this factor may also have a direct effect on behaviour in some circumstances. The first study to use the Theory of Planned Behaviour found that the predictive power of the Theory of Reasoned Action was greatly improved by the inclusion of perceived behavioural control (Ajzen and Madden, 1986).
Beliefs that behaviour will have certain outcomes and the evaluation of these outcomes

Beliefs that society wants him or her to carry out the behaviour and his or her motivation to comply

Beliefs that resources or obstacles are present that will help or hinder performance

Attitude to the Behaviour

Subjective Norm

Intention

Behaviour

Perceived Behavioural Control

---

Fig 3.2: The Theory of Planned Behaviour
3.3.2 Perceived behavioural control

Perceived behavioural control is a person's perception of how easy or hard it is for him or her to carry out an action (Ajzen, 1988). If a person believes that he or she is in possession of all the skills and information that are necessary in order to perform an action successfully then he or she is more likely to intend to carry out that action.

The direct antecedents of perceived behavioural control are control beliefs. A person believes that certain facilitators will aid him or her to perform a behaviour and that certain obstacles will hinder him or her from performing a behaviour. If he or she perceives these facilitators or obstacles to be present, this will affect his or her intentions.

To measure the factors that have led to perceived behavioural control a person is asked to express agreement with a control belief. For example:

<table>
<thead>
<tr>
<th>When I have a lot to carry walking is</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 2 1 0 -1 -2 -3</td>
</tr>
<tr>
<td>3 = Very easy, -3 = Very difficult</td>
</tr>
</tbody>
</table>

Then they are asked how likely they are to encounter the particular obstacle. This is called the perceived facilitation or inhibition effect.

<table>
<thead>
<tr>
<th>I have a lot to carry</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 2 1 0 -1 -2 -3</td>
</tr>
<tr>
<td>3 = Always, -3 = Never</td>
</tr>
</tbody>
</table>

By multiplying the belief strength by the perceived facilitation or inhibition effect this should give an indication of perceived behavioural control. To illustrate, if a person says that they find it very difficult to walk when carrying a lot of goods (-3) and that they very frequently have to carry many goods (3), then the product of this
(-9) indicates that this will lead to a negative perceived behavioural control. As with attitude and subjective norm, a bi-polar scale is used.

A person will have more than one control belief and so the process must be repeated for each belief. The products are summed and if the sum is positive then the perceived behavioural control is positive.

A direct measure of perceived behavioural control is usually made in any study using the Theory of Planned Behaviour in order to ensure that the validity of the belief-based method of measuring this factor may be confirmed (Ajzen, 1988). Many studies have shown correlations greater than 0.6, which shows strong correlation between the direct and indirect measures (Ajzen, 1988). Some of these studies will be mentioned below.

There are many sources of control beliefs: past experience of a behaviour such as information from other people or observations of others' attempts to carry out an action.

Perceived behavioural control may affect behaviour indirectly and directly, as illustrated in Figure 3.2. To succeed in performing an action there must be adequate control over the behaviour (Ajzen, 1988). That is, the performance of an action is dependent on the actual control that a person has over performing it. Perceived behavioural control is not the same as the actual control a person has: it is a person’s perception of how easy an action is to carry out. However, in some circumstances perceived behavioural control is an accurate reflection of actual behavioural control (Ajzen, 1985). If this is true, then perceived behavioural control could be used to measure actual behavioural performance (Ajzen, 1989).

Perceived behavioural control is not always a realistic estimate of actual behavioural control. If there is a deficit of information available to a person or if they have been given false information or if he or she has misconceptions of his or her skills, then it will not be the same as actual control. In these circumstances, it will not have a
direct effect on behaviour (Ajzen, 1985). It will continue, however, to affect the intention to attempt the behaviour.

3.4 Applications of the Theory of Planned Behaviour

3.4.1 Introduction:

The Theory of Planned Behaviour is used to:

1. Make predictions about behaviour
2. Explain why certain behaviours occur
3. Affect changes in behaviour

(Ajzen and Fishbein, 1980; Ajzen, 1985)

When a person makes the decision to use public transport, he or she is basing that decision on whether public transport is easy to use, on whether the advantages outweigh the disadvantages and on whether public transport use is perceived as being socially acceptable. Hence, it is apparent that choosing what mode to use on a trip is not a simple decision and is dependent on many variables. In this thesis, it is intended to show that the Theory of Planned Behaviour may be used to describe travel decisions and to explain the complex reasoning behind those travel decisions.

If the Theory of Planned Behaviour can be illustrated to describe travel behaviour decisions adequately, its applications could be very useful in the area of travel behaviour research. The theory could be used to estimate the impacts of transport policies and initiatives; or to explain why certain travel decisions are made; or to try to increase use of public transport by changing people’s beliefs.

When the Theory of Planned Behaviour is used as a predictive tool, intention is used to predict likely behaviour (Ajzen and Fishbein, 1980). According to Ajzen and Fishbein (1980) intention correlates highly with volitional behaviour. When
combined with perceived behavioural control, it serves as a good predictor of non-volitional behaviour (Ajzen, 1985).

If it can be shown that it can be used to describe travel behaviour and the decision-making processes behind modal choices, there seems to be no reason for not using the theory in travel behaviour research in the future. This thesis aims to use the theory to describe modal choices with regard to new urban public transport. It is hoped that the theory will offer greater insight into people’s travel decisions.

In this section, some areas where the theory has been used before are described in order to demonstrate the suitability of choosing it to look at people’s modal choices and their complex reactions to new modes of transport. It is intended to show that the Theory of Planned Behaviour has been used in the past to predict and explain behaviour with very good results and, therefore, that the decision to use it to examine people’s modal choices in Croydon and Dublin is a valid one.

3.4.2 Non-Transport Related Applications of the Theory of Planned Behaviour

The Theory of Planned Behaviour has been used to look at behaviours as diverse as voting behaviour (Fishbein and Coombs, 1974), weight loss (Schifter and Ajzen, 1985), occupational choices (Sperber et al, 1980) and family planning decisions (Fishbein et al, 1980c). In some of these studies the role of the theory has been to predict behaviour and in others to explain it. In other research the Theory of Planned Behaviour has been used as a tool to change the behaviour of alcoholics (Fishbein et al, 1980b).

As a predictive tool, the Theory of Planned Behaviour and the Theory of Reasoned Action have been used to predict the way in which people would vote in elections (Fishbein et al, 1980a; Fishbein and Coombs, 1974). In these studies, strong correlations have been found to exist between people’s voting intentions and their voting behaviour. However, the correlation weakens if there is too great a time lapse between measurement of intention and behaviour (Fishbein and Coombs, 1974). In a study of the voting intentions of 68 people in the 1976 American presidential
election, the theory predicted correctly the behaviour of 62 of those people (Fishbein et al, 1980a). This study used the Theory of Reasoned Action and also showed very strong correlations between the components of the theory and people’s actual behaviour. In particular, people’s behavioural beliefs and attitudes were seen to play an important role in determining people’s behaviour.

In Fishbein et al’s (1974) study of voting in the British General Election the theory correctly predicted the votes of 89% of those involved in the study. The theory has also more recently been used to examine people’s intention to exercise and their actual behaviour (Bozionelos and Bennet, 1999). The study looked at people’s frequency of exercise and the types of exercise they became involved in. This study found that the theory correctly predicted the exercising behaviour, both in terms of frequency and type of exercise engaged in, of 49% of the sample of 114 respondents.

When the Theory of Planned Behaviour is used as a predictive tool, it is usual to report correlations between intended and actual behaviour. The theory has been used to look at behaviours as diverse as drug use and attendance at church. In the first of these studies Ajzen et al (1982) found a correlation of 0.82 between student’s intention to use marijuana and their actual use of the drug. In the second study, King (1975) found a correlation of 0.90 between students’ intentions to attend church and their actual frequency of attending church. The theory has also been used to predict people’s use of the contraceptive pill by married couples as the main form of contraception. Correlations of 0.85 were found between couples’ intentions to use the pill and their actual use of the pill (Ajzen and Fishbein, 1980).

The Theory of Planned Behaviour has been used to explain the differences between stated weight loss intention and actual weight loss amongst female college students (Schifter and Ajzen, 1985). This is a type of behaviour that could not be considered to be volitional as external factors, such as rates of metabolism, could reduce a person’s control over this behaviour. In this study, strong correlations were found between a person’s attitudes to losing weight, their subjective norms and their perceived behavioural control and their intention to lose weight. A multiple
regression analysis demonstrated that the inclusion of perceived behavioural control as a determinant of a person's intention improved the predictive power of the model. Therefore, this study showed the importance of all three of the components of the Theory of Planned Behaviour. The Theory of Planned Behaviour has also been used to predict young people's smoking behaviour and it was found a correlation of 0.63 between young people's intentions to smoke and their actual behaviour (Dijkstra and Kuhlman, 1988).

As a tool to change behaviour, the theory has been used to change the behaviour of alcoholics (Fishbein et al., 1980b). A study was designed in order to persuade patients diagnosed as alcoholics to sign up for a treatment programme. There were three groups of alcoholics involved in the study. One group was exposed to a traditional campaign, which pointed out the dangers of drinking for their health but did not look at other factors, which might influence a person's attitudes to excessive drinking, or at the role played by subjective norm. A second group was exposed to a campaign, which focused on changing their attitudes and subjective norms regarding alcoholism. A third group was used as a control group and received no information. There were 40 people in each group and half the members of each group had originally expressed an intention to join an alcohol treatment programme. It was found that those who were exposed to the traditional appeal were least likely to sign up to the treatment programme. After being exposed to the campaign, only 25% actually signed up. In the control group 45% signed up. In the groups exposed to a campaign, which aimed changing their attitudes and subjective norms, 65% originally signed up to the treatment programme.

In this section it has been shown that the Theory of Planned Behaviour has been used to examine, predict and change various behaviour patterns. In these studies, the theory showed that there was very high correlation between people's behaviour and the various components of the theory. In addition, the method of measuring people's attitudes, subjective norm and perceived behavioural control by measuring their belief strengths has been achieved successfully in the studies that are mentioned. It seems sensible to suggest that this theory could be used to describe and predict travel
behaviour decisions and to give a greater understanding to travel behaviour choices. However, the behaviour patterns that have been modelled in the past are simpler than travel behaviour: there are fewer variables involved and in most cases the decisions have been binary. Therefore, the use of the Theory of Planned Behaviour to model travel behaviour in this thesis will be more complicated than the studies that have been described above.

3.4.3 Applications of the Theory of Planned Behaviour in transport research

The Theory of Planned Behaviour has been applied to some travel behaviour research. Much of this research is very recent. Some aspects are described in this section.

Several studies have used the Theory of Planned Behaviour to produce and measure the success of travel awareness initiatives (Jopson, 1999; Jopson, 2000; Hodgson et al, 1997; Hodgson et al, 1998; Pilling et al, 1999). Other projects have placed greater emphasis on looking at people's attitudes to various travel modes such as walking, cycling and bus (Forward, 1998a; Pilling et al, 1999).

The Theory of Planned Behaviour has been used to describe travel decisions regarding travel modes that are already in competition with each other (Forward, 1998a; Forward 1998b; Pilling et al, 1998; Pilling et al, 1999). The work in this thesis differs from this in that, while it uses the Theory of Planned Behaviour to describe people's modal intentions, this is with regard to completely new modes of which the respondents have had no experience. In previous research, the modes have been modes that the respondent will have used or seen being used on a regular basis. Thus, the decisions have already been made concerning their use.

Forward (1998a) used the theory to examine the modal choices of people in European cities. This was a large-scale quantitative study and focused on finding the correlations that existed between attitude, subjective norm and perceived behavioural control and the intention held by respondents to use the various modes under investigation. In addition, Forward (1998a) modified the Theory of Planned
Behaviour by including habit as a determinant of intention. That is, Forward hypothesised that the mode that was most often used by an individual would affect their future decisions.

The study was repeated with a slightly different focus in Gothenburg, where Forward (1998b) used the modified Theory of Planned Behaviour to assess modal choice on short trips. The modes that were studied were bicycle, car and walking. There were 188 people involved in this study.

These studies concluded that the Theory of Planned Behaviour was a good predictor of respondents' intentions to use various modes. Multiple linear regression analysis showed that the components of the theory could be used to predict people's intentions regarding the modes. In particular, it was found that perceived behavioural control and habit were found to be the best predictors of a respondent's intention to use a mode (Forward, 1998a; Forward, 1998b). Forward's Gothenburg study (1998b) reported that 69% of the variance in people's intention to drive a car was explained by the habit and the components of the Theory of Planned Behaviour. The earlier European study showed similar results: 78% of the variance in people's intention to drive a car was explained by the components of the theory and by habit (Forward, 1998a). However, if looking at new modes, such as the Tramlink in Croydon as is done in this study, it is difficult to examine the effect of habit on travel behaviour patterns. In addition, it could be argued that habit cannot be seen as a determinate of intention as the decisions that were made about modal choice in the past were based on the attitudes, subjective norms and perceived behavioural control that the person held at that time. If these have not altered significantly, then there is no reason that the modal choice made by the individual will change either. Therefore, in this thesis habit is not being considered as a determinant of intention.

Forward (1998b) used questionnaires to measure the strength with which certain beliefs were held. From these questionnaires, it was found that people's beliefs played a very important role in determining what their intentions were regarding the different modes. For example, Forward (1998b) found that people who intended to
cycle perceived it as a very easy mode to use and expected to meet few obstacles. Likewise, they held more favourable normative and behavioural beliefs, with respect to cycling, claiming that it would benefit their health and was inexpensive.

Similarly, Forward (1998b) found that those who intended to drive were more positive about its effects and were most likely to agree that it was a comfortable, inexpensive mode to use. They also did not agree to the same extent as those not intending to drive that the car could be seen as environmentally damaging.

Forward (1998a; 1998b) concluded that people had positive beliefs about the modes that they were going to use and that their intentions were determined by their attitudes, subjective norm and perceptions of behavioural control. Forward (1998a; 1998b) sought to validate the use of the Theory of Planned Behaviour as a predictor of travel intention when dealing with known modes. The studies showed strong correlations between the various elements of the theory and the intention to use the modes under investigation. This indicated that the Theory of Planned Behaviour was quite good at predicting people's modal choices. Forward (2000) has used the theory in five different studies to predict travel behaviour and explain modal choices with very good results.

The Theory of Planned Behaviour has been criticised in the past for excluding some variables that could improve its performance such as habit and personal norm (Forward, 1994). Personal norm is what a person believes he or she should do. It is what they believe it is moral for them to do. However, Forward (1994; 2000) has compared it favourably with other methods of assessing people's attitudes and predicting their behaviour. Empirical evidence exists to show that it predicts behaviour well in its current format. In this thesis, therefore, these additional variables will not be included in the theory.

Other studies, which have likewise looked at the relationship between the various elements of the Theory of Planned Behaviour and intention to use existing modes, also demonstrate the explanatory capabilities of the Theory of Planned Behaviour in travel research (Pilling et al 1998; Pilling et al 1999). Pilling et al (1998; 1999) used
the Theory of Planned Behaviour to describe and to explain the modal choices of young people by examining their attitudes and beliefs. This study did not use the theory to make predictions about modal choice but instead tried to influence the modal choices of young people involved in the study. The study focused on attitudes rather than subjective norms and perceived behavioural control.

This study differed from those of Forward (1998a; 1998b) in that while most of the data collection was quantitative, a qualitative study also took place before the administration of questionnaires (Pilling et al, 1999). Young people took part in focus groups in order to ascertain what types of beliefs they held about the modes that they used. These beliefs were incorporated into a questionnaire that sought to measure the strengths of the beliefs and to measure the attitudes of the young people (Pilling et al, 1999). The questionnaire was distributed to 1533 people and 555 responses were received.

The analysis of the questionnaire showed that the strength with which behavioural beliefs were held had a direct effect on the modes that the young people tended to choose (Pilling et al, 1998). Young people rated cost, convenience and safety as the most important attributes of a travel mode. With regards to the different modes, cycling and walking were seen as the "greenest" modes while the car was considered to be cheap, comfortable and convenient. Buses were not rated positively or negatively; people were very neutral about them. The findings showed that young people chose and used the modes about which they had the most positive beliefs. Hence, those people that were regular car users appeared to believe most strongly that the car was comfortable, cheap and convenient and have the most negative beliefs about public transport.

Therefore, as with the work of Forward (1998a, 1998b) some of the components of the Theory of Planned Behaviour have been used to describe the processes behind the travel decisions that people have made about existing modes. The explanatory power of the Theory of Planned Behaviour was well demonstrated in this study and
there was strong evidence that people's beliefs and attitudes to using various modes affected their decisions to use those modes (Pilling et al, 1999).

In addition to trying to explain travel behaviour decisions, this research also examined the role of the Theory of Planned Behaviour in encouraging young people to use the car less (Pilling et al, 1999). The results of the questionnaire were used as the basis for developing a travel awareness campaign to encourage young people to choose modes other than the car. The travel awareness campaign was designed in cooperation with youth workers from Manchester and was aimed at changing people's attitudes concerning car use, public transport, walking and cycling. A group of 63 young people were exposed to this campaign and their attitudes and behavioural beliefs were measured using a quantitative questionnaire, both before and after being exposed to the travel awareness campaign. These people were also interviewed and involved in meetings that sought to allow them to voice their beliefs at greater length. After exposure to the awareness campaign, it was found that people were more likely to have negative attitudes towards cars and more positive attitudes towards cycling, walking and trams. The findings seemed to show that attitudinal change was most difficult for modes which people used most often and where attitudes were strongly held. However, there was a significant change in the attitudes of people to the car: in particular, people were more likely to think of the car as an unsafe mode. For modes like the tram, which people used less often, their attitudes were easier to alter and proved more flexible.

This research (Pilling et al, 1998; Pilling et al, 1999) was limited to examining the relationship between attitude and intention. It omitted subjective norm and perceived behavioural control. However, Forward's study (1998a; 1998b) showed perceived behavioural control to be an important factor in the theory for explaining travel behaviour.

Other studies, which have also examined the role of the theory as a tool for raising travel awareness, have tried to study the effects of subjective norm and perceived behavioural control. Jopson (1999) argued that too much focus has been placed on
changing attitudes to modes. Jopson (1999) proposed using the Theory of Planned Behaviour to reduce car use by focusing on changing people’s levels of perceived behavioural control. This research claimed that although attitudes might be altered through attitude awareness initiatives, such as travel blending that this would not always result in a change in behaviour (Jopson, 2000). More emphasis was required on improving people’s levels of perceived behavioural control. This work illustrated that a strong correlation between people’s attitudes, perceived behavioural control and subjective norms and their behaviour existed.

Therefore, the Theory of Planned Behaviour has been used to study travel behaviour decisions in various ways. Some studies have focused on the attitudinal factors of the theory (Pilling et al, 1998) while others have placed greater emphasis on the looking at all the components of the theory and their effects on travel decisions (Jopson, 1999). These studies have used the Theory of Planned Behaviour to examine people’s modal choices in relation to existing modes and also to predict their intentions. The predictive power of the theory has been found to be quite significant in predicting people’s intentions to use a mode (Forward, 1998a; 1998b).

The use of the Theory of Planned Behaviour in travel behaviour research is relatively recent. This thesis will use the theory to describe people’s reactions to new urban public transport systems. Other research has demonstrated its usefulness as a tool in looking at modal choice, explaining travel behaviour and predicting intentions. Therefore, it seems an appropriate method to use to describe the complex decision-making processes involved in choosing to use a new mode of transport. It is also worth exploring its use as a method of predicting people’s travel behaviour and modal choices.

3.5 Summary

In the previous chapter, various methods of examining travel behaviour were examined, including the Theory of Planned Behaviour. As the main objective of this thesis was to examine the impacts of new urban public transport systems on people’s modal choices and to assess the motivations behind these modal choices it was
decided that The Theory of Planned Behaviour would be the predominant analysis tool in this thesis.

In Chapter 3 how the Theory of Reasoned Action and the Theory of Planned Behaviour, which evolved from the Theory of Reasoned Action, came into existence has been described. The components of these theories are attitude to the outcomes of behaviour, subjective norm and perceived behavioural control. These are seen as the determinants of intention. They have been described in this chapter and the way in which they are combined to predict intention and behaviour has been discussed.

The components of the Theory of Planned Behaviour can be measured using questionnaires and by measuring belief strengths. Some examples of how this can be done were given in this chapter and later, in Chapters 6 and 7, the questionnaires and interviews that were used to measure the attitudes, subjective norms and perceived behavioural control of potential users of the light rail systems in Croydon and Dublin will be described. It was pointed out in this chapter that is very important to ensure that these questions are measuring people’s attitudes, subjective norms and perceived behavioural control correctly. The method of avoiding this problem has been described in this chapter and it is a problem that will be raised again in the analysis and design of the studies described in Chapters 6 and 7 of this thesis.

This chapter has also described some of the areas that the Theory of Planned Behaviour has been applied to. It is apparent that the Theory of Planned Behaviour is a sophisticated tool that can describe very complex behaviours such as alcohol dependency and family planning choices. These studies have shown that the theory is capable of predicting these behaviours. Ajzen and Fishbein (1980) have found some very strong correlations between people’s intentions and their behaviour in their studies, as have the other studies that have been mentioned here. In addition, these studies have indicated that people’s attitudes, subjective norms and perceived behavioural control have an influence on their actions.
The theory has also been used to describe modal choices in some studies with success. These studies have indicated that the components of the Theory of Planned Behaviour play a role in determining people's modal choices and intentions.

The examples of studies of complex behaviour using the Theory of Planned Behaviour that have been described in this chapter have offered validation of the choice of the Theory of Planned Behaviour to examine travel behaviour and modal choice.

In the following chapter, an attempt will be made to further validate this choice before embarking on the studies in Dublin and Croydon by looking at the application of the theory to existing data describing the modal choices of car drivers in the UK. In addition, it is hoped that the application of the theory to this data will provide some insight into what people want from new urban public transport systems. It is an important objective of this thesis to assess the impacts of new urban public transport. Therefore, it is worthwhile knowing what existing drivers perceive that they want from new public transport.

Thus the study in Chapter 4 served two purpose: it tested the application of the Theory of Planned Behaviour to existing data before the studies in Croydon and Dublin were carried out and it gave an insight into what is needed from new urban public transport systems,
Chapter 4

Modal choices of car drivers
4.1 Introduction

In this thesis, the modal choices of people in relation to new public transport systems are studied. It is intended to show that people's modal choices are more complex than is sometimes allowed for and that there are many factors involved in the choice to use new public transport.

In Chapter 2, a short review of some psychological theories that can be used to examine travel choice was given. It was decided, for reasons described in Chapter 2, to use a theory borrowed from social psychology called the Theory of Planned Behaviour. This theory and some of its applications have been described in Chapter 3.

In order to examine the modal choices of people in relation to new public transport, studies were carried out of potential users of Croydon Tramlink and Dublin Luas. These studies and their results are described in Chapters 6 and 7. The studies involved using the Theory of Planned Behaviour to discover what types of decisions people had made about using the new light rail systems and how they had made those decisions.

Before designing and carrying out these studies, it was decided to examine whether the Theory of Planned Behaviour could be applied to existing data in order to explain modal choices. This data had been collected from semi-structured interviews with car drivers about real, specific car trips that they had made (Mackett, 1999).

One objective of this thesis is to examine the complexity of modal choices and to gain a better understanding of travel behaviour. In addition to allowing the application of the Theory of Planned Behaviour to be tested, the analysis of the data collected in these interviews gives an insight into the travel choices of car drivers and the reasons that they rejected public transport. In many cases, they wanted improvements to be made to public transport, the types of improvements that have been taking place in Croydon and will take place in Dublin.

This chapter aims to show that some people want to use public transport but that they want improvements to be made before they will use it. Improving public
transport in this way, however, will not automatically bring about a change in people's travel patterns. The other factors as described in the Theory of Planned Behaviour must also be studied.

4.2 Why do people use their cars?

4.2.1 Introduction

The data used in this chapter was originally collected as part of a study into people's willingness to reduce their car use on short trips (Mackett and Ahern, 2000; Ahern and Mackett, 2000). The study was carried out by University College London (UCL) with Steer Davies Gleave (SDG) at the Centre for Transport Studies (CTS). The contract for this study was placed with UCL by the Department of the Environment, Transport and the Regions (DETR). A very brief description will be give of how the data was collected in this section.

Much of the work in this study involved survey work, which was carried out by SDG (Steer Davies Gleave, 1999b). Five hundred households were selected at random in each of the five areas of London, Leeds, Ipswich, Hereford and Dorset. These areas were chosen for their varying topography and the fact that they included different types of areas.

- London: Major, international city
- Leeds: Metropolitan city
- Ipswich: Large sized town
- Hereford: Small sized town
- Dorset: Rural area.

There were three stages involved in collecting the information from these households.

1. The first interviews collected information about the household composition and number of vehicles owned. A memory jogger was left with each member of the household. This recorded some details of trips
that the person made over the course of two days. For example, records were made of where the person departed from, how long the trip took and how he or she made it. An appointment was made to return to collect the memory joggers and to speak with every member of the house over the age of 10.

2. In the second visit to the household, the memory joggers were used during interviews with the household members to collect travel information about the trips that they had made over the course of two days.

3. The information collected from these interviews in stage 2 was assessed to find out which households had made trips of less than 5 miles by car and households were selected at random from these. In-depth interviews were conducted with a selection of people about their short car trips. A copy of this questionnaire may be found in Appendix A. In this interview, the interviewee was asked, for each short car trip that they had made, to explain why they had used their car, what alternatives were available and what would have to happen so that they could use these alternatives. The interviewers were able to prompt respondents to ensure that all alternatives were considered, including changing destination, linking trips or getting someone else to make the trip. The results of these interviews are analysed in this chapter.

The analysis of this data took place at Centre for Transport Studies at UCL: 1624 car driver trips made by 310 people were analysed. A number of complex issues have been dealt with in the course of this analysis. Much effort has gone into trying to structure the data in a way that make it easy to interrogate but which retains the subtleties embedded within it (Ahern and Mackett 2000; Ahern, 2000).
4.2.2 Analysis of the data

Table 4.1 shows the purposes of the trips that are analysed in this chapter, in descending order. This is the reason why the person made the trip in the first place. Trips with the purpose “home” are trips that ended at the home.

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Total</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home</td>
<td>563</td>
<td>35</td>
</tr>
<tr>
<td>Other Escort (non-education)</td>
<td>207</td>
<td>13</td>
</tr>
<tr>
<td>Commuting</td>
<td>203</td>
<td>13</td>
</tr>
<tr>
<td>Shopping</td>
<td>197</td>
<td>12</td>
</tr>
<tr>
<td>Social</td>
<td>100</td>
<td>6</td>
</tr>
<tr>
<td>Visit friends</td>
<td>90</td>
<td>6</td>
</tr>
<tr>
<td>Escort to education</td>
<td>74</td>
<td>5</td>
</tr>
<tr>
<td>Personal business</td>
<td>71</td>
<td>5</td>
</tr>
<tr>
<td>Change Mode</td>
<td>67</td>
<td>4</td>
</tr>
<tr>
<td>Employer’s business</td>
<td>23</td>
<td>1</td>
</tr>
<tr>
<td>Eat or drink</td>
<td>15</td>
<td>1</td>
</tr>
<tr>
<td>Medical and dental</td>
<td>11</td>
<td>1</td>
</tr>
<tr>
<td>Education</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>1624</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 4.1: Purpose of the car trips analysed

The interviewees were also asked to say why they had chosen to use their cars rather than the alternatives that were available. These reasons are shown in Table 4.2 in descending order. In this table, there are 2707 reasons for using the car even though the drivers were only interviewed about 1624 trips. This is because the reasons were coded up from unstructured text so drivers were able to give more than one reason for using the car. Surprisingly, although all these trips were less than 5 miles long, the commonest reason for using the car was because of the length of the trip.
<table>
<thead>
<tr>
<th>Reasons</th>
<th>Total</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>It was a long way</td>
<td>525</td>
<td>19</td>
</tr>
<tr>
<td>I had heavy goods to carry</td>
<td>395</td>
<td>15</td>
</tr>
<tr>
<td>I was short of time</td>
<td>368</td>
<td>14</td>
</tr>
<tr>
<td>I was giving a lift to a friend or family member</td>
<td>342</td>
<td>13</td>
</tr>
<tr>
<td>The weather was bad</td>
<td>205</td>
<td>8</td>
</tr>
<tr>
<td>It was convenient</td>
<td>163</td>
<td>6</td>
</tr>
<tr>
<td>I needed the car for a further trip</td>
<td>150</td>
<td>6</td>
</tr>
<tr>
<td>It was dark out</td>
<td>148</td>
<td>6</td>
</tr>
<tr>
<td>I was on a social trip</td>
<td>137</td>
<td>5</td>
</tr>
<tr>
<td>I needed my car at work</td>
<td>110</td>
<td>4</td>
</tr>
<tr>
<td>I was taking an elderly or ill person</td>
<td>49</td>
<td>2</td>
</tr>
<tr>
<td>It was an unpleasant environment to travel through</td>
<td>45</td>
<td>2</td>
</tr>
<tr>
<td>I felt unwell</td>
<td>41</td>
<td>2</td>
</tr>
<tr>
<td>I cannot manage without my car</td>
<td>20</td>
<td>1</td>
</tr>
<tr>
<td>I was taking the dog for a walk</td>
<td>9</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>2707</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 4.2: Reasons for using the car

For each car trip, the driver had been asked what were the alternatives that were available. These are shown in Table 4.3. A total of 2529 alternatives were identified, as drivers were allowed to identify more than one alternative for a trip. For the purpose of the analysis, alternatives were weighted so that only one alternative was selected per trip. This was done by allocating a weight of the reciprocal of the number of alternatives mentioned on the trip. Table 4.4 shows the number of weighted alternatives. Public transport is seen as an alternative in 35% of cases. Therefore, it was the most popular of the alternatives that were identified by the car drivers.
### Table 4.3: The alternatives mentioned by the drivers

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walk</td>
<td>808</td>
</tr>
<tr>
<td>Bus</td>
<td>806</td>
</tr>
<tr>
<td>Cycle</td>
<td>240</td>
</tr>
<tr>
<td>Taxi</td>
<td>98</td>
</tr>
<tr>
<td>Somebody else to make the trip</td>
<td>73</td>
</tr>
<tr>
<td>Would not make the trip</td>
<td>50</td>
</tr>
<tr>
<td>Train or tube</td>
<td>52</td>
</tr>
<tr>
<td>Public transport - not specified</td>
<td>41</td>
</tr>
<tr>
<td>Motorcycle</td>
<td>8</td>
</tr>
<tr>
<td>Tram</td>
<td>2</td>
</tr>
<tr>
<td>No Alternative</td>
<td>351</td>
</tr>
<tr>
<td>Total</td>
<td>2529</td>
</tr>
</tbody>
</table>

### Table 4.4: Weighted alternatives

<table>
<thead>
<tr>
<th>Alternatives</th>
<th>Weighted total</th>
<th>Percentage %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walk</td>
<td>500</td>
<td>31</td>
</tr>
<tr>
<td>Bus</td>
<td>496</td>
<td>31</td>
</tr>
<tr>
<td>Cycle</td>
<td>114</td>
<td>7</td>
</tr>
<tr>
<td>Taxi</td>
<td>48</td>
<td>3</td>
</tr>
<tr>
<td>Somebody else to make the trip</td>
<td>34</td>
<td>2</td>
</tr>
<tr>
<td>Would not make the trip</td>
<td>25</td>
<td>2</td>
</tr>
<tr>
<td>Train or tube</td>
<td>26</td>
<td>2</td>
</tr>
<tr>
<td>Public transport - not specified</td>
<td>26</td>
<td>2</td>
</tr>
<tr>
<td>Motorcycle</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Tram</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>No alternative</td>
<td>351</td>
<td>22</td>
</tr>
<tr>
<td>Total</td>
<td>1624</td>
<td>100</td>
</tr>
</tbody>
</table>
On all these trips, the drivers had chosen to drive. The drivers were asked would have to happen for them to make the switch from car to the available alternatives. While the drivers mentioned alternatives like walking and cycling, as is evident in Table 4.4, this thesis is focusing on the decision-making processes behind choosing to use public transport. Therefore, Table 4.5 only shows what the drivers said would have to happen for them to use public transport.

<table>
<thead>
<tr>
<th>I would use public transport if....</th>
<th>Percentage %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bus routes were better and more plentiful</td>
<td>31</td>
</tr>
<tr>
<td>Buses were more frequent</td>
<td>19</td>
</tr>
<tr>
<td>Nothing in particular has to happen</td>
<td>16</td>
</tr>
<tr>
<td>It was easier to use public transport with dependents</td>
<td>7</td>
</tr>
<tr>
<td>Public transport was made more enjoyable to travel on</td>
<td>6</td>
</tr>
<tr>
<td>Bus information was better</td>
<td>6</td>
</tr>
<tr>
<td>There was an all-night public transport service</td>
<td>3</td>
</tr>
<tr>
<td>Train frequency and service were improved</td>
<td>2</td>
</tr>
<tr>
<td>Public transport was cheaper</td>
<td>2</td>
</tr>
<tr>
<td>Local shops were better</td>
<td>2</td>
</tr>
<tr>
<td>I was not giving someone a lift</td>
<td>2</td>
</tr>
<tr>
<td>I was better organised</td>
<td>2</td>
</tr>
<tr>
<td>The weather was nicer</td>
<td>1</td>
</tr>
<tr>
<td>There were better public transport links</td>
<td>1</td>
</tr>
<tr>
<td>The area was safer</td>
<td>1</td>
</tr>
<tr>
<td>Street lighting was improved</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
</tr>
</tbody>
</table>

*Table 4.5: The events that drivers said would bring about a switch to public transport*

In this study of drivers' mode choices and also in the later studies of potential users of new public transport systems that will be described in Chapters 6 and 7 of this thesis, it is intended to show how people make the decision to use or not to use public transport. It is hypothesised that these choices are made on the basis of the components of the Theory of Planned Behaviour: their attitudes, their subjective norms and their perceived behavioural control. Many of the drivers...
claimed that they wanted improved public transport systems if they were to make the switch from private car-use to public transport use. They wanted more extensive bus routes, public transport that was easier to use and more information about available services.

Table 4.5 shows that some of the drivers in this study had poor attitudes about public transport. They did not think it was a convenient mode of transport, as it did not go where they needed to get to and was infrequent. Some of the drivers felt that using public transport would have negative outcomes: they would be less safe. For this reason, they wanted better street lighting and areas where stops were located to be made safer if they were to consider using public transport. They felt that they would be less likely to reach their destinations on time and so they wanted bus and train frequencies to be improved upon.

Some of the drivers had low levels of perceived behavioural control with respect to existing public transport services. There were several obstacles that they identified as being in the way of their using public transport: lack of information about services, bad weather, and the need for good organisation. Some drivers did not feel that anything in particular had to happen for them to use public transport. It was their positive attitudes, subjective norms and perceived behavioural control about the car that led to them using it instead of any other mode.

In order to examine people's travel choices in more detail, Table 4.6 was constructed. This table shows all the reasons that drivers gave for using their car cross tabulated with the events that had to happen in order for them to use public transport. It shows this as percentages of the total number of reasons. There were 895 of these on the trips where people had said that they could use public transport. This is because, for each trip people could select more than one reason for using the car.
r,

=

2ý=

ý
CD

:ý :ý

CD

=, =
CD

CA (n

()Q

ý3

0 P

IM
(n

CD (IQ
ý.
0
`ý.
"

rA QQ

A
.0
1
5
+
(A
0
C)
in
"I
Uq in :ý
CD

ýr

rn CD :ý
CD
0
r0..

5* .0

CD
Cr :ý

a

'01

ýr 0
C)

Pj
r-+ 51
C) 0 ,0 110
z
ZS
Cr

Z. ,.O
0

ý3 =
CD 8

1:0

=

CD

0
= ' t: s
(D =
11)
10
CD

=

Iq

ý-t
0
.4ý
&

(: )
--t
CD
CD
0
" .

P
W

-.+
:: r
C-+
CL 0
(D
11:
ý in
'0

0
q

10
0

CD

z

ý3
(A

0
En ý1)

0
0
CD
0
CD

0
(D

I used the car
because
The weather
bad
was
C) C) C> C>
I
It
dark
was
out
9: al
C) Cý C) C>C) C)
C> I C)
I
It was a long
way
C>
C>C)
.-I
I was taking an
ill
elderly or
person
C>
C)
C)
C)
C)
C)
C>
C)
C)
C)
C)
C).
C:
)
5A
. .
. 1
I needed the
car for a
further
trip
;%t: ý.
C)
C)
I was invine a
lift to a friend
or family
member
WI C)I
I
felt
unwell
C>C>C> C>C> I
C) (D
C)
I had heavy
W C)
goods to carry
Icannot
manage
car
my
without
C) C) C>
It was more
convenient
CJ
<=
I needed my
for
work
car
I was on a
trip
social
C:) C)
I was short of
time
W C>
I was taking
the dog for a
walk
C>
C)
C)
C)
C)
C>
C)
It was an
unpleasant
environment to
travel through
C) C> 2gL
C>
Total
0
C)
W 4:-


The most common event that had to occur for public transport to become an alternative was that bus routes had to become more plentiful and better. This was already noted in Table 4.5. However, when looked at in conjunction with peoples' reasons for using their cars, it is easier to understand why they rejected public transport.

Even though all the trips were less than 5 miles long, the commonest reason for car-use among these people was that they were travelling a long way: it accounted for 23% of the reasons given. When people had to travel a long way, they were likely to say that bus routes had to be more plentiful: using the figures in Table 4.6, in 44% of cases where people used the car because they were travelling a long way they felt that they could not use public transport because the routes were not extensive enough.

These people were willing to use public transport in many cases but they needed to travel further away than existing routes would allow them and several changes of bus or train would be involved on the trip. For example, a man from Leeds made a trip of less than 5 miles by car to the chemist because to do so by bus would have meant 4 changes of bus on the way there and on the way back. Similarly, a man in Ipswich who made a shopping trip by car said:

"The buses are too complicated and they don't go where I want to go. Most of the buses here just go into town and radiate out from there so I would need to change buses in the centre of town if I wanted to use public transport."

In 27% of cases where people said that they used their car to give someone a lift they said that they would use public transport if bus routes were better and in a further 20% of cases people wanted more frequent buses. These people were unhappy with the public transport services currently available. However, they felt that changes to existing public transport would make it easier to use it in the future. They did not mention introducing new modes of public transport and were not questioned about it specifically. However, it is apparent that they are unhappy with existing services and want improvements.
When people had heavy goods to carry, they also felt that the bus services were inadequate. People used their cars to carry heavy shopping, as poor bus routes and timetables meant that they had to walk too far to stops and they would have to wait for a long time once at those stops. In approximately 29% of the cases where people had said that they had used the car to carry heavy goods, people had said that they would consider using public transport if the routes were improved and in 21% of cases they said that they wanted more frequent buses.

Time constraints accounted for 13% of the reasons that people had used the car. Once more, people wanted better bus routes and more buses. They wanted a better public transport system that they could rely on getting them to where they wanted to go and on time. As one woman from Leeds who made the trip to work by car said:

"It's not really practical for me to use the bus. I am going to work so speed is essential and I always have to wait a long time at the stop. It is not a great bus route either. It involves a long walk to get from the stop to work."

Examining the trips by looking at the reasons for car use and the reasons for not using public transport gives a greater understanding of why people turn down public transport. The commonest reason for not using public transport is that the routes are poor whereas a car is very convenient and flexible. In fact, when Table 4.6 is examined, it becomes apparent that people have chosen their cars over public transport because of the extra flexibility it allows them: they can travel further, carry their shopping and save time. However, the drivers have mentioned that public transport could be improved and that they would be willing to use it if these improvements were made.

In the tables above, drivers could select more than one reason for using the car on every trip. In order to simplify the analysis, a ranking system was devised so that only one reason for car use was selected. It is assumed that some reasons for using the car on a trip are more important or more dominant than other reasons. For example, a driver says that he or she used the car because he or she could not manage without the car and also because it was convenient. It would seem fair to
say that the former rather than the latter was the dominating reason for car use. In order to select which was the most important reason for car use on each trip in this study, the alternatives that the drivers said that they could have used during the interviews were examined.

Table 4.4 shows that on some trips the drivers mentioned no alternatives. Therefore, whenever a reason for using the car was given on a trip where no alternative was perceived as being available, that reason was given a score of one. On each short car trip, the most important reason for car use was the one with the highest score. In other words, the most dominant reason on any trip was that reason that was most often associated with trips where there was no alternative to the car.

Table 4.7 shows the ranking system that this method resulted in. According to Table 4.7, if a car driver said that they were using their car because it was convenient and because they needed it for work, the fact that they needed it for work would be the dominant reason for car use. Table 4.8 shows what the main reasons for car use were found to be using this ranking system.
<table>
<thead>
<tr>
<th>Rank</th>
<th>Main reasons</th>
<th>Percentage of these trips with no alternative given (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I needed my car at work</td>
<td>60</td>
</tr>
<tr>
<td>2</td>
<td>I cannot manage without my car</td>
<td>49</td>
</tr>
<tr>
<td>3</td>
<td>I needed the car for a further trip</td>
<td>22</td>
</tr>
<tr>
<td>4</td>
<td>I was taking an elderly or ill person</td>
<td>21</td>
</tr>
<tr>
<td>5</td>
<td>It was convenient</td>
<td>18</td>
</tr>
<tr>
<td>6</td>
<td>I had heavy goods to carry</td>
<td>14</td>
</tr>
<tr>
<td>7</td>
<td>I was giving a lift to family or friends</td>
<td>8</td>
</tr>
<tr>
<td>8</td>
<td>It was dark out</td>
<td>7</td>
</tr>
<tr>
<td>9</td>
<td>I was short of time</td>
<td>6</td>
</tr>
<tr>
<td>10</td>
<td>It was a long way</td>
<td>2</td>
</tr>
<tr>
<td>11</td>
<td>The weather was bad</td>
<td>2</td>
</tr>
<tr>
<td>12</td>
<td>I was on a social trip</td>
<td>2</td>
</tr>
<tr>
<td>13</td>
<td>I felt unwell</td>
<td>0</td>
</tr>
<tr>
<td>14</td>
<td>It was an unpleasant environment to travel through</td>
<td>0</td>
</tr>
<tr>
<td>15</td>
<td>I was taking the dog for a walk</td>
<td>0</td>
</tr>
</tbody>
</table>

*Table 4.7: Ranking system*
<table>
<thead>
<tr>
<th>Main reasons</th>
<th>Total trips with this main reason</th>
<th>Percentage of trips with this main reason (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I had heavy goods to carry</td>
<td>304</td>
<td>19</td>
</tr>
<tr>
<td>I was giving a lift to family or friends</td>
<td>268</td>
<td>17</td>
</tr>
<tr>
<td>I was short of time</td>
<td>184</td>
<td>11</td>
</tr>
<tr>
<td>It was a long way</td>
<td>180</td>
<td>11</td>
</tr>
<tr>
<td>It was convenient</td>
<td>163</td>
<td>10</td>
</tr>
<tr>
<td>I needed the car for a further trip</td>
<td>147</td>
<td>9</td>
</tr>
<tr>
<td>I needed my car at work</td>
<td>89</td>
<td>5</td>
</tr>
<tr>
<td>The weather was bad</td>
<td>75</td>
<td>5</td>
</tr>
<tr>
<td>It was dark out</td>
<td>73</td>
<td>4</td>
</tr>
<tr>
<td>I was on a social trip</td>
<td>67</td>
<td>4</td>
</tr>
<tr>
<td>I was taking an elderly or ill person</td>
<td>43</td>
<td>3</td>
</tr>
<tr>
<td>I cannot manage without my car</td>
<td>20</td>
<td>1</td>
</tr>
<tr>
<td>I felt unwell</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>I was taking the dog for a walk</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1624</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

*Table 4.8: Main reasons for car use*

Table 4.9 shows the cross tabulation of people’s main reasons for using the car and the events that would have to occur for people to be able to use public transport. It shows this as a percentage of 549: the total number of times that public transport was selected as an alternative, according to Table 4.4 of weighted alternatives. For example, 7% of the time that public transport was mentioned as an alternative to the car, people had said that they had used their cars because it was a long way and that bus routes would have to be more plentiful and better if they were to use public transport.
Table 4. Events leading to a chance to use public transport vs. main reasons for using the car.

| Event | Public transport was cheaper | There was an all night public transport service | The area was safer | I was more organised | I was not feeling some one's life | Traffic services and frequency were improved | Street lighting was improved | The weather was more enjoyable to travel | It was easier to travel with dependants | Nothing in particular had to happen | The weather was nicer | There were better public transport links | Bus choices were more plentiful and better | Bus information was better | The locals shops were better | I would use public transport if | Total |
|-------|-----------------------------|-----------------------------------------------|-------------------|-------------------|-------------------------|---------------------------------|--------------------------|---------------------------------|---------------------------------|---------------------------------|-----------------|---------------------------------|---------------------------------|-----------------|---------------------------------|--------------------------|
| 0     | 0                           | 0                                             | 0                 | 0                 | 0                       | 0                               | 0                        | 0                               | 0                               | 0                               | 0               | 0                               | 0                               | 0               | 0                               | 0                        |
| 1     | 0                           | 0                                             | 0                 | 0                 | 0                       | 0                               | 0                        | 0                               | 0                               | 0                               | 0               | 0                               | 0                               | 0               | 0                               | 0                        |
| 2     | 0                           | 0                                             | 0                 | 0                 | 0                       | 0                               | 0                        | 0                               | 0                               | 0                               | 0               | 0                               | 0                               | 0               | 0                               | 0                        |
| 3     | 0                           | 0                                             | 0                 | 0                 | 0                       | 0                               | 0                        | 0                               | 0                               | 0                               | 0               | 0                               | 0                               | 0               | 0                               | 0                        |
| 4     | 0                           | 0                                             | 0                 | 0                 | 0                       | 0                               | 0                        | 0                               | 0                               | 0                               | 0               | 0                               | 0                               | 0               | 0                               | 0                        |
| 5     | 0                           | 0                                             | 0                 | 0                 | 0                       | 0                               | 0                        | 0                               | 0                               | 0                               | 0               | 0                               | 0                               | 0               | 0                               | 0                        |
| 6     | 0                           | 0                                             | 0                 | 0                 | 0                       | 0                               | 0                        | 0                               | 0                               | 0                               | 0               | 0                               | 0                               | 0               | 0                               | 0                        |
| 7     | 0                           | 0                                             | 0                 | 0                 | 0                       | 0                               | 0                        | 0                               | 0                               | 0                               | 0               | 0                               | 0                               | 0               | 0                               | 0                        |
| 8     | 0                           | 0                                             | 0                 | 0                 | 0                       | 0                               | 0                        | 0                               | 0                               | 0                               | 0               | 0                               | 0                               | 0               | 0                               | 0                        |
| 9     | 0                           | 0                                             | 0                 | 0                 | 0                       | 0                               | 0                        | 0                               | 0                               | 0                               | 0               | 0                               | 0                               | 0               | 0                               | 0                        |
| 10    | 0                           | 0                                             | 0                 | 0                 | 0                       | 0                               | 0                        | 0                               | 0                               | 0                               | 0               | 0                               | 0                               | 0               | 0                               | 0                        |
| 11    | 0                           | 0                                             | 0                 | 0                 | 0                       | 0                               | 0                        | 0                               | 0                               | 0                               | 0               | 0                               | 0                               | 0               | 0                               | 0                        |
| 12    | 0                           | 0                                             | 0                 | 0                 | 0                       | 0                               | 0                        | 0                               | 0                               | 0                               | 0               | 0                               | 0                               | 0               | 0                               | 0                        |
| 13    | 0                           | 0                                             | 0                 | 0                 | 0                       | 0                               | 0                        | 0                               | 0                               | 0                               | 0               | 0                               | 0                               | 0               | 0                               | 0                        |
| 14    | 0                           | 0                                             | 0                 | 0                 | 0                       | 0                               | 0                        | 0                               | 0                               | 0                               | 0               | 0                               | 0                               | 0               | 0                               | 0                        |
| 15    | 0                           | 0                                             | 0                 | 0                 | 0                       | 0                               | 0                        | 0                               | 0                               | 0                               | 0               | 0                               | 0                               | 0               | 0                               | 0                        |
| 16    | 0                           | 0                                             | 0                 | 0                 | 0                       | 0                               | 0                        | 0                               | 0                               | 0                               | 0               | 0                               | 0                               | 0               | 0                               | 0                        |

I was taking the dog for a walk | I was short of time | I was on a social trip | I had heavy goods to carry | I could not manage without my car | I was giving a lift to a friend or family member | I needed the car for a further trip | I was taking an elderly or ill person | I was on a long way | I was delayed | I had the car because | I used the car |
The commonest main reasons for selecting the car over public transport were:

1. I was giving a lift to a friend or family member
2. I had to carry heavy goods

Once more, people were most likely to want changes to bus routes and bus timetables, followed by making it easier to bring dependents on public transport. A woman from Leeds who used the car to make a shopping trip said:

"The bus takes too long. I've tried it – I have to leave an extra half an hour, as they are so infrequent. It's impossible really. I don't have the time to wait around for buses."

A man, also from Leeds, on a trip to the chemist said:

"I couldn't use the bus – it was an emergency. I had to get a prescription and there was no way I would get there with our bus service. I would have to take 3 buses there and back."

About 10% of those who had said that they were using the car because they were giving a friend or family member a lift said that they could have used public transport if it was easier to travel with dependents. In many cases, these were people who were bringing children to school and did not feel confident letting them travel on public transport on their own. One man from Dorset said that he drove his daughter to school every day:

"My daughter is too young to go on the bus. I wouldn't feel happy letting her go on her own."

People also felt that it was difficult to travel on public transport when accompanying a child. A woman from London who collected her children from school every day said:

"I don't like using public transport when I am with the children. It takes too long and it is too difficult trying to lift all their stuff onto the bus. I need to use my car for these trips."
Examining the reasons for car use and the events that have to happen to bring about a change to public transport gives a better understanding of people's modal choices. People choose the car because of the convenience that it offers and the fact that it gives them more freedom. In Chapter 2, it was noted that many people associate the car with independence and freedom and in this study the reasons that people gave for car use would seem to confirm this. The car allowed people to travel further and to use their time more efficiently. The reasons for rejecting the existing public transport would also support this: people had rejected public transport because it did not offer them the same benefits as the car. The routes were inflexible and the timetables were infrequent. Accompanying children was too difficult and they could not be allowed to travel on their own. Therefore, this study shows that people have poor perceptions of existing public transport whereas their attitudes to the car are very good. They feel that it is easy to use and it offers them many benefits.

These findings would imply that in order for any new urban public transport system to be a success it must be easier to use, more convenient and more flexible than existing modes of transport. In essence, the new public transport mode must offer people some of the advantages that their cars give them if it is to have any impact on their travel behaviour. Public transport can rarely offer the same service as the car, obviously, as it lacks the car's flexibility but services that take into account people's needs and are more frequent could improve people's perceptions and encourage greater use. The systems in Dublin and Croydon aim to improve people's perceptions of public transport and light rail is often perceived in a more positive light than buses are. Therefore, it would be expected that people would have more favourable attitudes to these new systems. This will be discussed at greater length in Chapters 6 and 7.

4.2.3 Applying the Theory of Planned Behaviour

The objective of this thesis is to gain a greater understanding of travel behaviour and how people make modal choices. Earlier chapters have discussed the various methods that can be used to assess modal choices. Leading on from this assessment, it was decided to use the Theory of Planned Behaviour to examine the choices of potential users of new public transport systems in Croydon and
Dublin. In order to examine whether it was appropriate to use this method to assess travel behaviour, however, it was first decided to use the theory to study an existing body of data. In the previous section, the data in question has been described and has been examined using more conventional techniques. It has been shown that it is a very rich source of data, which gives a lot of information about modal choices and car drivers’ travel behaviour patterns.

The previous section showed some of the reasons that these people chose the car and rejected public transport and went some way to increasing our knowledge of travel behaviour. In this section, it is intended to increase that knowledge further using the Theory of Planned Behaviour to analyse the drivers’ modal choices. It is intended to show that the theory can contribute to understanding these choices.

The data from this survey was not originally collected to be analysed using the Theory of Planned Behaviour. Therefore, some manipulation of the data has taken place.

According to the Theory of Planned Behaviour, attitude to the behaviour, the subjective norms and perceived behavioural control are determined by the beliefs that the driver has about using the mode: the behavioural, normative and control beliefs respectively. In this study, car drivers have indicated alternatives that they might consider using in the future. The reasons that they used the car could be considered as the behavioural, normative and control beliefs concerning their intention to use the car for the trip. Tables 4.10, 4.11 and 4.12 show how these reasons have been translated to form the behavioural, normative and control beliefs.

<table>
<thead>
<tr>
<th>Reason</th>
<th>I believe that using the car is</th>
</tr>
</thead>
<tbody>
<tr>
<td>Convenience</td>
<td>More convenient</td>
</tr>
<tr>
<td>Short of time</td>
<td>Saves time</td>
</tr>
<tr>
<td>Social</td>
<td>Allows me more freedom on my social trips</td>
</tr>
</tbody>
</table>

Table 4.10: Reasons translated into behavioural beliefs
<table>
<thead>
<tr>
<th>Reason</th>
<th>Referent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lift to family or friends</td>
<td>My friends or family want me to take them somewhere in the car</td>
</tr>
</tbody>
</table>

*Table 4.11: Reasons translated into normative beliefs*

<table>
<thead>
<tr>
<th>Reason</th>
<th>I believe that using the car is preferable because...</th>
</tr>
</thead>
<tbody>
<tr>
<td>It was an unpleasant environment to walk through</td>
<td>It is safe in unpleasant areas</td>
</tr>
<tr>
<td>Dark out</td>
<td>It is safe when its dark</td>
</tr>
<tr>
<td>I needed the car for a further trip</td>
<td>It can be used to trip chain</td>
</tr>
<tr>
<td>Long way</td>
<td>It is good for long trips</td>
</tr>
<tr>
<td>Bad weather</td>
<td>It is warm and dry in bad weather</td>
</tr>
<tr>
<td>Taking old or ill person</td>
<td>I can escort older people</td>
</tr>
<tr>
<td>Needed for work</td>
<td>I need it at work</td>
</tr>
<tr>
<td>Taking the dog out</td>
<td>I can bring animals in it</td>
</tr>
<tr>
<td>Felt unwell</td>
<td>It is comfortable when I am unwell</td>
</tr>
<tr>
<td>Heavy goods</td>
<td>I can carry heavy goods</td>
</tr>
<tr>
<td>I cannot manage without my car</td>
<td>The trip cannot be made without a car</td>
</tr>
</tbody>
</table>

*Table 4.12: Reasons translated into control beliefs*

To study the relationship between the driver’s reasons for using the car and the presence or absence of public transport as an alternative, a logistic regression analysis was carried out with “possible use of public transport” as the dependent variable.

Regression analysis is a method used to investigate and model the relationships between variables. Logistic regression analysis is a form of regression analysis that is used when the dependent variable is dichotomous and the independent variables are continuous variables, categorical variables, or both.
The regression analysis was carried out several times, with different independent variables each time:

(1) Behavioural beliefs

(2) Normative beliefs

(3) Control beliefs

(4) Behavioural beliefs and normative beliefs

(5) Behavioural beliefs and control beliefs

(6) Control beliefs and normative beliefs

(7) Behavioural beliefs, control beliefs and normative beliefs

The analysis was conducted using the software package SPSS.

The analysis was conducted twice. The first time the analysis was conducted to examine the relationship between all the reasons that the driver gave for using the car on the trip and the presence or absence of public transport as an alternative. The second time it was conducted to examine the relationship between the driver's main reason for using the car on the trip and the presence or absence of public transport as an alternative.

Table 4.13 shows the results of the first time that the logistic regression analysis was conducted. The equation was:

\[
\ln \left( \frac{P}{1-P} \right) = a + b_1x_1 + b_2x_2 + \ldots
\]

Equation 4.1

Where:

\( P \) = Probability that public transport could be selected as a mode

\( 1-P \) = Probability that public transport could not be selected as a mode

\( \frac{P}{1-P} \) = The odds of public transport being selected

\( x_1, x_2 \ldots \) = Independent variables.
\[ b_1, b_2 \ldots = \text{Beta coefficients.} \]

The independent variables \((x_1, x_2\ldots)\) can be categorical or continuous. Here, they are categorical, as there are only two possibilities: a reason may or may not be the given as one of the driver's reasons for car use on that particular trip. For each categorical independent variable, a reference group is selected. Here, it is when the independent variable was not selected as a reason.

The beta coefficients show the increase in the odds of the outcome (public transport being selected as a possible alternative) that are associated with the \(x\) variable. For the reference group, \(b = 0\).

A change of \(b\) in \(\ln (P/1-P)\) is the equivalent of a change of \(\exp (b)\) in \(P/1-P\). The odds of the outcome occurring are relative to those in the reference category.

An example is the best way to illustrate this. In Table 4.13 \(\exp (b)\) for "It can be used to trip chain" is 0.5092. The reference category is that the driver has not said that the car was being used to trip chain. Therefore, \(b\) in that case is 0 and \(\exp (b)\) is 1. Thus if the trip involves a trip chain, public transport is 49% \((= 100(1-0.5092))\) less likely to be picked as an alternative.

The significance of the variables is also shown in Table 4.13: if this is less than 0.05, the variable is significant at the 95% level.

The best fit was found when behavioural beliefs and control beliefs were used as the independent variables. The significant variables were:

- It can be used to trip chain  \hspace{1cm} Control belief
- I can escort older people  \hspace{1cm} Control belief
- I need it at work  \hspace{1cm} Control belief
- It is good for long trips  \hspace{1cm} Control belief
- The trip cannot be made without a car  \hspace{1cm} Control belief
- More convenient  \hspace{1cm} Behavioural belief
Table 4.13: Logistic regression analysis for all reasons

Table 4.13 shows that those who had said that one reason for using the car was because of the distances involved were 80% less likely to say that they could use public transport for the trip than those who had not mentioned this as a reason. In the analysis in the previous section, many of those who had said that they had used the car to travel a long way, but that they could have used public transport, wanted better bus routes. Therefore, they had rejected public transport because of current inadequacies in the system, which meant travelling far was very difficult by bus but they would be willing to consider using public transport for those trips in the future if the relevant changes were made.

Drivers who said that they had chosen to use the car because they were making several trips were 50% less likely than those making simple trips to say that public transport was an option. Those who were making the trip by car simply because it was more convenient than public transport were 41% less likely to say that public transport was an option.

Unsurprisingly, some of the more "important" reasons were more indicative of not being able to use public transport. For example, people who said that they could not manage without a car were 67% less likely to say that public transport was a viable alternative. It is perhaps more surprising that some people who felt that they could not manage without a car were able to mention alternatives that they could use on the trip but this may be because they were probed in the interviews to consider the trips quite carefully and they may have re-estimated the importance of the car on some of their trips. Again, those accompanying elderly people were 72% less likely to say that they could use public transport...
and the analysis in the previous sections showed that even those who were willing to consider using public transport in the future would only do so if travelling with dependents, such as children or the elderly became easier. Those who were using the car because they needed it at work were most adamant that public transport could not be used. They were 80% less likely to say that public transport was a viable option to the car.

This shows that it was the control beliefs that had the greatest influence on whether public transport could be considered an appropriate alternative. When the car is perceived as a necessity, for example when it is needed for work or for a longer trip or when the trip could not be made without a car, then people were less willing to consider using public transport. Behavioural beliefs also had some effect on people’s willingness to consider public transport: they had positive attitudes to car use as they considered it convenient. As with the analysis of the reasons for car use and the events that have to occur for people to use a car, people chose to use the car because of the benefits that it offered them over public transport.

The above analysis looked at the relationship between all the reasons that the driver gave for using the car and the presence or absence of public transport as a viable alternative, mentioned by the driver. The more important reasons such as needing the car for work or escorting an older person were shown to have the greatest affect on a car driver’s willingness to consider public transport as an alternative mode. These were the reasons that were ranked most highly in Table 4.8 and were most likely to be selected as main reasons for car use. Therefore, it was decided to conduct the logistic regression analysis by examining the relationship between the main reasons for car use on each trip and the presence or absence of public transport as an alternative to the car.

The equation was for the second time that the analysis was conducted was:

\[
\ln \left( \frac{P}{1-P} \right) = a + b_1x_1 + b_2x_2 + \ldots
\]

Equation 4.2

Where:
P = Probability that public transport could be selected as a mode

1-P = Probability that public transport could not be selected as a mode

P/1-P = The odds of public transport being selected

x₁, x₂,... = Categorical independent variables.

b₁, b₂,... = Beta coefficients.

In this case, the independent variables are categorical, as there are only two possibilities: a reason may or may not be the main reason for car use. The reference group is when the independent variable was not selected as the main reason.

The beta coefficients show the increase in the odds of the outcome (public transport being selected as a possible alternative) that are associated with the x variable. For the reference group b = 0. As was explained before, a change of b in ln (P/1-P) is the equivalent of a change of exp (b) in (P/1-P). The odds of the outcome occurring are relative to those in the reference category. For example, in Table 4.14, exp (b) for “It can be used to trip chain” is 0.4083. The reference category is that the driver has not said that the main reason for car use was that the trip was part of a trip chain. In that case, b is 0 and exp (b) is 1. If the main reason is that the car is used in a trip chain, public transport is 59% (= 100(1-0.4083)) less likely to be picked as an alternative.

The best fit was found when behavioural beliefs and control beliefs were used as the independent variables. The significant variables were:

- It can be used to trip chain
  Control belief
- I can escort older people
  Control belief
- I need it at work
  Control belief
- More convenient
  Behavioural belief
Table 4.14 shows the results of the analysis. The significance of the variable is also indicated in this table. If this is less than 0.05, the variable is significant at the 95% level.

<table>
<thead>
<tr>
<th>Behavioural and control beliefs</th>
<th>Significance</th>
<th>b</th>
<th>Exp. (b)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I can escort older people</td>
<td>.000</td>
<td>-1.9896</td>
<td>.1368</td>
</tr>
<tr>
<td>I need it at work</td>
<td>.000</td>
<td>-1.7244</td>
<td>.1783</td>
</tr>
<tr>
<td>It can be used to trip chain</td>
<td>.000</td>
<td>-0.8958</td>
<td>.4083</td>
</tr>
<tr>
<td>More convenient</td>
<td>.0008</td>
<td>-0.5615</td>
<td>.5703</td>
</tr>
</tbody>
</table>

*Table 4.14: Logistic regression analysis for main reasons*

The analysis shows that public transport is only 43% less likely to be considered as an alternative if the driver has used the car mainly because it was convenient and 59% less likely to be selected if the car was used for a trip chain.

Once more, for the more “important” reasons the probability of considering public transport a realistic alternative was lower. If the main reason for car use is that it was needed at work, it is 82% less likely that the driver could consider using public transport in the future. In the earlier analysis, if this was cited as any of the reasons that that car was used, then public transport was 80% less likely to be selected. Public transport does not seem to be a viable option when escorting an older person is the main reason for car use: it is 86% less likely to be selected. In the earlier analysis, if this was cited as any of the reasons that that car was used, then public transport was 72% less likely to be selected. Therefore, there is agreement between both analyses about which reasons were the most likely to result in public transport being rejected as an alternative.

The analysis indicates that control beliefs and behavioural beliefs play a role in whether or not a person feels that they can use public transport on a trip. Normative beliefs are seen to play a less important role in modal choice. Control beliefs, in particular, were very important in determining whether a person would consider using public transport. The car was perceived as being easy to use and these trips could not be made on public transport, according to the drivers.
The analysis of the data shows that car drivers are willing to consider public transport for some of the trips that they made by car and they described what would have to happen for them to be able to use it. However, there were trips where public transport was not an alternative that they would use. The analysis that was described in this section looked at the reasons that drivers gave for using their cars on these trips and expressed them as behavioural, control and normative beliefs about the car. It was shown that people felt that they had high levels of control over car use: they could use it to escort older people, to travel during their working day on or to trip chain. They did not feel the same level of control over using public transport.

The importance of normative beliefs was not demonstrated in this analysis. In part, this may be because the survey was not originally designed to collect information to be analysed using the Theory of Planned Behaviour. Therefore, the author of this thesis has made assumptions in converting the reasons for car use into beliefs. There were few reasons that could easily be translated into normative beliefs. In the later studies of Croydon and Dublin, the survey have been explicitly designed to collect information about people’s behavioural, normative and control beliefs so the analysis of these studies will identify if normative beliefs play the same role as behavioural and control beliefs seem to play in people’s modal choices.

4.3 Summary

This thesis aims to show the complexities involved in travel decisions and to look at the potential impacts of new urban public transport on people’s travel behaviour. In this chapter, the results from this large-scale quantitative study of car drivers in the UK were analysed to examine modal choices and the complexity of modal choices.

The first section of this analysis showed that drivers express an interest in using public transport but that they want more extensive routes and better services. They are unhappy with the current services that are available to them and choose the car over public transport because of the flexibility it offers them. In Table 4.6 and 4.9, it was shown that people had chosen to use their cars because they
allowed them to travel further, to carry heavy goods, to save time and to escort their children. On the other hand, public transport was seen as being difficult to use: it involved having to make several mode changes on some trips, long walks to bus stops and was perceived as being unsafe for children. It would be expected, therefore, that systems such as those in Dublin and Croydon would improve people’s perceptions of public transport and would encourage more people to use them rather than their cars. The analysis of the data in this chapter implies that new urban transport systems have to be more extensive, less rigid and easier to use if they are to compete with the car. These are all aims that the Croydon light rail system, the Dublin light rail system and many other systems share as will be described in Chapter 5. The studies carried out in Chapter 6 and 7 will demonstrate whether or not this has actually had any impact on people’s intentions regarding the systems.

In the second part of this chapter, the data was analysed using the Theory of Planned Behaviour. This analysis reinforced the fact that people were not considering public transport as an alternative mode to the car because of its inflexibility, its inconvenience and the difficulty associated with using it. The car could be used for trip chaining and it was considered more convenient than other modes. The analysis using the Theory of Planned Behaviour also showed that drivers are not prepared to consider public transport as an alternative on all trips, even if improvements are made. Control factors, such as needing a car for work or escorting elderly people, were most likely to prevent them from using public transport.

The data in this study was not originally collected for analysis with the Theory of Planned Behaviour. However, the application of the theory has proven to be quite effective in examining modal choices. There have been positive relationships between people’s beliefs about modes and their actual behaviour. Also, people’s attitudes and perceived behavioural control were shown to play a role in determining people’s modal choices. In addition, applying the theory to existing data enabled the interviews and questionnaires for the Dublin and Croydon studies to be designed more effectively. For example, the survey described here did not consider the importance of normative beliefs on people’s travel behaviour.
and so it was highlighted that this was an area that would have to be included more explicitly in the studies in Dublin and Croydon. The following chapters describe studies, which were designed for analysis with the theory and so will serve as better demonstrators of the ability of the theory to explain modal choices.
PAGE NUMBERING AS ORIGINAL
Chapter 5

Croydon Tramlink and Dublin Luas
5.1 Introduction

The objectives of this thesis are to study the impacts of new urban public transport systems on people's travel behaviour, to examine the decision-making processes behind choosing to travel by the new mode and to illustrate the complexities of these processes. As was seen in Chapter 4, many drivers are unhappy with the current public transport system that they are offered and claim that better, more flexible and more convenient public transport would allow them to use it. The drivers in the study in Chapter 4 claimed to use their cars because they offered them flexibility and convenience. In Dublin and Croydon, two new systems were being built at the time of the study that were meant to offer people public transport that was more convenient, quicker and more efficient and therefore could be expected to attract more people onto public transport. However, as was pointed out in Chapter 2, forecasting the impacts of new public transport systems on peoples' travel behaviour is not always accurate as the choices that people make with regard to transport are complicated and not well-understood. The construction of two new light rail systems in Dublin and Croydon offered an opportunity to exam people's motivations behind choosing to use or not to use the new systems. As was discussed in Chapter 2, it was decided to examine how people had formed their intentions regarding these systems using the Theory of Planned Behaviour.

In Croydon, a series of in-depth interviews was carried out with potential users of Tramlink to find out what factors had played a part in their decisions to use or not to use Tramlink. These users were again contacted six months after the system opened in order to determine whether their intentions had accurately predicted their actual behaviour. Meanwhile, the system in Dublin, called the Luas gave the opportunity to investigate the intentions of people with respect to a light rail system at a much earlier stage of development. It is important to know at this stage whether people are willing to use the system, before any significant capital is invested in constructing the infrastructure. The first section of Luas will not be ready to open until 2002 and so it is at a very different stage of development to Tramlink. Again, the intentions of potential users of the Dublin system were measured. This time, however, questionnaires were distributed to
205 people. This was because it was felt that people would not be so aware of Luas as people in Croydon were of Tramlink and would not have formed opinions that were as strong or as complex.

The following chapters (6 and 7), describe how the studies were conducted in Croydon and in Dublin, what results were collected and how these were analysed. However, in order to understand people's responses to the systems it is necessary to know how they came about and what problems were encountered, as this will affect people's normative, behavioural and control beliefs and their attitudes, subjective norms and perceptions of behavioural control. For example, in Chapter 2, it was stated that the construction problems experienced by Sheffield Supertram during its construction had a profound negative effect on people's perceptions and readiness to use the system. Therefore, this chapter will describe the histories of Tramlink and Luas and some of the details of their construction. It will also describe how Tramlink operates and Luas will operate: timetable details and ticket prices will influence a person's modal choices. In addition, the routes of the light rail systems will be described. The chapter will also mention some of the problems that delayed the opening of the Tramlink.

5.2 The history of Tramlink

5.2.1 Introduction

Croydon is the second largest urban area in the South East. It has a population of approximately 335,000. Congestion is reported as being the most serious problems preventing businesses from locating in Croydon (Anderson, 1999). It is hoped that Tramlink will be able to reduce some of this congestion by offering drivers an alternative to the car. Tramlink is expected to attract 20,000 passengers a day in the morning rush hour and it is expected that, after 18 months, 26 million passengers will use Tramlink a year (Anderson, 1999). One of the objectives of the Tramlink operators is that 10% of its passenger journeys will replace car trips (Feakins, 1999b).

Another objective for Tramlink is to improve connections from Croydon to London. All the routes will stop at East Croydon, which is the main station in Croydon for trains to London. Tramlink will also connect Croydon to
Wimbledon Underground Station, where the District Line on the tube continues into the west London and to the train station in Wimbledon where there are services to Waterloo.

5.2.2 The starting point for Tramlink

Tramlink is not the first tram system on the streets of Croydon. Trams ran in Croydon from 1901 until April 1951. Over the years trolley buses and then diesel buses have replaced them. In 1990, London Transport and the London Borough of Croydon became joint promoters of a new light rail system for Croydon. In the summer of 1991, tenders were invited from companies to invest in the design of Tramlink. The Government wanted companies to contribute private funding to Tramlink. At this stage, three companies were chosen to develop the Tramlink Project with London Transport and the London Borough of Croydon. These were Transdev who are French operators, AEG (UK) who are German rolling stock manufacturers and Tarmac Construction, a British construction company. These companies had to prepare performance specifications for the Tramlink and a contractual structure for the second stage of the competition.

London Transport deposited a Private Bill in Parliament in November 1991. In July 1994 the Croydon Tramlink Act was granted Royal Assent. A year later, tenders were invited to design, build and operate the Tramlink. Four tenders were submitted. London Transport felt that all the tenders required too much public spending but after consultation with the London Borough of Croydon and London Transport, a 99-year concession to design, build and operate Tramlink was awarded to a consortium of private companies called Tramtrack Croydon Limited (TCL). This company was made up of the following members:

(1) CentreWest Buses Ltd. is the Tramlink operator. This is a subsidiary of First Group plc.

(2) Bombardier Eurorail supplied the vehicles and carriages. This is a consortium of companies from France, Belgium, Austria and Britain.
Sir Robert Mc Alpine and Amey Construction Ltd. have come
together to form Construction Joint Venture (CJV). They have built
the infrastructure required for Tramlink.

The Royal Bank of Scotland plc and 3i organised the private sector
Project Financing for Tramlink.

Preparations for the construction of Tramlink started in 1997 when utilities were
diverted. This was completed in the summer of 1998. The first Tramlink line
from New Addington to Croydon opened on the 10th of May 2000. The
Beckenham Junction to Croydon route opened on the 23rd of May 2000 and the
route from Wimbledon to Croydon opened on the 30th of May.

5.2.3 Financing Tramlink

TCL was awarded the Concession Agreement to build and operate Tramlink
under the Government’s Private Finance Initiative (PFI). This means that
Tramlink had to attract private funding and be led by the private sector. TCL
may retain fare revenue in order to finance Tramlink but all risks that are
associated with construction and operation are transferred to them from the
public sector. TCL were selected as concessionaires as they required the least
public sector funding of the four tenders submitted. They were awarded a 99-
year concession: 3 years to build the infrastructure and 96 years to operate
Tramlink (Kendall, 1999).

The scheme has cost £200 million, of which the Government has funded £125
million. There has been some confusion in Croydon amongst the public about
where the remainder of the money has come from: a survey carried out for
Croydon Council in 1998 showed that 59% of respondents thought that the
Council was funding Tramlink (Spring, 1998). In fact, the remaining finance has
been borrowed from the Royal Bank of Scotland and 3i by TCL and it will be
paid back as fare revenue is collected.

In order to receive public sector funding under the PFI, a project must show that
it is financially viable and that passengers and other road users will benefit from
its construction. There will be no more public sector funding for Tramlink when
it is operational. It is expected that it will be funded mostly by fare revenue in the future (Kendall, 1999). In order to meet its financial targets, Tramlink must attract at least 20 million passengers a year (Kendall, 1999).

Responsibility lies solely with TCL to ensure that Tramlink is successful. London Transport has retained the right to determine fare levels, standards of stops and vehicles and the level of service that the operators must provide (Tarr, 1999).

5.2.4 Construction of Tramlink

Utility diversions were commenced in January 1997 and were overseen by London Transport. These continued for 18 months. The companies involved were:

- Thames Water
- British Telecom
- British Gas
- Seeboard
- Telewest
- Mercury
- National Grid

Croydon was divided into zones for the purpose of this work. When a zone was being worked on, two buffer zones were maintained on either side. This was to prevent traffic problems (Cunningham, 1999). In each zone, work on Tramlink commenced 6 months after utility diversions were commenced. Therefore, building of Tramlink did not commence until July 1997. This led to some concern in the general public who could not see any work being carried out over ground from January 1997 to July 1997. Therefore, they felt that no progress was being made on Tramlink, even though they were suffering delays on their trips. At the same time businesses were suffering disruptions and some people in the
interviews described in chapters 6 and 7 said that Tramlink had put people out of business.

Construction of Tramlink started on the central Croydon loop, the New Addington section and the depot at Therapia Lane. The Croydon loop is 5.5km long and is all on street. Of this, 2.4km is separated from traffic, 0.9km shares road space with taxis and buses only and 2.1km shares space with all other traffic. Businesses in Croydon reported losses of trade during the construction work (Croydon On-line Press Release, 1997).

Figure 5.1 shows the Tramlink routes.
The New Addington route runs on an alignment that is parallel and adjacent to the highways. This is almost entirely purpose built for Tramlink (Cunningham, 1999). On this route, Tramlink passes through an area of environmental interest so care had to be taken to protect badgers that live there when the alignment was selected (Anderson, 1999). Tunnels were built for them under the tram tracks and construction work had to be halted from November 1997 to June 1998 in order not to disrupt their mating season.

The depot at Therapia Lane, on the Wimbledon line, is the centre of operations. It was also the location to which trams were delivered so it was important that it was built early on in the scheme. The Wimbledon route runs entirely on former railway corridor. Much of the route to Beckenham also runs on former railway lines. On these routes, the new alignment for Tramlink was substantially different to that of the old heavy rail and much work had to be done to ensure that the new track, the masts, power ducts and communication ducts were fitted in (Cunningham, 1999).

There are 38 stops on the Tramlink routes. These stops are all 32.2m long and 350mm above the track. When Tramlink stops at the platform, the doors line up with it exactly so there are no difficulties for the mobility impaired to access the vehicle. In some of the interviews carried out with people in Croydon for this thesis, people said that they would use Tramlink for shopping as they had been told it would be easy to get on and off with shopping, because of these stops.

Tramlink uses some old Railtrack stations when it runs from Wimbledon to West Croydon and from Elmers End to Addiscombe Road; both sections are on the Wimbledon route. It was decided to demolish the platforms at most of these stations and to construct new ones. At Wimbledon Station and Elmers End Station, the platforms have not been demolished: instead the track level has been raised. This is to allow people to interchange at platform level. It is a very important objective of Tramlink to allow greater access to London and there was evidence, as will be seen in Chapter 7, that people were going to use Tramlink to get to train stations which would allow them to travel on to London.
There have been some problems with construction and some adverse publicity. In Croydon centre, the public have not welcomed the large H-Section girders that TCL have used for the overhead line (Feakins, 1999a). These sections are rolled steel joists up to 34 * 34 cm and up to 11 m high. TCL have defended the use of the sections by claiming that the cost of slimmer, tubular poles, as used in Nantes and Grenoble, was not economically feasible (Snowdon, 1999). However, there has been much negative publicity about the visual intrusiveness of the heavier sections and many feel that they have been over-engineered (Feakins, 1999a). In this thesis, even interviewees who were generally positive about Tramlink mentioned that it did not contribute to the urban environment when these large girders were used.

Tramlink was originally due to open on the 4th of November 1999 and, as late as June 1999, TCL officials were claiming that Tramlink could open two weeks earlier than scheduled (Tarr, 1999). Construction was ahead of schedule and tests were continuing as planned. However, Tramlink opening was delayed with the New Addington line opening on the 10th of May 2000.

There have been problems on the Addiscombe Road, on the Central Croydon loop with drainage problems. A filler used during construction has been absorbing water, which lead to earth leakage problems. In addition, there have been several problems at East Croydon, which lead to the track being taken up and in December 1999 there were no stops completed on the routes.

Tramlink also failed to satisfy Her Majesty’s Rail Inspectorate (HMRI) that all the signals were safe, in time for a November opening. There have also been timetabling problems. Tramlink had to satisfy London Transport that it could run trams on the agreed 21-trams/hour service and that it could also provide a saturation service. Tramlink had to be able to run at 33% higher capacity, in other words provide a 28-trams/hour service, if required with no major changes to the system. There have been numerous problems in achieving these goals. Accidents have put trams out of action and track problems have delayed the runs on all the lines.
When it became obvious that Tramlink would not open until 2000, it was proposed to open it in stages with the New Addington route coming into service in April. However, problems with the track construction, passenger information displays and traffic lights led to more delays. There were disagreements between Construction Joint Venture (CJV) and TCL about the handover of Tramlink to TCL, because of these problems. TCL refused to take possession of Tramlink as they felt that CJV had not completed Tramlink satisfactorily. CJV had not met all the London Transport timetabling requirements. In addition, bus companies in Croydon had to be given two weeks notice before Tramlink started operating so that changes may be made to routes where the trams and buses may overlap.

These delays mean that Tramlink opened in stages in May 2000.

5.3 Tramlink Routes

5.3.1 Introduction

Tramlink has a 28km route: 14km runs on former British Rail track. The remainder runs on street: 8.5km runs on new rights-of-way and 5.5km runs on existing roads (Cunningham, 1999). Figure 5.1 shows the three main Tramlink routes. There are 38 stops on the routes and the average distance between stops is 750m. However, the distance between stops varies from 350m to 1600m.

5.3.2 Croydon Town Centre

In Croydon, the route follows a clockwise circuit of the town centre: this part of the route will be all on street. The route starts at East Croydon Station, which is the main interchange for people travelling from Croydon to London, and continues on to George Street. There is a stop at George Street West, near the pedestrianised North End. This stop is to allow people to get into the shopping area of Croydon. From here the route goes on to Reeves Corner. This is the point where trams to and from Wimbledon leave and enter the loop of central Croydon. The route proceeds to a stop at West Croydon train station and then back to East Croydon station via a stop at Wellesley Road. This is a very busy street and trams run on a segregated track on the central reservation.
At East Croydon the route proceeds to Lebanon Road along Addiscombe Road. Only buses, trams and taxis can use Addiscombe Road. Trams run in both directions along this road. At the Sandilands Junction stop, the route diverges: trams go to New Addington, Beckenham Junction and Elmers End from here.

5.3.3. Sandilands to New Addington

New Addington is a council estate with very poor links to Croydon. The trip by tram takes 17 minutes by tram rather than 40 – 60 minutes by bus (Tramlink Information Pack, 1999). However, there is a need for feeder buses in New Addington, and the stop at Addington Village does not seem to serve the village very well. It has been built as an interchange with feeder buses running to it rather than as a stop for the village. Other problems on this route include the potential vandalism of trams and stops in New Addington, which is an area with a high crime rate and high unemployment. In addition, the tram passes through some very sparsely populated areas on its route to New Addington, which is not beneficial to patronage levels. However, this route is a very important route for Tramlink: it replaces the very infrequent 130 bus to New Addington, although there will be a need for feeder buses to parts of the New Addington estate.

When this route leaves the circuit of Croydon at East Croydon, it will continue to Sandilands where it diverges from the Beckenham Junction route and the Elmers End route to head South East to New Addington. The route continues from Sandilands on the old railway track and passes through three tunnels: the Woodside Tunnel, the Park Road Tunnel and the Coombe Road Tunnel. After this the route continues on to Larcombe Close where it crosses the site of the old Coombe Road railway station. The tram route proceeds to cross Lloyd Park Avenue. The route continues on to Oaks Road. It crosses Coombe Lane and goes into the grounds of Heathfield before reaching the Gravel Hill stop, opposite Addington Palace. Then the route goes to Kent Gate Way, running alongside Addington Park. From here, the route proceeds to a stop on the southern end of Addington village, where there is a bus interchange. From Addington Village the tram route proceeds along Lodge Lane stopping at Fieldway and King Henry’s Drive, to New Addington where there is another bus interchange.
5.3.4 Sandilands to Beckenham Junction

At Sandilands Junction, the route to Beckenham Junction follows the disused railway line to stop at Addiscombe Road, Blackhorse Lane and Woodside. Both Blackhorse Lane and Woodside were train stations in the past. The route continues to Area where it diverges from the Sandilands to Elmers End route to head to the north. It passes by South Norwood Park to a stop at Harrington Road. Just before the Birkbeck stop the trams start to share the route with Railtrack. This is the Crystal Palace – Beckenham Junction Railtrack route. There are stops at Avenue Road and Beckenham Road before reaching Beckenham Junction. On this route, there are train interchanges at Birckbeck for connections to London Bridge and at Beckenham for connections to Victoria and Brixton.

While the route to New Addington replaces an infrequent bus service, the route to Beckenham is less easy to justify. It may be that the route was selected as there were already rail track to Beckenham Junction, which could be used by Tramlink.

5.3.5 Sandilands to Elmers End

At the Sandilands Junction the route to Elmers End follows the same route described above as far as Arena. Here the route continues straight on towards Elmers End, where there are connections to Charing Cross, Lewisham and London Bridge. The route follows a former railway line.

5.3.6 Reeves Corner to Wimbledon

There was no bus service between Croydon and Wimbledon so this route improves links greatly: the journey previously could only be made by train. In addition, travelling to London via the underground at Wimbledon is also made much easier.

The route to Wimbledon leaves Croydon at Reeves Corner, and follows the former road alignment to a stop at Wandle Park. Here it follows the old railway route to Mitcham Junction, with stops at Waddon Marsh, Ampere Way, Therapia Lane and Beddington Lane. Therapia Lane is the location of the depot. This is
the centre of Tramlink operations. Tramlink's route then proceeds to follow the old railway line to Mitcham Junction where it runs beside the railway station. There are interchanges here to Sutton and Clapham Junction. The route continues on to Mitcham, Belgrave Walk, Phipps Bridge, Merton Park and Wimbledon. In Wimbledon, the trams will go directly into the station to allow easier interchanges from Tramlink to train.

Many people interviewed were going to use Tramlink to make the trip to Wimbledon on leisure trips. These trips would be infrequent, as described in Chapter 7, but it is apparent that Tramlink will generate some new trips along this route.

### 5.4 Tramlink Operations

#### 5.4.1 Tramlink Vehicles

Bombardier has supplied the trams. Table 5.1 shows the details of the 24 Tramlink passenger vehicles. People working in Croydon, such as those people who were interviewed for this thesis, had seen these vehicles running through Croydon on test-runs for several months before Tramlink was opened. They had seen that the vehicles were spacious, with lots of standing room, as is apparent from this table. They would also have seen that the tram is a low-floor and easy access vehicle. The floor height at the entrance is 400mm – this is to ensure that there is disabled access. There are 4 doors on each side of the carriages.

<table>
<thead>
<tr>
<th>Vehicle Characteristics</th>
<th>Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tram Length</td>
<td>30.4 m</td>
</tr>
<tr>
<td>Tram Width</td>
<td>2.65m</td>
</tr>
<tr>
<td>Tram Height</td>
<td>3.36m</td>
</tr>
<tr>
<td>Seats</td>
<td>70</td>
</tr>
<tr>
<td>Standing Spaces</td>
<td>138</td>
</tr>
<tr>
<td>Total Capacity</td>
<td>208</td>
</tr>
<tr>
<td>Doors</td>
<td>8</td>
</tr>
<tr>
<td>Max Speed</td>
<td>80 km/hr</td>
</tr>
</tbody>
</table>

*Table 5.1: Tram Details (Source: Hull, 1999)*
Changes were made to tram vehicles after they were delivered to Croydon in order to comply with Disability Discrimination Act. All the doors had to have black strip doors. Those trams with advertising were especially difficult to alter, as some of these were already black. These trams had to have the doors changed to white. One set of doors on each side of the vehicle has a wheelchair logo to indicate the position of the wheelchair area. There is level access at the doors to 76% of the floor space in the vehicle. The remaining floor space may be accessed via a single step.

5.4.2 Tramlink Timetables and Tickets

In London, London Transport has a statutory duty to provide and monitor public transport services (Tarr, 1999). Therefore, according to the Concession Agreement, TCL must comply with a performance specification, which is decided by London Transport. This specification covers such areas as frequencies, timetables, noise pollution, fares and cleanliness of the vehicles and the stops. London Transport will also take responsibility to re-route buses so that Tramlink and buses compliment each other rather than compete with each other (Tarr, 1999).

Table 5.2 shows the service frequencies of Tramlink on each of the routes and Table 5.3 shows the times of the first and last trams.

The trams have very short headways, especially during the weekdays. The frequency of the service should encourage commuters to use Tramlink. Table 5.3 shows that Tramlink operations will start very early in the morning and finish much later than the current bus service in Croydon. This should allow more people to choose to use Tramlink for social trips into Croydon at nighttime, rather than having to rely on their cars, as is currently the case.
<table>
<thead>
<tr>
<th>Day</th>
<th>Time</th>
<th>Frequency</th>
<th>Table 2: Frequency of Tramlink on the different routes (Source: Tramlink Information Pack)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday</td>
<td>06:00 - 07:00</td>
<td>Weekdays AM</td>
<td>Croydon - Beckenham - Elmers End - Wimbledon Routes</td>
</tr>
<tr>
<td>Monday</td>
<td>07:00 - 08:00</td>
<td>Weekdays Evening</td>
<td>Croydon - Beckenham - Elmers End - Wimbledon Routes</td>
</tr>
<tr>
<td>Saturday</td>
<td>08:00 - 18:00</td>
<td>Weekdays Day Time</td>
<td>Croydon - Beckenham - Elmers End - Wimbledon Routes</td>
</tr>
<tr>
<td>Sunday</td>
<td>19:00 - 00:00</td>
<td>Saturday Evening</td>
<td>Croydon - Beckenham - Elmers End - Wimbledon Routes</td>
</tr>
</tbody>
</table>

Key:
- Croydon
- Beckenham
- Elmers End
- Wimbledon
- New
<table>
<thead>
<tr>
<th>Routes</th>
<th>First Tram: Weekdays</th>
<th>First Tram: Saturday</th>
<th>First Tram: Sunday</th>
<th>Last Tram</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wimbledon - Croydon</td>
<td>06:00</td>
<td>06:10</td>
<td>07:40</td>
<td>00:10</td>
</tr>
<tr>
<td>Croydon - Wimbledon</td>
<td>05:19</td>
<td>05:27</td>
<td>07:27</td>
<td>23:57</td>
</tr>
<tr>
<td>Croydon - Elmers End</td>
<td>05:00</td>
<td>05:04</td>
<td>07:05</td>
<td>00:35</td>
</tr>
<tr>
<td>Elmers End - Wimbledon</td>
<td>05:30</td>
<td>05:30</td>
<td>07:38</td>
<td>00:08</td>
</tr>
<tr>
<td>Beckenham - West Croydon</td>
<td>05:49</td>
<td>06:08</td>
<td>07:38</td>
<td>00:38</td>
</tr>
<tr>
<td>West Croydon - Beckenham</td>
<td>05:27</td>
<td>05:44</td>
<td>07:14</td>
<td>00:14</td>
</tr>
<tr>
<td>Junction</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Addington - West Croydon</td>
<td>04:55</td>
<td>04:55</td>
<td>06:34</td>
<td>00:49</td>
</tr>
<tr>
<td>West Croydon - New Addington</td>
<td>04:29</td>
<td>04:29</td>
<td>06:08</td>
<td>00:11</td>
</tr>
</tbody>
</table>

Table 5.3: Time of the first and last trams at ends of each route (Source: Tramlink Information Pack)

The company that will be taking over the operations of Tramlink is called Tram Operations Limited (TOL). This is a subsidiary of CentreWest, which is owned by the First Group plc. TOL was set up in 1997 and it has a 30-year contract with TCL to run Tramlink (First Tram Operations, 1999). It took over Tramlink from CJV. However, as described previously, there were problems with the hand-over of Tramlink from CJV to TCL. Prior to opening, CJV was required to demonstrate that Tramlink could operate to the timetable for two weeks. There were several delays in achieving this.

Tramlink tickets are on sale at every stop through a ticket machine and also in newsagents. London Transport and Travelcards are accepted on Tramlink, as London Transport are very eager that Tramlink is used in conjunction with other modes of public transport and is seen to compliment these modes (Tarr, 1999). There is also a special One Day Bus and Tram Pass that allows unlimited travel on bus and tram services in zones 2-4.
London Transport has the right to determine the fares on Tramlink (Tarr, 1999). The fares are 90p for a single trip and 40p for a child fare. Trips to Wimbledon from Croydon, however, will cost £1.30.

5.4.3 Tramlink Publicity

Croydon Council have not had any part to play in the construction of Tramlink infrastructure, apart from approving the detailed design and ensuring that traffic was managed effectively during the construction phase (Anderson, 1999). Tramlink is to be operated completely by TCL and the Council will have no part to play beyond its usual role as a local authority. However, the Council have been involved in publicising and marketing Tramlink with TCL (Anderson, 1999).

Croydon Council conducted a survey in 1991, in order to gauge public opinion of Tramlink (Walker, 1997). The results have often been quoted in Tramlink literature. Ratepayers in Croydon were issued a questionnaire. Only 20% of those questionnaires returned indicated an outwardly negative response to Tramlink. However, few people felt that Tramlink was ever likely to be a reality at this stage so it is unlikely that 80% of those questioned were very in favour of Tramlink as is often reported in TCL’s and the Council’s literature (Walker, 1997).

In 1996, the Council carried out a series of consultations with shop and business owners on Croydon’s streets to ascertain what type of arrangements they would require for deliveries and access when construction commenced. However, as people did not think that Tramlink would ever be a reality at this stage, the consultations met with a very poor response (Walker, 1997).

As construction commenced in 1997, however, interest in Tramlink increased. The Council conducted several public consultations and questionnaires of the public’s opinions. In addition, exhibitions were set up in supermarkets in order to inform people about Tramlink (Spring, 1998). The Council also set up an Information Shop in Croydon town centre. This Information Shop contained details of routes, construction plans and sold merchandise pertaining to Tramlink. Croydon Council also produced an information pack with details about tram
vehicles and routes. This was available in hard copy form and also on a web site maintained by the Council.

TCL and the Council produced fact sheets each week, which detailed construction news and changes to traffic. These were available at the Council offices and on TCL's web site, although this web site was rarely up-dated and maintained the message “Web site under construction” for the duration of the construction of Tramlink.

There have been criticisms about both TCL and the Council’s publicity: they have been criticised for being too low key and for not keeping people informed of all developments (Tarr, 1999).

One source of confusion for the public has been ticketing prices. Until very shortly before Tramlink opened, very little information about Tramlink’s pricing structure or bus/tram interchanges had been made freely available and members of the public did not seem to know if Tramlink was to be included in London Transport’s Travelcard scheme.

Other problems arose when the Tramlink Information shop in Croydon closed from September 1999 until November 1999 for refurbishment. In addition, the weekly up-dates also stopped in the autumn of 1999 for a period. This was especially unfortunate given that Tramlink’s planned opening date of the 4th of November 1999 was approaching and people were left with no source of information as to whether the system would be ready or not.

Even when the weekly up-date sheets produced by TCL and the Council about road closures and construction were being produced, not everyone knew where to find them as they were not distributed to houses.

Finally, with the numerous delays that prevented Croydon Tramlink from being opened there was much confusion in Croydon as to when the tram would be operational. No information was made available to the public and it seemed as if TCL up-dated the opening date every week. Eventually, Tramlink started operations in May 2000.
5.5 The history of Luas

5.5.1 The starting point for Luas

Dublin is a capital city with a population of 1.3 million. Recent years have seen an unprecedented surge in economic growth so that what used to be one of Europe's poorest cities is now one of its richest. This has led to higher levels of car ownership, population growth and congestion. It has also led to the most rapidly rising house prices in Europe and the development of large suburbs on the outskirts of the city and of commuter towns in counties neighbouring Dublin, resulting in high levels of peak hour congestion as people commute from these areas. If this congestion is to be reduced, a significant improvement has to be made to the provision of public transport in the city.

Currently, the only form of public transport available to most people in Dublin is the bus, although there is a heavy rail system called the Dart (Dublin Area Rapid Transit) that runs along Dublin's coast from Howth to Dun Laoghaire, suburbs to the north and south of the city respectively. The bus routes have been upgraded in recent years and "Quality Bus Corridors" (QBCs) have been put in place or are planned for 11 routes into the city centre. These are corridors where buses have a dedicated 24-hour lane available to them. However, most of Dublin's bus routes only provide access to the city centre and not across the city. In addition, it is recognised that buses alone will not achieve the transfer from car to public transport that is required if the rise in congestion is to be halted (Dublin Transportation Initiative Final Report, 1994).

Therefore it has been decided to build a light rail system in Dublin. This system, in its first phase, will consist of four lines, as shown in Figure 5.2. The light rail system will be called the Luas, which means "speed" in Irish. It is expected that Luas will achieve a transfer from car to public transport in excess of 8,000 trips in the 2011 morning peak (Dublin Transportation Initiative Final Report, 1994). In addition, the Luas routes have been selected so that they will help urban regeneration in disadvantaged parts of Dublin. There will also be a line to the airport, which at the moment is only accessible by road. The system will be extended in the future and parts of it may be upgraded to metro.
Figure 5.2: Dublin light rail: Luas routes
5.5.2 Financing Luas

Luas will be one of the first Public Private Partnership (PPP) projects in Ireland. It is intended that it will be partly financed by private companies who will be allowed to keep the revenue. The Irish government will provide €430 million to build the surface lines and €160 million for the underground section.

5.6 Luas Routes

5.6.1 Line A

Line A will connect the north inner city to Tallaght, a suburb that is south of Dublin city. Tallaght is a very large suburb with a population of 75,000 people. Parts of Tallaght have unemployment rates of up to 53% and much of the housing is council housing. Recently, however it has enjoyed a period of regeneration. The largest hospital in Dublin was opened in 1998 in Tallaght. One of the biggest shopping centres in Europe was opened in Tallaght’s town centre in 1988. South Dublin County Council, which employs 1,100 people, has its headquarters in Tallaght. There is also a third level college in Tallaght. It is intended that Luas will play a part in regenerating Tallaght by providing better access to the city centre and by making Tallaght more accessible from other suburbs in Dublin.

Line A will be a 14km long route from Tallaght to Middle Abbey Street. Of this, 7km will run on street. There will be 5-minute headways between trams and the journey from Tallaght to the city centre will take 38 minutes (Department of Public Enterprise, 1998) The line will carry 2800 people an hour in both directions.

Construction of the first Luas line (Line A) commenced in April 2000. This line is due to open in 2002.

5.6.2 Line B

Line B will run from Sandyford, a suburb in the south, to the city centre. It will run along the old Harcourt Street railway line. It will carry 3000 people an hour
and there will be a five-minute headway (Department of Public Enterprise, 1999). The journey will take 22 minutes.

There will be a short underground section between St. Stephens Green and Broadstone, although exactly where this will be has not been decided as yet (see figure 5.2). This underground section has proven to be a contentious issue. Some people are very supportive of the underground option while others see it as an unnecessary expense and believe that it will simply cause problems during construction (Department of Public Enterprise, 1999). WS Atkins, who were the consultants who originally compiled the report about the various light rail options for Dublin, recommended that a surface option be chosen as it was felt that the disruption that the construction of an underground line would cause would be very severe (Dublin light rail transit study, 1998).

Construction on Line B started in Autumn 2000 and will be competed in 2003. There are plans to extend this line further south to Cabinteely.

5.6.3 Line C

Line C is a very short but very important part of the light rail route for Dublin. This line will connect Line A at Abbey Street to Connolly Station. Line A will have a stop at Heuston Station, the railway station that offers services to the south of the country (Cork, Waterford, Limerick and Kerry). This station is located in the west of Dublin. Connolly Station is located in the east of the city and offers services to Belfast and the north of the country. At present, the only connection between these two railway stations is by bus or by car. Line C will also provide connection to Busáras, the regional bus station.

Construction of Line C is scheduled to commence in Spring 2001 and the line will open in Winter 2002.

5.6.4 Line D

Line D will form the route from the city centre to the airport, which is north of the city centre. At present there is no rail access to the airport. Dublin is the only city in Europe with an airport catering for more than 10 million passengers.
annually that does not have a city centre rail link to the airport. The exact route that this line will follow has not been decided as yet. This line will not open until 2005.

5.7 Summary

This chapter has described the how Croydon Tramlink and Luas were planned and problems that were faced during planning and construction. The objective of this thesis is to examine the potential impacts of new urban public transport systems with a view to improving the understanding that is held of people’s reactions to changes in public transport supply. It is intended to examine the perceptions and beliefs that people have with regard to new public transport systems. The problems faced by any new system and the issues that arise during planning and construction have an influence on people’s perceptions and beliefs. Therefore, this chapter played an important role in describing some of the areas that could affect the opinions and intentions of potential users of Luas and Tramlink.

In the next two chapters, the studies carried out in Dublin and Croydon, the results and the analysis of these results will be described. This will demonstrate whether any of the issues mentioned in this chapter had an effect on people’s travel behaviour and decision-making processes.
Chapter 6

Methodology of the Study
6.1 Introduction:

This chapter describes the study that was carried out in Croydon to examine the stated modal choices of potential users of Tramlink. The study was conducted between April 1999 and February 2000. A study of the interviewees' actual behaviour was carried out 5 months after Tramlink opened and this is also described in the chapter. In addition, the chapter describes the study conducted in Dublin to test the methodology that arose out of the studies in Croydon.

It was discussed in Chapter 2 that modal choices are complex and that it is difficult to model the decision-making processes behind them. In this thesis, it is intended to look at the potential impacts of new urban public transport systems and to try to understand the motivations behind people's travel decisions. Therefore, it has been decided to use the Theory of Planned Behaviour to investigate how people in Croydon and Dublin made the decision to use or not to use Tramlink and Luas. In addition, the follow-up study in Croydon of interviewees' actual behaviour allows the forecasting ability of the theory to be tested.

Already, the analysis of a large-scale survey of car drivers in the UK has been described in Chapter 4 (Mackett, 1999; Ahern and Mackett, 2000). This was a conventional study, carried out by means of interviews with car drivers about their actual trips. The data from these interviews was analysed in Chapter 4 and it was shown that drivers are interested in using public transport but currently think that public transport systems are inadequate. Therefore, it would be expected that improving the public transport supply by building new systems such as Tramlink and Luas would attract more people to use public transport.

In this thesis, an attempt has been made to analyse the modal choices of the interviewed car drivers using the Theory of Planned Behaviour, as was described in Chapter 4 (Ahern, 2000). This yielded interesting results and showed that drivers find the car easy to use and have more positive attitudes to it than towards existing public transport systems. In addition, it was shown that attitude and perceived behavioural control seemed to play a role in determining the drivers' behaviour. However, the data was not originally collected to be analysed with
this theory. When analysing the data for the thesis, it was necessary to make assumptions about people's behavioural, normative and control beliefs as has been described in Chapter 4. However, the work carried out on existing data served as a good test of the application of Theory of Planned Behaviour to travel behaviour research before the studies in Croydon and Dublin were designed.

This chapter will examine in more detail the relationship between improvements in public transport and the desire to use it. At this point, it is worthwhile recalling the original objectives of the thesis before describing how those objectives have been achieved with the work described in this chapter. In summary, the objectives of this thesis are:

1. To contribute to and improve existing understanding of people's modal choices and the decision-making processes behind those modal choices, particularly in relation to new modes of transport.

2. To examine whether the Theory of Planned Behaviour offers a good framework in which to study modal choices and the decision-making processes behind modal choices.

3. To show that the use of the Theory of Planned Behaviour can be used to make predictions about people's travel behaviour.

4. To examine the potential impacts of two new urban public transport systems on travel behaviour.

These objectives were achieved by carrying out studies in Dublin and Croydon.

In Croydon, the public transport service was changed substantially with the construction of Tramlink. Its opening provided the opportunity, therefore, to investigate how people form their beliefs with regard to new public transport and how these beliefs can determine their attitudes, subjective norms and perceptions.
of behavioural control and how these can, in turn, determine their intention to use the system. The objectives of this study in Croydon were to:

(1) Find out what people’s normative beliefs, behavioural beliefs and control beliefs about Tramlink were.

(2) Discover how these beliefs would determine what people’s attitudes, subjective norms and perceptions of behavioural control were.

(3) Show how these factors contributed to people’s decisions to use or not to use Tramlink. That is, to show how these factors play a part in determining people’s travel behaviour.

(4) Examine whether people’s beliefs and attitudes, subjective norms and perceptions of behavioural control could play a role in predicting their use of new public transport.

To achieve these objectives, a series of interviews was conducted with people working in Croydon prior to the opening of Tramlink. To ensure that those who took part in the survey would have an opportunity to use Tramlink once it had opened, it was decided to interview people who worked in the centre of Croydon. This led to 30 people being recruited for the interviews. The interviews were unstructured, qualitative interviews in order to allow deeper probing of people’s answers and to allow an in-depth study of people’s decision-making processes to be carried out. Five to six months after the system opened, the interviewees were re-contacted to find out whether the predictions made about their future use of the system, based on the interviews, were actually correct.

In Dublin, the new light rail system will change the existing supply of public transport quite dramatically. In order to investigate whether a method could be devised to examine the beliefs, attitudes, subjective norms and perceptions of behavioural control of potential users of a system more easily and more efficiently than using in-depth interviews, a questionnaire was designed, using the lessons learned from the Croydon study, to measure the components of the Theory of Planned Behaviour for large numbers of people. These questionnaires were distributed to potential users of the Luas. This study took place between June and August 2000.
This chapter describes how the Croydon study was conducted and the interviews were carried out. It will also describe how the study was conducted in Dublin. Chapter 7 will describe the analysis of the interviews using the Theory of Planned Behaviour, how this led to the questionnaire design for Dublin and the analysis of these questionnaires.

6.2 Recruitment of Interviewees

6.2.1 Introduction

The recruitment of interviewees for the study commenced in April 1999. It was important that those interviewed would all be potential users of Croydon Tramlink. As was described in Chapter 5, all three Tramlink routes will make a loop of Croydon town centre. Therefore, it was decided to interview only people who worked in central Croydon, as these people would all have an opportunity to use Tramlink.

The interviews that were to follow the recruitment process were qualitative, unstructured interviews. The reason for choosing this type of study is explained later in this chapter. The choice of this methodology had an impact on the way in which people were recruited for the study. In qualitative research, attempts are made to explain the meaning and diversity of people's views and to allow them to articulate these views in their own words (Lewis et al, 1999). Sample sizes have a tendency to be smaller than in quantitative research. In quantitative research, samples are large and selected randomly in order to represent the population. In qualitative research, samples are selected using a technique called purposive sampling.

6.2.2 Purposive Sampling

In qualitative research, an attempt is made to collect a diverse range of perspectives. Therefore, the sample is not chosen to mirror the population. Instead, the researcher must determine whom he or she needs to speak to in order to ensure that a range views are uncovered. To do this, he or she must first of all define the research question. To answer this question, he or she must determine
what are the factors or traits that could cause people to hold different views or perspectives.

In this study, the aim is to map the attitudes, subjective norms and levels of control that people have to using Croydon Tramlink. It is intended to show how people make modal choices. The type of factors that could affect the attitudes, subjective norms and levels of control are shown in Table 6.1. Therefore, the sample must be composed of people who hold these characteristics.
### Characteristics

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age:</td>
<td>The sample must be made up of people of varying age groups. It was decided to recruit people in the following age bands: &lt;20, 20-34, 35-49, 50-59</td>
</tr>
<tr>
<td>Sex:</td>
<td>Males and females may make travel decisions in different ways. Therefore, interviewees must be recruited from both sexes.</td>
</tr>
<tr>
<td>Place of habitat:</td>
<td>On or Off Tramlink route: Living close to a stop will influence a person’s decision to use Tramlink. Each group must be represented in the sample.</td>
</tr>
<tr>
<td>Car Ownership:</td>
<td>Owning a car will obviously have an impact on modal choices. Those with and without cars must be represented in the sample.</td>
</tr>
<tr>
<td>Household Composition:</td>
<td>People with children are more likely to make escort trips. This may impact on modal choices.</td>
</tr>
<tr>
<td>Free Car Parking at Work:</td>
<td>People with and without car parking at work must be included in the sample.</td>
</tr>
<tr>
<td>Intention to use Tramlink:</td>
<td>The sample must be composed of people with positive and negative intentions to use Tramlink.</td>
</tr>
<tr>
<td>Current Mode of Transport:</td>
<td>Those who use public transport already may have different views of Tramlink to those who use cars. Therefore the sample must include people who drive to work and people who use public transport or walk to work.</td>
</tr>
</tbody>
</table>

**Table 6.1: Characteristics that could influence the attitudes, subjective norms and perceived behavioural control of respondents towards Tramlink**

It had been decided to recruit only people who worked in Croydon. This was because one of Tramlink’s main objectives is to attract people onto public transport for their commuting trips (Anderson, 1999). Letters were sent to several
companies in Croydon to ask them to take part in the study in April 1999. Table 6.2 shows the number of companies written to and the level of response that was met. It is apparent that there was a high level of negative responses and non-responses from companies. Several companies that gave negative responses said that it was against company policy to take part in surveys or studies.

<table>
<thead>
<tr>
<th>Class</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Companies Contacted</td>
<td>37</td>
</tr>
<tr>
<td>Positive Responses</td>
<td>8</td>
</tr>
<tr>
<td>Negative Responses</td>
<td>20</td>
</tr>
<tr>
<td>No Answer</td>
<td>11</td>
</tr>
</tbody>
</table>

*Table 6.2: Response rate of companies in Croydon*

In May 1999 only 3 companies had confirmed that they would be taking part in the study. Those companies were Allied Irish Bank (UK), Gann Insurance and Bank of Ireland (UK). A further 5 decided to take part between June 1999 and July 1999. The companies that took part were:

- Allied Irish Bank (United Kingdom)
- Gann Insurance
- Bank of Ireland (United Kingdom)
- Allders department store
- Halifax
- Croydon Council: None of the interviewees were involved in Croydon Council’s Tramlink department.
- Clyssedale Bank
- Davidson Professional Centre

These companies were issued questionnaires to distribute to their staff. A copy of this questionnaire may be found in Appendix B. The questionnaire was used to recruit people for the interview. To ensure that all the characteristics in Table 6.1
were accounted for, the respondents were asked their age, sex, household composition, where they lived, if they owned a car and if they had free parking at work. In addition, respondents were asked how they normally travelled to and from work and whether they intended to use Tramlink when it opened. At the end of the questionnaire, respondents were asked if they would participate in an interview in the future. Table 6.3 shows how many people returned the questionnaires and how many of these were interested in taking part in the interview.

<table>
<thead>
<tr>
<th>Questionnaires</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Questionnaires sent out</td>
<td>76</td>
</tr>
<tr>
<td>Questionnaires returned</td>
<td>50</td>
</tr>
<tr>
<td>Positive</td>
<td>35</td>
</tr>
<tr>
<td>Negative</td>
<td>15</td>
</tr>
</tbody>
</table>

Table 6.3: Questionnaires returned

The first set of questionnaires was returned in July 1999. They continued to be returned until September 1999. The respondents who agreed to be interviewed were monitored to check that all the characteristics that were required in Table 6.1 were present. In the end 33 people were interviewed, as 2 respondents dropped out due to illness and time constraints. Three people were interviewed as part of the pilot study while the other thirty were interviewed as part of the main survey. This led to the sample that is detailed in Tables 6.4 to 6.9.

<table>
<thead>
<tr>
<th>Sex</th>
<th>Total</th>
<th>&lt;20</th>
<th>20-34</th>
<th>35-49</th>
<th>50-59</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>15</td>
<td>4</td>
<td>3</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Female</td>
<td>15</td>
<td>1</td>
<td>6</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>30</td>
<td>5</td>
<td>9</td>
<td>10</td>
<td>6</td>
</tr>
</tbody>
</table>

Table 6.4: Sex and age characteristics of the sample

As Table 6.4 shows, the sample was well balanced between the sexes. The majority of people fell in the two middle age brackets, which is to be expected, since the sample only includes people who are working. The sample is, however, very small, which can lead to difficulties when looking at sub-samples.
Once more, there are people in both sexes who have children.

While the number of people with cars in the sample is high (Table 6.6), very few people can avail of free parking at work (Table 6.7). The presence of a parking space is something that could have quite significant impact on a person’s decision to use a car. This will be referred to in more detail in Chapter 7.

The majority of people intend to use Tramlink for some types of trip but Chapter 7 will show that the amount and the type of trips that people plan to use it for varies extensively.

<table>
<thead>
<tr>
<th>Sex</th>
<th>Children (&lt;19 in household)</th>
<th>No Children</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>8</td>
<td>7</td>
<td>15</td>
</tr>
<tr>
<td>Female</td>
<td>7</td>
<td>8</td>
<td>15</td>
</tr>
<tr>
<td>Total</td>
<td>15</td>
<td>15</td>
<td>30</td>
</tr>
</tbody>
</table>

*Table 6.5: Sex and household composition of the sample*

<table>
<thead>
<tr>
<th>No Cars</th>
<th>1 Car</th>
<th>2+ Cars</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>9</td>
<td>19</td>
<td>30</td>
</tr>
</tbody>
</table>

*Table 6.6: Car ownership of the sample*

<table>
<thead>
<tr>
<th>Free Parking at Work</th>
<th>No Free Parking at Work</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>22</td>
<td>30</td>
</tr>
</tbody>
</table>

*Table 6.7: Availability of parking of the sample*

<table>
<thead>
<tr>
<th>Sex</th>
<th>Intend to use Tramlink</th>
<th>Do not Intend to use Tramlink</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>11</td>
<td>4</td>
<td>15</td>
</tr>
<tr>
<td>Male</td>
<td>11</td>
<td>4</td>
<td>15</td>
</tr>
<tr>
<td>Total</td>
<td>22</td>
<td>8</td>
<td>30</td>
</tr>
</tbody>
</table>

*Table 6.8: Sex and intention to use Tramlink of the sample*
These tables (Tables 6.4 – 6.9) demonstrate that all the characteristics that were originally determined as important in the analysis of attitudes, subjective norms and perceived behavioural control were present in the sample. The interviews can be expected to show a wide range of opinions which is what is required from this type of study.

6.3 Qualitative Study of Croydon Tramlink

6.3.1 Introduction

This study uses the Theory of Planned Behaviour to examine modal choices. As has been outlined in Chapter 2, it is intended to demonstrate that this theory can contribute to the understanding of how modal choices are made. In Croydon, people’s reactions to a new mode that they may have no previous experience of are being modelled. This means that the theory is being used to get people to predict their future use of the mode and to describe how they come to that decision.

Therefore, it is important to have the opportunity to probe people’s thoughts and to allow them to articulate their beliefs. It was decided that the best way to find out about modal choices and to elicit the attitudes, subjective norms and perceived behavioural control of people was to use a qualitative study. Qualitative research provides more descriptive data than quantitative research (Sherman and Reid, 1994). As this study was focused on describing and examining the complexity of modal choices, using a qualitative methodology provided more useful data. Qualitative research, according to Denzin and Lincoln (1994), allows the researcher to get closer to the respondent’s points of view and perspectives, whereas in quantitative research, the researcher remains remote and
cannot probe the respondent about their views. The qualitative format allows the individual being interviewed to describe his or her own perceptions and explain his or her behaviour (Jensen, 1999).

To collect the qualitative information, the respondents were interviewed for approximately 40 minutes each. The interviews were unstructured, where respondents could speak for as long as they wished. All the interviews were conducted by the same person: the author of this thesis. At one point the possibility of using focus groups rather than interviews was explored, as this would allow more people to take part in the survey. However, focus groups can lead to more articulate members of a group making their opinions heard while other opinions may not surface (Rutherford, 1998).

6.3.2 Unstructured Interviews

Unstructured interviews differ from structured interviews in that they have no pre-set questions. Instead, the interviewer uses a topic guide that reminds him or her of what must be discussed in the interview. The topics may be raised in any order and the interview is much more flexible than a structured interview.

The topic guide is the basis of the interview (Rutherford, 1998; Lewis et al, 1999). The researcher decides what questions must be asked in order to achieve the objectives of the interview. He or she then groups these into topics or groups.

In this study, the objectives of the research were, as has been mentioned, to examine the impacts on modal choices of new urban public transport and the decisions-processes behind modal choices using the components of the Theory of Planned Behaviour. Therefore the interviews had to elicit:

- The interviewees' intentions with respect to using Tramlink for work trips and non-work trips
- The interviewees' attitudes to using Tramlink for work trips and non-work trips
- The interviewees' subjective norms with respect to using Tramlink for work trips and non-work trips
The interviewees' perceived behavioural control over using Tramlink for work trips and non-work trips

The interviewees' behavioural beliefs about using Tramlink for work trips and non-work trips

The interviewees' normative beliefs about using Tramlink for work trips and non-work trips

The interviewees' control beliefs about using Tramlink for work trips and non-work trips

A copy of the topic guide may be found in Appendix C. The format and design of the topic guide is described here.

The first section of the topic guide was used to put the interviewee at ease. The objective of the interview was described to the interviewees and they were told that they could stop the interviewer whenever they wished to. In addition, some general information was asked for. Much of this information had been included in the questionnaire already but these were questions that the interviewees found easy to answer, before they were asked to start describing points of view and perspectives. Figure 6.1 shows Section 1.
**Section 1: Introduction:**

My name is Aoife Ahern and I am a research student at University College London. I am interviewing people in Croydon to find out how they feel about Tramlink and the difference they feel it will make to their trips. I want to get as wide a range of views as possible so please feel free to say anything that you want to say. The interview will last between 30 minutes and 40 minutes and no personal information will be disclosed to outside bodies. If at any stage you wish to stop me, let me know and if anything I say is not clear please do not hesitate to stop me and ask me what I mean.

**Ask about some general information to put the interviewee at ease**

- What are the ages of their children?
- How many employed adults live in the household?
- Do they have a car?
- Do they have a parking space at work?

---

**Figure 6.1: Section 1 of the topic guide: Bold face includes instructions to interviewer**

The interviews were designed to find out what people's beliefs; attitudes and other components of the theory were towards using Tramlink. It was decided to look at these in relation to the different types of trips that people could make on Tramlink. Four trip types were identified:

- Commuter trips to Croydon
- Business trips made away from the place of work in Croydon during the day
- Non-work trips made from home to Croydon town centre
- Non-work trips made to areas other than Croydon town centre

These last trips were quite frequently made from the workplace rather than home.
All the trips could either replace existing trips made by car or other modes or could be trips generated by the presence of Tramlink. It was decided, therefore, to divide the interview into 2 sections. The first section would deal with commuter trips and work trips made during the day and the second section with non-work trips. Each section would look at both newly generated trips and trips that were replacing existing trips. The topic guide only served as a guide for the interview and advised the interviewer what questions and topics needed to be answered. The questions could be asked in any order.

Figures 6.2 and 6.3 show the section of the topic guide that looked at work trips. As can be seen in Figures 6.2 and 6.3, each of the components of the Theory of Planned Behaviour was examined in the topic guide. If the interviewees said that they intended to use Tramlink for either commuter trips or work trips made in the course of the day they were asked about the behavioural beliefs that led to this decision, how the attitudes of those around them had an influence on their intention to use Tramlink for work trips and how their levels of perceived behavioural control helped them to make the decision. They were also asked about the disadvantages of Tramlink, about what outcomes could make it less attractive as a mode, about the people who felt that Tramlink use was not worthwhile and the obstacles could prevent them from using Tramlink. During the course of the interviews, the interviewer tried to find out why these people had decided to try to use Tramlink for work trips and commuter trips even though they had identified disadvantages, negative normative beliefs and negative control beliefs. The interviewer identified which beliefs, outcome evaluations, referents and control beliefs had led the interviewee to deciding to use Tramlink. Similarly, if the interviewee had rejected Tramlink as a mode to use for work trips the interviewer discovered the beliefs that led to this decision. The interviewer also examined whether any positive behavioural, normative or control beliefs were held about Tramlink use on work trips and why the negative ones outweighed these.

The advantages of using a qualitative interview are apparent in this situation: the interviewer used the topic guide to remind herself of the contents of the interview but was not tied to any particular order. She had the opportunity to probe
interesting beliefs and find out how those beliefs came to be. She also had the opportunity to examine why some beliefs had held more importance than others in the decision-making process. The most important thing to remember about this topic guide is that it is not a set of pre-set questions that must be asked in the course of the interview. It serves simply as a reminder to the interviewer to discuss the respondent's work trips and non-work trips and to ensure that the interviewer asks about the respondents' beliefs and decision-making processes.

Section 3 of the topic guide was similar to section 2 but the questions related to non-work trips instead. These were non-work trips from Croydon and to areas outside of Croydon.
Section 2: Work Trips

If this person intended to use Tramlink for any work trips to Croydon town centre or areas outside Croydon town centre: Will they use it for commuter trips or for work trips from Croydon during the day? How regularly will they use Tramlink? Are any of these trips newly generated trips? Will they be travelling to a new destination to fulfil a purpose that is currently carried out elsewhere?

A. Attitude

Do they hold a positive or negative attitude to Tramlink use on work trips?
Do they feel Tramlink will be pleasant to use on work trips?

B. Behavioural Belief and Outcome Evaluations

How do they believe Tramlink will benefit their work trip? How will it be better or worse than current mode? (Prompt for advantages or disadvantage: comfort, reliability, flexibility etc.) How important are these advantages or disadvantages?

C. Subjective Norms

Do they believe that anyone that they know is in favour or against Tramlink use?

D. Normative Beliefs, Referents and Motivation to Comply

Do they know anyone who will use Tramlink for work or school trips? Do they know of any people or groups who are promoting or objecting to Tramlink? Would any of these people have any influence on their choices? What do their family and friends and work colleagues think?

E. Perceived Behavioural Control

Do they think that there are any obstacles that could prevent them from using Tramlink? Will it be easier than using their current mode?

F. Control Beliefs and Perceived Facilitating Effect

What are the obstacles that could prevent them from using Tramlink on work trips? (Prompt to consider weather, time safety etc.) What could help them use Tramlink on work trips? (Prompt to consider parking issue, easy access to vehicle etc.) How likely do they feel they are to meet these obstacles and facilitators on trips to and from work?

Figure 6.2: Section 2 of the interview: Interviewee intends to use Tramlink on work trips
Section 2: Work Trips

If this person did not intend to use Tramlink for any work trips to Croydon town centre or areas outside Croydon town centre.

A. Attitude

Do they hold a positive or negative attitude to Tramlink use on work trips?
Do they feel Tramlink will be easy or pleasant or enjoyable to use on work trips?

B. Behavioural Belief and Outcome Evaluations

How do they believe Tramlink would inconvenience their work trip? How would it be better or worse than current mode? (Prompt for advantages or disadvantage: comfort, reliability, flexibility etc.) How important are these advantages or disadvantages?

C. Subjective Norms

Do they believe that anyone that they know is in favour or against Tramlink use?

D. Normative Beliefs, Referents and Motivation to Comply.

Do they know anyone who will use Tramlink for work or school trips? Do they know of any people or groups who are promoting or objecting to Tramlink? Would any of these people have any influence on their choices? What do their family and friends and work colleagues think?

E. Perceived Behavioural Control.

Do they think that there are any obstacles that could prevent them from using Tramlink? How easy is it to use their current mode?

F. Control Beliefs and Perceived Facilitating Effect.

What are the obstacles that could prevent them from using Tramlink on work trips? (Prompt to consider weather, time safety etc.) What could help them use Tramlink on work trips? (Prompt to consider parking issue, easy access to vehicle etc.) How likely do they feel they are to meet these obstacles and facilitators on trips to and from work?

Figure 6.3: Section 2 of the interview: Interviewee does not intend to use Tramlink on work trips
6.3.3 Conducting the Interviews

A pilot study was conducted in August 1999. This involved three interviewees. The purpose of the pilot study was to assess the topic guide and to find out the best way of recording the interviews. Three methods were used. One interview was taped, one was not taped but notes were taken and one was taped and notes were taken. Arising from this, no changes were made to the topic guide. It was decided to tape all the interviews to make it easier to transcribe them at a later date. Permission for taping the interviews was always sought and was always given. In addition, it was decided to design a response sheet for the interviewer to note down important points in the course of the interview. This response sheet may be found in Appendix D. It contained information taken from the recruitment questionnaire so that the interviewer could refer to this during the interview. In addition, common advantages and disadvantages, referents and obstacles were listed so that these could be ticked off quickly if they were mentioned during the interview. The combination of this sheet summarising the contents of the interview and the tape recordings made it much easier to transcribe them during analysis.

The interviews were conducted between September 1999 and December 1999. Each of the interviews was conducted in the office at the workplace of the interviewee. In most cases this was an empty room. The interviews lasted approximately 40 minutes. Interviewees were given the opportunity to make comments about the interviews at the end of the session. No one made any negative comments about the structure of the interview. Several people mentioned, however, that it had been interesting to have the opportunity to speak about their concerns in relation to Tramlink. Therefore, the format of the qualitative interviews was well received. Interviewees were also asked if they had anything else to say about Tramlink that they felt that they had not had a chance to mention during the interview. Many interviewees availed of this opportunity to accentuate issues already raised in the interview.

A good qualitative interview must consist of the interviewee doing most of the talking. The interviews can be quite difficult to conduct, as the interviewer has to be able to probe the interviewee’s opinions without directing his or her answer.
This can be achieved using open-ended questions and asking people to elaborate on statements and comments made during the interview (Lewis et al, 1999).

6.3.4 Follow-up study

Tramlink started operation in May 2000. A follow-up study was conducted in October and November 2000 of those people who had been interviewed in order to find out how many of them were using the system. A questionnaire was distributed to each interviewee. This questionnaire is shown in Figure 6.4 below and also in Appendix E. The purpose of this questionnaire was to examine whether people’s intentions, attitudes, subjective norm and perceived behavioural control correlated well with their actual behaviour and to seek to validate the use of the Theory of Planned Behaviour as a tool to examine and predict modal choices.

In the first question, the interviewee was asked if he or she has used Tramlink in its first few months of operation and was then given instructions of how to proceed with the questionnaire. Those people who had used Tramlink were asked two questions to ascertain how often they had used it and for what types of trips. They were also asked about whether they were satisfied with Tramlink use and whether they would use it in the future. This was in order to ascertain how many people were simply trying out Tramlink in its first few weeks of operation and how many had become regular users of the system.

People who had not used Tramlink are also asked whether they intended to use it in the future. The fact that Tramlink had only been open for 5 months meant that not everyone who wanted to use it, especially people who intended to use it for irregular trip types, would have been able to use it so it was decided to compare past intention with both actual behaviour and present intention.
QUESTIONNAIRE

1. Have you used Tramlink since it opened? Please tick the correct answer.
   Yes [ ]
   No [ ]

   If you have used Tramlink please answer questions 2-6 inclusive.
   If you have not used Tramlink, please answer questions 5-8 inclusive.

2. Have you used Tramlink for:
   - Trips to and from work
   - Non-work trips to Croydon centre
   - Business trips
   - Non-work trips outside Croydon centre

3. How often have you used Tramlink?
   - More than twice a week
   - More than twice a fortnight
   - More than twice a month
   - More than once a month
   - Less than once a month
   - Only once

4. Are you satisfied with Tramlink use? Please comment.

5. How often do you intend to use Tramlink in the future?
   - More than twice a week
   - More than twice a fortnight
   - More than twice a month
   - More than once a month
   - Less than once a month
   - Only once
   - Never

6. Do you intend to use Tramlink in the future for: (Please tick those trips that you intend to use Tramlink for)
   - Trips to and from work
   - Non-work trips to Croydon centre
   - Business trips
   - Non-work trips outside Croydon centre

7. Why have you not used Tramlink?

8. Would anything encourage you to use Tramlink in the future?

Figure 6.4 Follow-up study questionnaire
Of the original 30 interviewees, it was possible to contact 26 people, one of whom had been abroad for the past six months and, therefore, could not complete the entire questionnaire. The questionnaire asked people about whether they had used Tramlink, how often they had used it, what trips they had used it for and whether they intended to use it in the future. The final question was asked since the study was carried out so soon after Tramlink had opened and people who wanted to use Tramlink may not have had an opportunity to use it yet but may intend to use it in the future.

6.4 Dublin Study

6.4.1 Introduction

The study of people's intentions and the interviews in Croydon demonstrated the complexity of modal choices. This study elicited the beliefs that people held towards a new transport mode. The study was conducted as a qualitative study for the reasons described above. It was intended to use the Croydon system to demonstrate the complexity of travel behaviour research and of modal choices in particular. When the interviews were conducted, Croydon Tramlink was in the final stages before it opened. People were able to see Tramlink vehicles carrying out test runs every day.

In Dublin, the study was extended to examine how people felt about new public transport at a much earlier stage and how early on people actually form intentions and opinions of a service. At an early stage, it is very important to determine how people intend to use the system before capital is invested in building it. It was seen in Chapter 2 that many people had negative perceptions of Supertram due to construction problems that occurred in Sheffield and in Chapter 5 similar problems, although on a lesser scale, occurred in Croydon two years before the system opened. These types of problems can have a significant effect on people's travel behaviour and modal choices so looking at their perceptions and beliefs at this early stage is important. However, people's knowledge about the system will be more vague at this stage and they are less likely to hold strong opinions about it. Therefore, it was decided that it would not be appropriate to carry out in-depth interviews in Dublin as had been done in
Croydon. Instead, a questionnaire was designed to measure the components of the Theory of Planned Behaviour of potential users of Luas. It was intended to design a questionnaire that would measure people's attitudes, subjective norms and perceived behavioural control about using Luas. A major objective for Luas is to reduce the number of peak hour trips made by private car. Therefore, it was decided to focus only on commuter trips in this survey.

The study was conducted in two stages. A pilot study took place in May 2000 when 50 questionnaires were distributed to potential users of Luas. Changes were made to this questionnaire and a further 205 questionnaires were distributed to potential users of Luas. Of these, 60 questionnaires were returned which gave a response rate of 29%. The following section will describe both parts of this study.

6.4.2 Pilot Stage

The pilot study was conducted in Swords. This is a suburb in north County Dublin and, as can be seen in Figure 5.2 in Chapter 5, it is located at the end of the proposed extension of Line B. Two companies took part in the pilot study:

- Allied Irish Bank, Swords
- Banks of Ireland, Swords

The questionnaire that was distributed had to be designed to measure:

- The intention of the respondents to use Luas on their commuter trips
- People's attitudes to using Luas on commuter trips
- People's subjective norms regarding using Luas on commuter trips
- People's perceived behavioural control regarding using Luas on commuter trips

In Chapter 3, the methods of measuring attitudes, subjective norms and perceived behavioural controls were described. They involved measuring the factors that
are the determinants of attitudes, subjective norms and perceived behavioural controls.

(1) Attitudes: In Chapter 3, it was shown that attitudes might be measured by measuring a person's behavioural beliefs and outcome evaluations.

(2) Subjective norms: A description was given in Chapter 3 of how to measure a respondent's normative beliefs and motivation to comply with various referents which are the immediate determinants of his or her subjective norms.

(3) Perceived behavioural control: It was shown, in Chapter 3, how to measure a person's control beliefs and the strength of these beliefs in order to determine their perceived behavioural control.

In addition, it was decided to measure the respondents' attitudes, the subjective norms and perceived behavioural control directly in the questionnaire. In Chapter 3, it was mentioned that the validity of measuring a person's attitudes, subjective norms and perceived behavioural control by measuring the strengths of their beliefs should always be checked by using a direct measure of these components of the Theory of Planned Behaviour. The correlation between the direct measures and the belief-strength measures should be examined. The results of this examination will be described in Chapter 7.

The direct measurement of people's attitudes, subjective norms and perceived behavioural control is carried out in a similar fashion to the way in which people's belief strengths are measured. The respondents are presented with statements and are asked to rate their agreement with these statements.

The questionnaire that was used at the pilot stage contained 10 sections. The full questionnaire may be found in Appendix F. The first section collected some brief general information from the respondents, as shown in Figure 6.5.
Section 1: Background Information: This information is strictly confidential.

1. What town or village is nearest where you live?

____________________________________

2. What town or village is nearest where you work?

____________________________________

3. Please state your gender. Place an X on the relevant line.
Male ______
Female ______

4. Please state your age bracket. Place an X on the relevant line.
<20 ______
20 - 34 ______
35 - 49 ______
50 - 59 ______
60+ ______

5. How do you normally travel to work? Please put an X on the relevant line.
Car ______
Bicycle ______
Bus ______
Other (Please specify) ______

Figure 6.5: Background information
After this, the respondents were given some directions as to how to complete the rest of the questionnaire. In the pilot study questionnaire, these instructions were quite detailed. These are shown in Figure 6.6.

In this questionnaire, you will be presented with statements and asked to rate your response to these statements on a scale. Put a circle around the number, which most strongly reflects your opinion.

For example,

It often rains in Ireland

\[
\begin{array}{cccccc}
 3 & 2 & 1 & 0 & -1 & -2 & -3 \\
 3 = \text{Agree strongly} \\
 -3 = \text{Disagree strongly}
\end{array}
\]

If you agree strongly, put a circle around 3.
If you agree, put a circle around 2.
If you agree more than you disagree, put a circle around 1.
If you neither agree nor disagree, put a circle around 0.
If you disagree more than you agree, put a circle around -1.
If you disagree, put a circle around -2.
If you disagree strongly, put a circle around -3.

**Figure 6.6: Instructions to the respondents**

Sections 2 to 10 measured the respondents' intentions, attitudes to using Luas, outcome evaluations, behavioural beliefs, subjective norm, normative beliefs, motivation to comply, perceived behavioural control, control beliefs and control belief strengths respectively. The behavioural, normative and control beliefs that the respondents were questioned about were taken from the interviews that were conducted in Croydon. The method by which they were selected will be described in Chapter 7. In addition, respondents were asked to comment on the questionnaire. Figures 6.7 to 6.17 show these sections.
As in Croydon, only people who worked on the proposed route of Luas were sent the questionnaires. The questionnaires were sent to two companies that were located in Swords village. These were:

- Allied Irish Bank
- Bank of Ireland

Fifty questionnaires were sent out and ten were returned.

**Section 2: Intention:**
I intend to use Luas to travel to work when it opens
3 2 1 0 -1 -2 -3
3 = Agree strongly -3 = Disagree strongly

*Figure 6.7: Intention to use Luas*

Section 2 found out how likely the respondents were to use Luas for work trips.

**Section 3: Attitude**
For me to use Luas to travel to work would be:
3 2 1 0 -1 -2 -3
3 = Very good -3 = Very bad
3 2 1 0 -1 -2 -3
3 = Very pleasant -3 = Very unpleasant
3 2 1 0 -1 -2 -3
3 = Very easy -3 = Very difficult

*Figure 6.8: Attitude to using Luas*

In Section 3, the respondents had to indicate how they felt about using Luas. Some respondents had problems with this section and did not understand why they were asked these questions.

Sections 4 and 5 look at the determinants of attitude: these are behavioural beliefs and outcome evaluations. In the main survey, the way in which sections 4 and 5 were presented to the respondents was changed to make it easier for them
to understand what they were being asked. This will be described in the next section.

**Section 4: Outcome Evaluations:** These statements look at what kinds of outcomes are important to you

<table>
<thead>
<tr>
<th>Outcome Evaluation</th>
<th>Code</th>
<th>Rating</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saving time on the trip to work is:</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>3 = Very important</td>
<td>-3</td>
<td>= Very unimportant</td>
<td></td>
</tr>
<tr>
<td>A comfortable journey is on my trip to work is:</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>3 = Very important</td>
<td>-3</td>
<td>= Very unimportant</td>
<td></td>
</tr>
<tr>
<td>Saving money on my trip to work is:</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>3 = Very important</td>
<td>-3</td>
<td>= Very unimportant</td>
<td></td>
</tr>
<tr>
<td>Decreasing the chances of being involved in a traffic accident on my trip to work is:</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>3 = Very important</td>
<td>-3</td>
<td>= Very unimportant</td>
<td></td>
</tr>
<tr>
<td>Conserving the environment is:</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>3 = Very important</td>
<td>-3</td>
<td>= Very unimportant</td>
<td></td>
</tr>
<tr>
<td>Increasing my sense of personal safety on my trip to work is:</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>3 = Very important</td>
<td>-3</td>
<td>= Very unimportant</td>
<td></td>
</tr>
<tr>
<td>Reducing the traffic on my trip to work is:</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>3 = Very important</td>
<td>-3</td>
<td>= Very unimportant</td>
<td></td>
</tr>
</tbody>
</table>

*Figure 6.9: Outcome evaluations*
**Section 5: Behavioural beliefs:** These statements look at how likely you think the outcomes above are likely to happen if you were to travel to work on Luas.

I believe that using Luas would save time on the trip to work:

\[
\begin{array}{cccc}
3 & 2 & 1 & 0 \\
-1 & -2 & -3 \\
3 = \text{Strongly agree} & -3 = \text{Strongly disagree}
\end{array}
\]

I believe that using Luas would give me a comfortable journey on my trip to work:

\[
\begin{array}{cccc}
3 & 2 & 1 & 0 \\
-1 & -2 & -3 \\
3 = \text{Strongly agree} & -3 = \text{Strongly disagree}
\end{array}
\]

I believe that using Luas would save money on my trip to work:

\[
\begin{array}{cccc}
3 & 2 & 1 & 0 \\
-1 & -2 & -3 \\
3 = \text{Strongly agree} & -3 = \text{Strongly disagree}
\end{array}
\]

I believe that using Luas would decrease the chances of being involved in a traffic accident on my trip to work:

\[
\begin{array}{cccc}
3 & 2 & 1 & 0 \\
-1 & -2 & -3 \\
3 = \text{Strongly agree} & -3 = \text{Strongly disagree}
\end{array}
\]

I believe that using Luas on my trip to work would conserving the environment:

\[
\begin{array}{cccc}
3 & 2 & 1 & 0 \\
-1 & -2 & -3 \\
3 = \text{Strongly agree} & -3 = \text{Strongly disagree}
\end{array}
\]

I believe that using Luas would increase my sense of personal safety on my trip to work:

\[
\begin{array}{cccc}
3 & 2 & 1 & 0 \\
-1 & -2 & -3 \\
3 = \text{Strongly agree} & -3 = \text{Strongly disagree}
\end{array}
\]

I believe that using Luas would reduce the traffic on my trip to work:

\[
\begin{array}{cccc}
3 & 2 & 1 & 0 \\
-1 & -2 & -3 \\
3 = \text{Strongly agree} & -3 = \text{Strongly disagree}
\end{array}
\]

I believe that using Luas would provide me with a reliable form of traffic on my trip to work:

\[
\begin{array}{cccc}
3 & 2 & 1 & 0 \\
-1 & -2 & -3 \\
3 = \text{Strongly agree} & -3 = \text{Strongly disagree}
\end{array}
\]

*Figure 6.10: Behavioural beliefs*
Section 6 examines the respondents' subjective norm, while sections 7 and 8 look at the determinants of the subjective norm: normative beliefs and the motivation to comply with referents. Respondents were confused by some of the terms that were used in this part of the questionnaire. Therefore, these sections were also changed in the main survey.

Section 6: Subjective norm: This statement looks at what you believe those people whose opinions you value think that you should do.

Most people who are important to me think that I should use Luas to travel to work:

3 2 1 0 -1 -2 -3

3 = Strongly agree -3 = Strongly disagree

Figure 6.11: Subjective norm

Section 7: Normative beliefs: These statements look at what you believe those around you think that you should do.

My friends think that I should use Luas to travel to work:

3 2 1 0 -1 -2 -3

3 = Strongly agree -3 = Strongly disagree

My family think that I should use Luas to travel to work:

3 2 1 0 -1 -2 -3

3 = Strongly agree -3 = Strongly disagree

My work colleagues think that I should use Luas to travel to work:

3 2 1 0 -1 -2 -3

3 = Strongly agree -3 = Strongly disagree

The local authority thinks that I should use Luas to travel to work:

3 2 1 0 -1 -2 -3

3 = Strongly agree -3 = Strongly disagree

Dublin Transportation Office thinks that I should use Luas to travel to work:

3 2 1 0 -1 -2 -3

3 = Strongly agree -3 = Strongly disagree

Figure 6.12 Normative Beliefs
Section 8: Motivation to comply: These statements look at how much you want to do what those around you think you should do.

In general, I want to do what my friends tell me to do:

\[
\begin{align*}
3 & \quad 2 & \quad 1 & \quad 0 & \quad -1 & \quad -2 & \quad -3 \\
3 &= \text{Strongly agree} & -3 &= \text{Strongly disagree}
\end{align*}
\]

In general, I want to do what my family tell me to do:

\[
\begin{align*}
3 & \quad 2 & \quad 1 & \quad 0 & \quad -1 & \quad -2 & \quad -3 \\
3 &= \text{Strongly agree} & -3 &= \text{Strongly disagree}
\end{align*}
\]

In general, I want to do what my work colleagues tell me to do:

\[
\begin{align*}
3 & \quad 2 & \quad 1 & \quad 0 & \quad -1 & \quad -2 & \quad -3 \\
3 &= \text{Strongly agree} & -3 &= \text{Strongly disagree}
\end{align*}
\]

In general, I want to do what the local authority tells me to do:

\[
\begin{align*}
3 & \quad 2 & \quad 1 & \quad 0 & \quad -1 & \quad -2 & \quad -3 \\
3 &= \text{Strongly agree} & -3 &= \text{Strongly disagree}
\end{align*}
\]

In general, I want to do what Dublin Transportation Office tells me to do:

\[
\begin{align*}
3 & \quad 2 & \quad 1 & \quad 0 & \quad -1 & \quad -2 & \quad -3 \\
3 &= \text{Strongly agree} & -3 &= \text{Strongly disagree}
\end{align*}
\]

Figure 6.13: Motivation to comply
Section 9 measures the respondents' perceived control over using Luas to travel to work. Sections 10 and 11 look at the determinants of perceived behavioural control. Once more, a simpler method of presenting these statements was used in the main survey. The sections were perceived as being too long and the respondents did not always understand the terminology that was used.

**Figure 6.14: Perceived behavioural control**

<p>| | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>-1</td>
<td>-2</td>
</tr>
</tbody>
</table>

3 = Strongly agree
-3 = Strongly disagree

**Section 9: Perceived behavioural control:** This statement measures how easy you feel it is to use Luas.
I believe that it will be very easy to use Luas
Section 10: Control beliefs: These statements look at what obstacles could get in the way of you using Luas.

If I had a lot of items to carry on my trip to work I would be more likely to use Luas.

3 2 1 0 -1 -2 -3
3 = Strongly agree -3 = Strongly disagree

If the traffic was heavy on my trip to work I would be more likely to use Luas.

3 2 1 0 -1 -2 -3
3 = Strongly agree -3 = Strongly disagree

If it was dark on my trip to work I would be more likely to use Luas.

3 2 1 0 -1 -2 -3
3 = Strongly agree -3 = Strongly disagree

If I was in a hurry on my trip to work I would be more likely to use Luas.

3 2 1 0 -1 -2 -3
3 = Strongly agree -3 = Strongly disagree

If the weather was bad on my trip to work I would be more likely to use Luas.

3 2 1 0 -1 -2 -3
3 = Strongly agree -3 = Strongly disagree

If I lived close to the Luas route I would be more likely to use Luas.

3 2 1 0 -1 -2 -3
3 = Strongly agree -3 = Strongly disagree

If I worked close to the Luas route I would be more likely to use Luas.

3 2 1 0 -1 -2 -3
3 = Strongly agree -3 = Strongly disagree
### Section 11: Perceived facilitating effect

These statements look at how likely you are to encounter the above obstacles.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>I often have a lot of items to carry on my trip to work.</td>
<td>3 2 1 0</td>
</tr>
<tr>
<td>3 = Strongly agree, -3 = Strongly disagree</td>
<td></td>
</tr>
<tr>
<td>The traffic is often heavy on my trip to work.</td>
<td>3 2 1 0</td>
</tr>
<tr>
<td>3 = Strongly agree, -3 = Strongly disagree</td>
<td></td>
</tr>
<tr>
<td>It is often dark on my trip to work.</td>
<td>3 2 1 0</td>
</tr>
<tr>
<td>3 = Strongly agree, -3 = Strongly disagree</td>
<td></td>
</tr>
<tr>
<td>I am often in a hurry on my trip to work.</td>
<td>3 2 1 0</td>
</tr>
<tr>
<td>3 = Strongly agree, -3 = Strongly disagree</td>
<td></td>
</tr>
<tr>
<td>The weather is often bad on my trip to work.</td>
<td>3 2 1 0</td>
</tr>
<tr>
<td>3 = Strongly agree, -3 = Strongly disagree</td>
<td></td>
</tr>
<tr>
<td>I live close to the future Luas route.</td>
<td>3 2 1 0</td>
</tr>
<tr>
<td>3 = Strongly agree, -3 = Strongly disagree</td>
<td></td>
</tr>
<tr>
<td>I work close to the future Luas route.</td>
<td>3 2 1 0</td>
</tr>
<tr>
<td>3 = Strongly agree, -3 = Strongly disagree</td>
<td></td>
</tr>
</tbody>
</table>

*Figure 6.16: Perceived facilitating effect*
Section 12 was a very important section in the pilot survey. People's main complaints were that the questionnaire was too long and that they did not follow the logic of it. That is, they did not always understand what they were being asked. Therefore the questionnaire was changed for the main study. The changes will be described in the next section.

**Section 12: If you have any comments about this questionnaire, please tell me.**

Figure 6.17: Comments on the questionnaire

6.4.3 Main Study

Following from the pilot study, the questionnaire was altered and the main study took place. The new questionnaire was distributed to companies on the proposed Luas routes. The questionnaire may be found in Appendix G.

A total of 205 hundred questionnaires were sent to the companies, of which 60 were returned. This meant that there was a 29% response rate. The following companies returned questionnaires:

- South Dublin County Council. Line A
- Roches Stores, Tallaght: A department store. Line A.
- Aer Lingus Head office at Dublin Airport. Line D
- Debenhams at the Jervis Centre Line A
- Boots at the Jervis Centre Line A

The questionnaire sent out for the main survey was a simplified version of the questionnaire used in the pilot study. It contained only 5 sections. The first section collected background information from the respondents and was the same
as in the pilot study. After this the respondents were given very simple instructions about how to fill in the questionnaire. This is because in the pilot survey, respondents had said that the instructions were too detailed and took too long to read. The instructions were:

"In this questionnaire, you will be presented with statements and asked to rate your response to these statements on a scale. Please put a circle around the number that most strongly reflects your opinion."

Figures 6.18 to 6.22 show the sections that were included in the questionnaire after this.

| I intend to use Luas to travel to work when it opens. |
|------------------|-----------------|------------------|
| 3 | 2 | 1 | 0 | -1 | -2 | -3 |
| 3 = Agree strongly, -3 = Disagree strongly |

Figure 6.18: Section 1 measuring intention

The first section measured people's intention to use Luas to travel to work. Section 2 amalgamated the measuring of attitude, behavioural beliefs and outcome evaluations. The respondents were only presented with one statement about their attitude to Luas. For measuring behavioural beliefs and outcome evaluations, the respondents were presented with a series of statements in pairs. This made it easier for the respondents to understand why they were being asked about certain features of their work-trip. A similar system was used in Section 3, which measured the subjective norm, the normative beliefs and the respondents' motivation to comply with their referents; and in Section 4, which measured perceived behavioural control, control beliefs and the likelihood of encountering certain obstacles and facilitators to using Luas. The respondents were presented with a single statement to measure the subjective norm in Section 3 and a single statement to measure perceived behavioural control in Section 4. They were then presented with pairs of statements to measure the determinants of the subjective norm and perceived behavioural control. Presenting the statements in pairs made it easier for the respondents to complete the questionnaire. For example, the respondents were asked if they felt that their families wanted them to use Luas; immediately afterwards they were asked whether they wanted to comply with their families. This meant that they were able to follow the logic of the questionnaire and could understand why they were being asked each question.
In the pilot study, the respondents were asked to rate the importance of different features in some sections (Figure 6.9) and to rate agreement with statements in other sections (Figure 6.10). It was decided that it would be easier for the respondents to answer the questionnaire if the same format was used throughout in the main survey. Therefore, the respondents were always asked to express agreement with a statement.
<table>
<thead>
<tr>
<th>Statement</th>
<th>Agreement Rating</th>
<th>Disagreement Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>For me to use Luas to travel to work would be agreeable.</td>
<td>3, 2, 1, 0</td>
<td>-1, -2, -3</td>
</tr>
<tr>
<td>Saving time on my trip to work is important to me.</td>
<td>3, 2, 1, 0</td>
<td>-1, -2, -3</td>
</tr>
<tr>
<td>A comfortable journey on my trip to work is important to me.</td>
<td>3, 2, 1, 0</td>
<td>-1, -2, -3</td>
</tr>
<tr>
<td>To save money on my trip to work is important to me.</td>
<td>3, 2, 1, 0</td>
<td>-1, -2, -3</td>
</tr>
<tr>
<td>To decrease my chances of being involved in a traffic accident on my trip to work is important to me.</td>
<td>3, 2, 1, 0</td>
<td>-1, -2, -3</td>
</tr>
<tr>
<td>To conserve the environment is important to me.</td>
<td>3, 2, 1, 0</td>
<td>-1, -2, -3</td>
</tr>
<tr>
<td>To increase my sense of personal safety on the trip to work is important to me</td>
<td>3, 2, 1, 0</td>
<td>-1, -2, -3</td>
</tr>
<tr>
<td>To reduce the amount of traffic on the roads on my trip to work is important to me.</td>
<td>3, 2, 1, 0</td>
<td>-1, -2, -3</td>
</tr>
</tbody>
</table>

I believe that using Luas will save me time on my trip to work.
I believe that using Luas will increase my comfort on my trip to work.
I believe that using Luas will save me money on my trip to work.
I believe that using Luas will decrease my chances of being involved in a road traffic accident on my trip to work.
I believe that using Luas will help to conserve the environment.
I believe that using Luas will help to increase my sense of personal safety on my trip to work.
I believe that using Luas will reduce the traffic on the roads on my trip to work.

Figure 6.19: Section 2 of the questionnaire
Most people who influence my opinions think that I should use Luas to travel to work.
3 = Agree strongly, -3 = Disagree strongly

<table>
<thead>
<tr>
<th>My family think that it is a good idea for me to use Luas to go to work</th>
<th>In general, I want to do what my family think I should do:</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 2 1 0 -1 -2</td>
<td>3 2 1 0 -1 -2</td>
</tr>
<tr>
<td>3 = Agree strongly, -3 = Disagree strongly</td>
<td>3 = Agree strongly, -3 = Disagree strongly</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>My friends think that it is a good idea for me to use Luas to go to work</th>
<th>In general, I want to do what my friends think I should do:</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 2 1 0 -1 -2</td>
<td>3 2 1 0 -1 -2</td>
</tr>
<tr>
<td>3 = Agree strongly, -3 = Disagree strongly</td>
<td>3 = Agree strongly, -3 = Disagree strongly</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dublin Transportation Office think that it is a good idea for me to use Luas to go to work</th>
<th>In general, I want to do what the Dublin Transportation Office think I should do:</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 2 1 0 -1 -2</td>
<td>3 2 1 0 -1 -2</td>
</tr>
<tr>
<td>3 = Agree strongly, -3 = Disagree strongly</td>
<td>3 = Agree strongly, -3 = Disagree strongly</td>
</tr>
</tbody>
</table>

*Figure 6.20: Section 3 of the questionnaire*
I believe that it will be easy for me to use Luas on my work trips.
3 = Agree strongly, -3 = Disagree strongly

<table>
<thead>
<tr>
<th>Statement</th>
<th>Likelihood Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>I often carry a lot of items on my work trip</td>
<td>3 2 1 0 -1 -2 -3</td>
</tr>
<tr>
<td>3 = Agree strongly, -3 = Disagree strongly</td>
<td></td>
</tr>
<tr>
<td>The traffic is often very heavy on my work trip</td>
<td>3 2 1 0 -1 -2 -3</td>
</tr>
<tr>
<td>3 = Agree strongly, -3 = Disagree strongly</td>
<td></td>
</tr>
<tr>
<td>It is often dark on my work trip</td>
<td>3 2 1 0 -1 -2 -3</td>
</tr>
<tr>
<td>3 = Agree strongly, -3 = Disagree strongly</td>
<td></td>
</tr>
<tr>
<td>I am often in a hurry on my work trip</td>
<td>3 2 1 0 -1 -2 -3</td>
</tr>
<tr>
<td>3 = Agree strongly, -3 = Disagree strongly</td>
<td></td>
</tr>
<tr>
<td>The weather is often bad on my work trip</td>
<td>3 2 1 0 -1 -2 -3</td>
</tr>
<tr>
<td>3 = Agree strongly, -3 = Disagree strongly</td>
<td></td>
</tr>
<tr>
<td>I live close to the Luas route</td>
<td>3 2 1 0 -1 -2 -3</td>
</tr>
<tr>
<td>3 = Agree strongly, -3 = Disagree strongly</td>
<td></td>
</tr>
<tr>
<td>I work close to the Luas route</td>
<td>3 2 1 0 -1 -2 -3</td>
</tr>
<tr>
<td>3 = Agree strongly, -3 = Disagree strongly</td>
<td></td>
</tr>
</tbody>
</table>

Figure 6.21: Section 4 of the questionnaire
6.5 Summary

The objectives of this study are to look at how people change their travel behaviour when there are new public transport systems built and to examine whether better predictions can be made about those changes if the decision-making process is better understood. In order to achieve this objective, it was decided to carry out studies in areas where two new light rail systems were being built: in Croydon and Dublin, using the Theory of Planned Behaviour, which, as was described in Chapters 2 and 3, it was felt would give an insight into people’s motivations behind their modal choices.

In this chapter, the interviews that were carried out in Croydon in order to look at the intentions of potential users of Tramlink were described. Using the lessons learned from the application of the Theory of Planned Behaviour to existing data, as described in Chapter 4, interviews were designed to measure the components of the theory that have already been described in Chapter 3. The study consisted of 30 qualitative interviews that were designed to examine the role of attitude, subjective norms, perceived behavioural control and beliefs in people’s decisions to use a new urban public transport system. The overall aim in this study was to use the Theory of Planned Behaviour to discover more about how people make travel choices with respect to new urban public transport.

The chapter also describes how people in Croydon were contacted after Tramlink had started running in order to find out whether the intentions that they had expressed at the interview stage were the same as their actual behaviour. The objective of this was to investigate the predictive power of the theory and to look at how the various components relate to actual behaviour. According to Ajzen and Fishbein (1980) there should be a positive relationship between the components and behaviour. This will be examined in detail in the analysis of the studies in Chapter 7.

This chapter also describes how a study was conducted in Dublin of people’s intentions regarding another new system called the Luas. In Chapter 2 and Chapter 5, it was pointed out that construction problems, publicity and political situations will affect people’s perceptions at a very early stage of the system’s...
developments and that these perceptions can influence the system’s performance and ability to attract passengers. Therefore, it was decided to examine the beliefs, attitudes, subjective norms and perceived behavioural control of possible users of Luas in Dublin and to find out what their intentions were regarding Luas and how they had formed these intentions. This study contributed to the objectives of the thesis by showing how people made travel decisions and also how the Theory of Planned Behaviour could be implemented on a large-scale, using questionnaires.

In Chapter 7, the results of the studies in Croydon and Dublin will be analysed. This will examine the links between attitudes, beliefs, and subjective norm, perceived behavioural control and intentions and behaviour. The analysis will examine people’s motivations for choosing to use or not to use the new light rail systems and will discuss whether the Theory of Planned Behaviour can contribute to better predictions of travel behaviour choices. It will examine whether the theory affords a better understanding of modal choices that can help to predict the potential impacts of new urban light rail systems.
Chapter 7

Analysis of the study results
7.1 Introduction

In this chapter, the results of the studies that were described in Chapter 6 are analysed. The analysis was carried out with a view to fulfilling the objectives that were originally set out by this thesis. That is, the analysis was carried out to examine the potential impacts of new urban public transport on people’s travel behaviour and to try to explain why those impacts occur. There were two parts to the analysis. Firstly, an analysis was carried out of the interviews and questionnaires in Croydon and secondly, an analysis was carried out of the study in Dublin.

In the case of the study in Croydon, there were six main steps in the analysis of the interviews and questionnaires:

(1) Elicit people’s normative beliefs, behavioural beliefs and control beliefs about Tramlink.

(2) Show how these beliefs determined what people’s attitudes, subjective norms and perceptions of behavioural control were.

(3) Demonstrate that people’s attitudes, subjective norms and perceptions of behavioural control correlated well with people’s intentions to use or not to use Tramlink and had contributed to people’s travel decisions.

(4) Show how people’s attitudes, subjective norms and perceptions of behavioural control differed for different types of Tramlink users.

(5) Show that people’s intentions correlated well with their actual behaviour.

(6) Show that people’s attitudes, subjective norms and perceptions of behavioural control correlated well with their actual behaviour.

In the first part of the study when interviews were conducted, it was intended to show how people make travel decisions. Afterwards, the follow-up study of the actual behaviour of the interviewees showed how well people’s intentions at the interview stage correlated with their actual behaviour and also how well the
various components of the Theory of Planned Behaviour correlated with people’s actual behaviour.

The study was extended by designing a questionnaire to be used to investigate whether it was possible to make predictions about people’s use of a new system. The questionnaire was distributed in Dublin to a small sample. The results of the questionnaire were analysed to examine the correlation between the components of the Theory of Planned Behaviour and people’s intention to use the new light rail system.

7.2 The analysis of the Croydon interviews

7.2.1 Introduction

The data proved to be very complex to analyse as it was collected in unstructured form. While this led to a lot of very relevant data being collected, a careful analysis was vital to ensure that the diversity of information that the qualitative, unstructured interviews yielded was not lost.

The interviews were transcribed from the tape recordings. This was made easier by the response sheets that had been used during the interviews. The interviews had been designed to collect information about:

(1) Commuter trips on Tramlink

(2) Work trips made from Croydon during the working day

(3) Non-work trips made to Croydon

(4) New trips that were made because of Tramlink

From the analysis it was found that the majority of the new trips that would be generated were non-work trips that were made away from Croydon, to areas that people might not have considered going to before. Therefore, it was decided to examine four trip types during the analysis:

- Commuter trips to Croydon
Business trips made away from the place of work in Croydon during the day

Non-work trips made from home to Croydon town centre

Non-work trips made to areas other than Croydon town centre

The attitudes, the subjective norms and perceived behavioural control regarding all these trip types were examined. A person may have different expectations for the mode that he or she chooses to use on the commute to work than for the mode that he or she would use for visiting a friend. This is because on the trip to work people are more likely to need to be in a certain place at a certain time: they must be able to rely on the fact that the mode that they choose to use will reach their workplace on time. However, on most leisure trips, time is not of the same priority and people may be more flexible in their choice of mode.

Each interview was analysed in the same way. Firstly, the interviewee's attitude to Tramlink use in general was assessed and assigned a score. This was repeated for his or her attitude to Tramlink use for the different trip types. A scoring system from -3 to 3 was used with 3 indicating that the interviewee had been very positive about using Tramlink and -3 indicating that he or she had been very negative.

In order to decide what score to give each interview, the interviews were studied to find the interviewees' behavioural beliefs. According to the Theory of Planned Behaviour, the attitudes the interviewees held were determined by what they believed would happen if they used Tramlink. While the transcripts of the interviews were studied, a list was drawn up of every behavioural belief that was found in the interviews. The interviews were then re-examined, individually. A page, similar to that show in Figure 7.1 was drawn up for each interview. Each time a belief was found in the interview, a mark was made on this sheet. For example if a person said that Tramlink would decrease their chances of being involved in a traffic accident a mark would be made in the column with the heading “Positive” in the row next to this belief.
Those interviews with the most positive beliefs were given a high score for their attitudes to using Tramlink. Those with negative beliefs were given negative scores for their attitudes to using Tramlink. Figure 7.1 does not show all the behavioural beliefs that the interviews were analysed for. It only serves as an example of the type of table that was used in the analysis of the interviews. The procedure was carried out 5 times for each interview to assess people's attitudes to the following:

- Tramlink use in general
- Tramlink use on commuter trips
- Tramlink use on work trips away from the office
- Tramlink use on non-work trips into Croydon centre
- Tramlink use on non-work trips to areas other than Croydon centre.
### Interview number:

### Attitude score:

<table>
<thead>
<tr>
<th>Behavioural belief</th>
<th>Positive</th>
<th>Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>I believe that using Tramlink will...</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increase/decrease my chances of being involved in an accident</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Will increase/decrease my comfort levels</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Will make commuting to work easier/more difficult</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Figure 7.1 Assigning a score for attitude*

The second determinant of intention is the subjective norm (Fishbein and Ajzen, 1980). The subjective norms were determined by what the interviewees believed those around them (known as their referents) wanted them to do: these were the interviewees' normative beliefs. The score was used to assess how much the interviewees' referents wanted them to use Tramlink: 3 meant that the referents were in favour of Tramlink being used and -3 meant that referents were against its use.

In order to assign this score, a list was compiled of all the referents that the interviewees mentioned. A sheet such as that in Figure 7.2 was prepared for each interview. Those who most often mentioned that referents wanted them to use Tramlink were given the highest scores for subjective norm. The procedure was
carried out 5 times for each interview. This was done to assess people’s subjective norm for the following cases:

- Tramlink use in general
- Tramlink use on commuter trips
- Tramlink use on work trips away from the office
- Tramlink use on non-work trips into Croydon centre
- Tramlink use on non-work trips to areas other than Croydon centre

<table>
<thead>
<tr>
<th>Interview number:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Subjective norm score</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Normative belief</td>
</tr>
<tr>
<td>My family want/ do not want me to use Tramlink</td>
</tr>
<tr>
<td>My friends want/ do not want me to use Tramlink</td>
</tr>
<tr>
<td>Croydon Council want/ do not want me to use Tramlink</td>
</tr>
<tr>
<td>TCL want/ do not want me to use Tramlink</td>
</tr>
</tbody>
</table>

*Figure 7.2: Assigning a subjective norm score*

The final component of the Theory of Planned Behaviour that the interviews had to be analysed for was the interviewees’ perceived behavioural control: how easy did they think it would be to use Tramlink? Again, a scoring system was used. If the interviewees felt that using Tramlink would be very easy, then the interview was assigned a score of 3. If they believed it would be very difficult, it was
assigned a score of −3. This was repeated for Tramlink use on work trips and non-work trips.

In order to assign this score, the interviews were studied to find the control beliefs that led to the perceived behavioural control that people held. A list of all the control beliefs that were found in the interviews was compiled and then a sheet as shown in Figure 7.3 was prepared for each interview. If a person said that Tramlink was close to their home a mark would be made in the row next to this belief in the column headed “Positive”. Not all the control beliefs that people mentioned are shown in Figure 7.3 as this only serves as example of the type of table that was used in the analysis. Those interviews where facilitators to Tramlink use were most often mentioned and obstacles were least often mentioned were given the highest scores for perceived behavioural control. The procedure was carried out 5 times for each interview to assess people’s perceived behavioural control in relation to the following cases:

- Tramlink use in general
- Tramlink use on commuter trips
- Tramlink use on work trips away from the office
- Tramlink use on non-work trips into Croydon centre
- Tramlink trips on non-work trips to areas other than Croydon town centre.

<table>
<thead>
<tr>
<th>Interview number:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived behavioural control score:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Control belief</th>
<th>Positive</th>
<th>Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tramlink is far/close to my home</td>
<td></td>
<td></td>
</tr>
<tr>
<td>It is/it is not safe to use at night</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tramlink is easy/difficult to use in bad weather</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Figure 7.3 Assigning perceived behavioural control score*
Although the Theory of Planned Behaviour states that the intention to carry out an action is determined by a person’s attitude to the action, their subjective norm and their perceived behavioural control, the analysis discussed below will show that there was some ambiguity involved in people’s subjective norm. People said that Croydon Council and Tramtrack Croydon Limited (TCL) wanted them to use Tramlink but this advice had very little effect on them. They were not going to carry out an action because they were urged to do so by Croydon Council or TCL. Therefore, people sometimes had very positive normative beliefs and believed that their friends, family, Croydon Council and TCL all wanted them to use Tramlink but did not want to do what these organisations wanted them to do. It was decided to measure people’s motivation to comply with their referents. Scores were assigned as before with 3 meaning that the interviewee wanted to comply with his or her referents and -3 meant that they wanted to do the opposite to what this referent said. People often stated that the opinions of TCL and Croydon Council had no effect on them. A sheet such as that shown in Figure 7.4 was used. Once more, these scores were compiled for the following cases:

- Tramlink use in general
- Tramlink use on commuter trips
- Tramlink use on work trips away from the office
- Tramlink use on non-work trips into Croydon centre
- Tramlink trips on non-work trips to areas other than Croydon town centre.
Interview number:

Motivation to comply score:

<table>
<thead>
<tr>
<th>Motivation to comply</th>
<th>Positive</th>
<th>Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>The opinions of my friends are important</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The opinions of my family are important</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The opinions of Croydon Council are important</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The opinions of TCL are important</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 7.4: Assigning a score for motivation to comply with referents

The significance of assigning scores to people’s motivation to comply with referents was very important. It will be seen in the analysis that people were much more willing to comply with their friends and family than with TCL and Croydon Council. According to Ajzen and Fishbein (1980) only those referents that are salient should be included in calculating a person’s subjective norm. Therefore, for each interview the subjective norm was recalculated, excluding Croydon Council and TCL, as even those who were going to use Tramlink were ignoring the advice of Croydon Council and TCL. They had chosen to use it because of what their friends or family said, and because of their own opinions. Both scores for subjective norm will be given in the analysis below. People’s motivation to comply with these referents was also re-calculated. The scores were assigned in the same way as before. To calculate an interviewee’s subjective norm, each interview was analysed using the same type of sheet as shown in Figure 7.3, except that all references to Croydon Council and TCL were ignored. To calculate people’s motivation to comply with referents, a sheet similar to that in Figure 7.4 was prepared for each interview, omitting references to the Council and TCL.
Table 7.1 shows the scoring system that was used for each factor. For the analysis, the interviews were divided into two groups: those with people who intended to use Tramlink and those who never intended to use Tramlink. The latter group was very uncomplicated: it is called Group A in the following analysis. The former group, however, was composed of many different user types. The frequency with which they intended to use Tramlink varied extensively as did the type of trips that they intended to use Tramlink for. Therefore this group was further subdivided into two groups: those who intended to use Tramlink for commuting, called Group B in this chapter, and those who intended to use Tramlink for other trip types only, called Group C in this chapter. It is important to note that each of the groups A, B and C is small and that difficulties can arise when attempting to carry out statistical tests on small samples. The following sections will describe the analysis of the interviews of each of these groups.
<table>
<thead>
<tr>
<th>Component of the Theory of Planned Behaviour</th>
<th>Scores</th>
</tr>
</thead>
</table>
| Attitude                                   | 3 = Very positive  
                                           | 2 = Positive  
                                           | 1 = Mainly positive  
                                           | 0 = Neutral  
                                           | -1 = Mainly Negative  
                                           | -2 = Negative  
                                           | -3 = Very Negative |
| Subjective norm                            | 3 = Very positive  
                                           | 2 = Positive  
                                           | 1 = Mainly positive  
                                           | 0 = Neutral  
                                           | -1 = Mainly Negative  
                                           | -2 = Negative  
                                           | -3 = Very Negative |
| Motivation to comply                       | 3 = very motivated to comply  
                                           | 2 = motivated to comply  
                                           | 1 = mostly motivated to comply  
                                           | 0 = neutral  
                                           | -1 = mostly opposed to complying  
                                           | -2 = opposed to complying;  
                                           | -3 = extremely opposed to complying |
| Perceived behavioural control              | 3 = very high control  
                                           | 2 = high control  
                                           | 1 = mostly high control  
                                           | 0 = neutral  
                                           | -1 = mostly low control  
                                           | -2 = low control  
                                           | -3 = extremely low control |

*Table 7.1: Score system used for the interviews*
7.2.2 Non-Users of Croydon Tramlink: Group A

There were eight people who intended never to use Tramlink. Table 7.2 shows the composition of Group A.

<table>
<thead>
<tr>
<th>Sex</th>
<th>Age</th>
<th>&lt;20</th>
<th>20-34</th>
<th>35-49</th>
<th>50-59</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td></td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 7.2: Sex and age of those who intend never to use Tramlink

The interviewees in this group were adamant that the new urban public transport system planned for Croydon could have no impact on their travel behaviour. It is the objective of this analysis to find out how they came to this decision by looking at their beliefs and perceptions.

Pervading through all the interviews with people in Group A was a belief that using Tramlink would not benefit them personally and would make their trips more difficult.

Table 7.3 shows the average scores calculated for the attitudes of Group A to using Tramlink, using the scoring system outlined in Table 7.1. No scores are given for the different trip types as these people only gave views on why they would never use Tramlink, rather than why they would use it for one trip type and not another.

<table>
<thead>
<tr>
<th>Component of the Theory of Planned Behaviour</th>
<th>Mean score</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attitude to using Tramlink</td>
<td>-1.5</td>
<td>-3 → 0</td>
</tr>
<tr>
<td>Subjective norm (1)</td>
<td>-1.3</td>
<td>-3 → 1</td>
</tr>
<tr>
<td>Motivation to comply with referents (1)</td>
<td>0.3</td>
<td>0 → 1</td>
</tr>
<tr>
<td>Subjective norm (2)</td>
<td>-1.8</td>
<td>-3 → 0</td>
</tr>
<tr>
<td>Motivation to comply (2)</td>
<td>2.1</td>
<td>0 → 3</td>
</tr>
<tr>
<td>Perceived behavioural control</td>
<td>-2.0</td>
<td>-3 → 2</td>
</tr>
</tbody>
</table>

Table 7.3: Scores for Group A
Table 7.3 shows that the attitudes to using Tramlink ranged from a score of 0 (neutral) to −3 (very negative). The average was −1.5. Obviously, these people did not feel using Tramlink would be of benefit to them personally. However, some of them were not negative about Tramlink itself. Therefore, it is important to make the distinction between attitudes to Tramlink and attitudes to using Tramlink. There were members of this group who felt Tramlink was a good idea. For example, one woman said:

"I think that I and my family are in favour of Tramlink and public transport in general”

But she stressed the fact that it would not be a mode she could use:

"I have severe reservations about the route. They chose the routes because they were the easiest ones to go on rather than because they would be useful to anyone.”

Therefore, it is apparent that people’s perceptions of a new public transport system may actually be positive but if they do not feel that the system can serve them adequately they will not use it. On the whole, however, people in this group had negative attitudes both to Tramlink itself and Tramlink use. Table 7.4 shows the top five behavioural beliefs that were held by this group. These were elicited from the interviews. It is apparent from these beliefs that it was the quality of the trip on Tramlink that these people were most concerned about: the lack of safety, the discomfort, the inconvenience and the stress. In addition they felt that the trip would be costly.

Part of this negative attitude could be explained by some of the problems that Tramlink faced in its construction period, that have been described in Chapter 5 and the fact that people said that were not always kept informed about road closures and bus route changes.

There had been several accidents during the testing of Tramlink, which were reported extensively in local papers. In addition, Tramlink had been delayed because it had failed some safety tests of Her Majesty’s Royal Inspectorate (HMRI). Again, this fact was reported in local newspapers. One man said:
"There have been many accidents. The trams are too quiet and the bells aren't loud enough. Someone will be killed."

At that same time, Croydon Council and TCL were not giving people enough information about what was being done to improve safety or to train drivers.

This group also felt that Tramlink would be expensive to use: as has been mentioned in Chapter 5, details about ticket prices for Tramlink and combined bus - Tramlink tickets had not been made public by TCL until it was very close to the opening of Tramlink so people were confused about the costs involved.

<table>
<thead>
<tr>
<th>Behavioural beliefs</th>
<th>People who had this belief</th>
</tr>
</thead>
<tbody>
<tr>
<td>I believe that using Tramlink will increase my chances of being involved in a traffic accident.</td>
<td>6</td>
</tr>
<tr>
<td>I believe that using Tramlink will decrease my sense of comfort.</td>
<td>5</td>
</tr>
<tr>
<td>I believe that using Tramlink will make commuting to work more difficult as it will cost time</td>
<td>5</td>
</tr>
<tr>
<td>I believe that using Tramlink will be more stressful than driving.</td>
<td>5</td>
</tr>
<tr>
<td>I believe that using Tramlink will cost me more than using my car.</td>
<td>4</td>
</tr>
<tr>
<td>I believe that using Tramlink will be inconvenient.</td>
<td>4</td>
</tr>
</tbody>
</table>

Table 7.4: Behavioural beliefs of Group A: 8 people in Group A

The second element of the Theory of Planned Behaviour is the subjective norm. Table 7.3 shows that the score for the subjective norm ranged from 1 (people are mostly positive about me using Tramlink) to −3 (people are very negative about me using Tramlink). The average was −1.3. The wide range reflects the fact that people felt that the Council and TCL, the company building Tramlink, wanted them to use Tramlink but that their friends and family did not think that they should use Tramlink. Table 7.5 shows the referents that were mentioned and how often that they were mentioned.
<table>
<thead>
<tr>
<th>Referents</th>
<th>In favour of me using Tramlink</th>
<th>Opposed to me using Tramlink</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Friends</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Work Colleagues</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Croydon Council</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>TCL</td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 7.5: The referents mentioned by Group A: 8 people in Group A

Returning to Table 7.3, the interviewees’ motivation to comply with these referents ranged from 1 (mainly positive motivation to comply with the referents) to 0 (neutral). The average was 0.3. The referents that held most power over the interviewees were friends and family who tended to be opposed to them using Tramlink and those with the least power were Croydon Council and TCL who were in favour of the interviewees using Tramlink. The interviewees were annoyed with the Council and TCL for not giving them enough information about opening times and traffic changes. The problems with the closure of the Tramshop and the inadequacies of TCL’s publicity have been described in Chapter 5. As one woman said of the Council and TCL:

“They haven’t kept us well-informed. Weekly bulletins or something just to let you know what was happening would have been nice.”

It was decided that as people’s motivation to comply with Croydon Council and TCL was so low, they could not be considered to be salient referents. Therefore, Table 7.3 also shown scores calculated for subjective norm and motivation to comply when only a person’s friends, family and work colleagues were included. Table 7.3 shows that people’s subjective norm (-1.8) was lower as fewer referents wanted them to use Tramlink while their motivation to comply with these referents (2.1) was much higher.

The third factor in the Theory of Planned Behaviour is perceived behavioural control. From Table 7.3, the average level of perceived behavioural control in this group was low (-2.0) and ranged from 2 (high control) to -3 (very low control). For two people, using Tramlink was very easy as they lived near it and
worked near it but they felt that it would not benefit them to use it. Hence, their negative attitude to Tramlink use was the deciding factor against them using it. However, some people said that even if they had wanted to use Tramlink they could not do so. The types of obstacles to using Tramlink that they identified in the interviews are listed in Table 7.6. Predominant were the beliefs that the stops and routes were inconvenient. There had been criticisms, mentioned in Chapter 5, of the fact that some of the Tramlink routes did not always go through very populated areas and that getting to stops would be very difficult for some people. The control beliefs of this group would seem to lend credence to those criticisms.

As one woman said:

"How is someone with shopping and a push chair going to use it? Who wants to get on a bus, travel to a Tramlink station, get on a tram and get to another point and perhaps you are still not at your destination? It'll be even worse in the winter when it's wet."

<table>
<thead>
<tr>
<th>Control beliefs</th>
<th>People who had this belief</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tramlink is too far from my home.</td>
<td>6</td>
</tr>
<tr>
<td>The routes are not where I want to go.</td>
<td>6</td>
</tr>
<tr>
<td>It is not safe to use at night</td>
<td>5</td>
</tr>
<tr>
<td>There is nowhere to wait when it is wet and cold.</td>
<td>4</td>
</tr>
<tr>
<td>There is nowhere safe for me to leave my car when I want to transfer to Tramlink.</td>
<td>2</td>
</tr>
<tr>
<td>I cannot use it for heavy goods</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 7.6 Control beliefs of Group A: 8 people in Group A

The qualitative analysis of Group A showed that the interviewees did not feel that Tramlink use would benefit them. It would be too difficult to use and they did not evaluate the outcomes of this behaviour highly. In addition, most of their referents did not favour Tramlink use and they did not feel motivated to comply with those that did. Therefore, negative attitudes to using Tramlink, negative subjective norms and negative perceived behavioural control led to a negative intention to use Tramlink.
For this group, the most important factor seemed to be that Tramlink would have no positive outcomes for them. The subjective norm was less important as they were neutral about complying with several referents, although they were more willing to comply with friends and family members. However, the poor publicity from Croydon Council and TCL and the poor perceptions of the system caused by construction problems did not help to improve people’s attitudes to Tramlink use.

Finally, perceived behavioural control was an important factor for Group A: many obstacles were identified that would prevent them from using Tramlink. Chief among these was the problem of access to Tramlink from home and what Group A considered to be its poor choice of routes.

It is apparent from this qualitative analysis of those people who were most negative towards Tramlink that they did not feel that this new urban public transport system could change their travel behaviour. That is not to say that all the members of this group felt that all new public transport was unhelpful or that that could never change their travel behaviour. The analysis above shows that many of these people genuinely felt that using Tramlink would be very difficult. It is apparent that the lack of information made available to people also had an effect on their decision not to use Tramlink. Above, it was shown that several people were worried about safety on Tramlink and about the costs involved. These fears could have been allayed with a more vigorous marketing approach by TCL or the Council.

Figure 7.5 summarises the findings for Group A.
Lack of safety
Stress
Inconvenience
Lack of comfort
Cost

Attitude = -1.5

I do not intend to use Tramlink for any trips

Subjective norm 1 = -1.3
Subjective norm 2 = -1.8

Perceived behavioural control = -2.1

Normative Beliefs:
My family and friends think I should not use Tramlink.
TCL and Croydon Council think that I should use Tramlink.

Control Beliefs:
Too far from home/work
Bad Weather
No Park and Ride
Heavy Items to carry

Figure 7.5:
The Theory of Planned Behaviour and the Intentions of Group A
7.2.3 Commuter trips and Tramlink: Group B

The group that offered the greatest contrast to those who had decided to never to use Tramlink was the group comprised of those who decided to use it to travel to work: Group B. There were 10 people in Group B. Six of these regularly drove to work, while the other 4 currently used the bus for work trips Table 7.7 shows the composition of the group.

<table>
<thead>
<tr>
<th>Sex</th>
<th>Age</th>
<th>&lt;20</th>
<th>20 – 34</th>
<th>35 – 49</th>
<th>50 – 59</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td></td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Male</td>
<td></td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>1</td>
</tr>
</tbody>
</table>

*Table 7.7: Sex and age of Group B*

While the members of Group A felt that Tramlink would have no impact on their travel behaviour, for members of Group B it was expected to have quite a significant impact on their travel behaviour. Eight of the people in the group felt positive enough about Tramlink to say that it would become their regular mode of transport for their work trips, 6 of whom would no longer be using their cars to travel to work. They also intended to use Tramlink for many other trip types, although on a less regular basis than for their commuting trips. Some of these trips would also replace existing car trips. Therefore, the analysis needs to ascertain what were the differences in the decision-making processes for the members of Group B that meant that they felt motivated to use Tramlink on several trip types. A first step is to examine the differences in their attitudes, subjective norm and perceived behavioural control. According to the Theory of Planned Behaviour, these are the important determinants in any decision-making process and so it is expected that those of Group B would differ from those of Group A. Table 7.8 shows the scores calculated for this group using the scoring system in Table 7.1. It is apparent that all the average scores for components of the theory are positive.
In addition, if a person was willing to use Tramlink for the most important trip of the day where time was at a premium, they were also more willing to consider it for other, less pressing trips. Many of these trips were currently made by car, in particular trips to areas outside of Croydon town centre. Table 7.9 shows the types of trips that members of Group B were intending to make by Tramlink. Only two members of the group intended to use Tramlink only for commuter trips.

<table>
<thead>
<tr>
<th>Trip type</th>
<th>People intending to make this trip type by Tramlink:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commuter Trips, non-work trips to Croydon and non-work trips from Croydon</td>
<td>8</td>
</tr>
<tr>
<td>Commuter Trips</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 7.9: Intention to use Tramlink for multiple trip types: 10 people in Group B

Therefore, the attitudes towards using Tramlink of the interviewees in this group were positive for several trip types. Table 7.10 shows the attitude scores calculated for this group for specific trip types using the scoring system in Table 7.1.
<table>
<thead>
<tr>
<th>Trip type</th>
<th>Mean score</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commuter trips</td>
<td>2.2</td>
<td>1 → 3</td>
</tr>
<tr>
<td>Non-work trips to central Croydon</td>
<td>1.9</td>
<td>1 → 3</td>
</tr>
<tr>
<td>Non-work trips from Croydon</td>
<td>2.1</td>
<td>0 → 3</td>
</tr>
</tbody>
</table>

Table 7.10: Attitudes of Group B: 10 people in Group B

From Table 7.10, we see that members of Group B were particularly positive about using Tramlink for commuter trips. This is also reflected in the types of behavioural beliefs that the interviewees had. These beliefs are listed in Table 7.11. From this table, we see that members of Group B were impressed by the convenience of Tramlink: they felt that it would make it easier to commute and would be less stressful than driving. They were impressed by the frequent timetables that would allow them to use Tramlink to commute. These timetables were detailed in Chapter 5 and one aim of TCL was to provide a more frequent public transport service. This is in marked contrast with members of Group A who had stated that Tramlink would be difficult and uncomfortable to use.
<table>
<thead>
<tr>
<th>Behavioural beliefs</th>
<th>Number of people who had this belief</th>
</tr>
</thead>
<tbody>
<tr>
<td>I believe that using Tramlink will make it easier to commute to work as it will save me time</td>
<td>8</td>
</tr>
<tr>
<td>I believe that using Tramlink will make it easier for me to conduct personal business in and around Croydon.</td>
<td>6</td>
</tr>
<tr>
<td>I believe that using Tramlink will improve air quality and the environment in Croydon.</td>
<td>5</td>
</tr>
<tr>
<td>I believe that using Tramlink will be more convenient than using other modes if I want to travel away from Croydon.</td>
<td>5</td>
</tr>
<tr>
<td>I believe that using Tramlink will be easier than using the bus or the car when I want to shop.</td>
<td>4</td>
</tr>
<tr>
<td>I believe that using Tramlink will be less stressful than driving.</td>
<td>3</td>
</tr>
<tr>
<td>I believe that using Tramlink will cost me more than using my car.</td>
<td>2</td>
</tr>
</tbody>
</table>

*Table 7.11: Behavioural beliefs of Group B: 10 people in Group B*

The behavioural beliefs show that some members of the group agreed with the non-users that Tramlink would cost more than using the car but for members of Group B it was a cost, that the interviewees were willing to accept for a better public transport service. As one woman said:

"I'll pay more if it's a better service."

Members of this group were also more likely to believe that their referents wanted them to use Tramlink. Table 7.8 shows the average scores for subjective norm while Table 7.12 shows the scores for individual trip types. The referents that they mentioned are shown in Table 7.13.
Trip type | Mean score | Range
--- | --- | ---
Commuter trips (1) | 1 | -1 → 3
Non-work trips to Croydon (1) | 1 | -1 → 3
Non-work trips from Croydon (1) | 1 | 0 → 3
Commuter trips (2) | 0.8 | -1 → 2
Non-work trips to Croydon (2) | 0.9 | 1 → 2
Non-work trips from Croydon (2) | 1 | 0 → 2

Table 7.12: Scores for subjective norm (1) and subjective norm (2) (omitting TCL and Croydon Council)

Referent | In favour of me using Tramlink | Against me using Tramlink
--- | --- | ---
Council | 7 | 0
Family | 5 | 1
Friend | 5 | 1
Tramstop | 0 | 3
TCL | 1 | 0

Table 7.13: The referents mentioned by Group B: 10 people in Group B

As with the people who intended never to use Tramlink, the referents that were mentioned included family, friends, the Council and TCL. In addition, a group called Tramstop that had been distributing leaflets opposing the building of Tramlink was also mentioned. It is ironic that the interviewees who never intended to use Tramlink had never heard of Tramstop but that some of those who intended to use Tramlink on quite a regular basis had heard of them and had been unaffected by their publicity.

Once more, the average score for motivation to comply with referents (0.2) as shown in Table 7.8 would indicate that interviewees were quite neutral about complying with the referents. This score arises from the fact that people were quite motivated to comply with friends and family but were not motivated to comply with the Council, Tramstop and TCL. The Council and TCL were encouraging use of Tramlink but, as with those who did not intend to use Tramlink, the interviewees felt that the Council had handled publicity badly and
only one person knew that TCL were involved in publicising Tramlink. Very little information had been made available to them and the confusion about opening dates antagonised them. They intended to use Tramlink despite their reservations about complying with the Council. As one man stated:

"The public were consulted but I don't think that it had much impact. The Council made up it's mind and just did what it wanted."

People were more likely to be persuaded to use Tramlink because of the attitudes of their family and friends. In most cases, they said that their family and friends were in favour of them trying out Tramlink.

Once more, the interviewees’ subjective norm and motivation to comply with referents were re-calculated to include only relevant their friends and family. Tables 7.12 and 7.8 shows that the subjective norm did not change very much when the Council, TCL and Tramstop were excluded as most of the time people felt that their friends and family were in agreement with the Council and TCL and wanted them to use Tramlink, although these family and friends did not tend to have very strong views on the subject. Therefore in Table 7.12, a slight drop in people’s subjective norm for the different trip types is apparent. Few people had mentioned Tramstop or TCL as referents. People’s motivation to comply with their referents was higher (1.2) when the Council, Tramstop and TCL were excluded.

Therefore, there are some similarities to be found in the decision-making processes of both groups at this stage. Interviewees in Group A and Group B were more willing to listen and be swayed by the views of their friends. Both groups stated that they were disappointed with the publicity of the Council and TCL. There are differences in their decision-making processes too, however. For Group A, the disappointment in TCL’s and the Council’s publicity played a part in determining their decisions to use Tramlink while for Group B the advantages that Tramlink offered and the strong positive behavioural beliefs they had about using Tramlink could not be countered by their poor opinion of TCL’s and the Council’s publicity campaigns.
Moving on to the third component of the decision-making process, which is a person’s perceived behavioural control, it was found that the respondents in Group B felt that they had very high control over their intention to use Tramlink for all their trips as Table 7.14 shows. They felt that they had the most control over their commuting trips.

<table>
<thead>
<tr>
<th>Trip type</th>
<th>Mean score</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commuter trips</td>
<td>2.1</td>
<td>-1 → 3</td>
</tr>
<tr>
<td>Non-work trips to Croydon</td>
<td>1.7</td>
<td>-1 → 3</td>
</tr>
<tr>
<td>Non-work trips from Croydon</td>
<td>1.7</td>
<td>-1 → 3</td>
</tr>
</tbody>
</table>

*Table 7.14: Perceived behavioural control on the different trip types*

Table 7.15, which lists their control beliefs, also demonstrates that members of Group B felt that Tramlink use would facilitate their trips. They identified factors that they felt would make travelling on Tramlink easy: the convenience of a service that was frequent and close to work, home and leisure facilities was an important advantage. In Chapter 4, where the results of a large-scale study of the reasons that car-drivers chose to drive were described, it was shown that many of the drivers had rejected public transport due to its inflexibility and inconvenience. These drivers had claimed that improved services with better routes and timetables would allow them to use public transport more often. In the interviews in Croydon, it becomes apparent that it is just these features of Tramlink that make it so attractive to members of Group B. While members of the group mentioned some obstacles, they felt that these would only prevent them from using Tramlink on certain occasions; such as if they were doing a large grocery shop or had to travel home at night when they were working overtime.
<table>
<thead>
<tr>
<th>Control Beliefs</th>
<th>Number of People who had this belief</th>
</tr>
</thead>
<tbody>
<tr>
<td>I work close to a stop</td>
<td>10</td>
</tr>
<tr>
<td>I live close to a stop</td>
<td>9</td>
</tr>
<tr>
<td>Tramlink goes where I want to go</td>
<td>4</td>
</tr>
<tr>
<td>I do not have to wait around at stops</td>
<td>6</td>
</tr>
<tr>
<td>There is nowhere safe place for me to leave my car when I want to transfer to Tramlink.</td>
<td>4</td>
</tr>
<tr>
<td>I cannot use it for heavy goods</td>
<td>3</td>
</tr>
<tr>
<td>I work odd hours</td>
<td>2</td>
</tr>
<tr>
<td>I cannot use Tramlink when it is dark.</td>
<td>2</td>
</tr>
<tr>
<td>Tramlink is too far from my home.</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 7.15: Control beliefs of Group B: 10 people in Group B

Therefore, there is a great contrast between the two groups. Both groups, however, had similar decision-making processes where they examined the outcomes of using Tramlink, considered the opinions of referents and looked at how easy or difficult it would be to use Tramlink. Tramlink use was considered to bring with it benefits, to be something that their friends and family approved of and to be easy to do for members of Group B while members of Group A were sceptical about its benefits, felt that those around them were not in favour of it and that it was too difficult to use. For members of Group B, the benefits that it would bring were an important factor in their decision-making process. These benefits related to using Tramlink on work trips and non-work trips. As with the non-users of Tramlink, the subjective norm showed that people were more willing to comply with friends and family. Finally, perceived behavioural control was a very important factor: for Group B, Tramlink use was perceived as being relatively easy and being something that would make their trip easier than it currently was.

Figure 7.6 shows a summary of the behavioural beliefs, normative beliefs and control beliefs of Group B.
Figure 7.6:

The Theory of Planned Behaviour and the Intentions of Group B
In the analysis of the interviews so far two groups have been highlighted: for members of Group A, Tramlink would have no impact on their travel behaviour while for members of Group B, Tramlink would have a significant impact on their travel behaviour and they would make regular commuting trips on it. There was another group of interviewees who intended to use Tramlink but only for trips other than commuting trips. This was Group C and there were 12 people in this group. Of these 6 travelled to work by car, 2 by bus and 4 by train. Most of their non-work trips were made by car although they occasionally used public transport. In this section, the potential impact of Tramlink on the travel behaviour of these interviewees will be assessed and their decision-making processes will be analysed. Table 7.16 shows the trips types that they intended to make on Tramlink.

<table>
<thead>
<tr>
<th>Trip type</th>
<th>People who intended to make this trip type on Tramlink</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-work trips from Croydon</td>
<td>7</td>
</tr>
<tr>
<td>Non-work trips to Croydon</td>
<td>5</td>
</tr>
<tr>
<td>Work trips made during the day from Croydon</td>
<td>3</td>
</tr>
</tbody>
</table>

Table 7.16: Trip types of Group C: 12 people in Group C

While it may seem that the proportion of the sample intending to use Tramlink was high, the amount by which interviewees in Group C intended to use it was very low. Only two people intended to use Tramlink regularly and even then it would only be once or twice a week. This is partly due to the nature of the trips for which they intended to use Tramlink: non-work trips and work trips made during the day from Croydon. These trips are not as frequently made as daily commuter trips.

The impact of Tramlink on the travel behaviour of members of Group C was more complicated to analyse than for either of the other two groups. People in this group intended to use Tramlink in many different ways. As can be seen in Table 7.17, which shows the attitude, subjective norm, motivation to comply
scores and perceived behavioural control scores for this group, there were very wide ranges of attitudes, subjective norms and perceived behavioural control scores for this group. This is because of the diversity involved in this group: people were planning to use the Tramlink for only very few trips and those trips were quite different for each person. Therefore, looking at the travel behaviour and finding decision-making patterns were more difficult for Group C. However, the use of in-depth interviews and the Theory of Planned Behaviour allowed the subtleties of each person’s behaviour and choices to be examined in greater detail.

<table>
<thead>
<tr>
<th>Component of the Theory of Planned Behaviour</th>
<th>Mean score</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attitude to using Tramlink</td>
<td>0.3</td>
<td>-3 → 3</td>
</tr>
<tr>
<td>Subjective norm (1)</td>
<td>1.2</td>
<td>-3 → 3</td>
</tr>
<tr>
<td>Motivation to comply with referents (1)</td>
<td>-0.5</td>
<td>-3 → 3</td>
</tr>
<tr>
<td>Subjective norm (2)</td>
<td>0.4</td>
<td>-2 → 3</td>
</tr>
<tr>
<td>Motivation to comply with referents (2)</td>
<td>1.0</td>
<td>0 → 3</td>
</tr>
<tr>
<td>Perceived behavioural control</td>
<td>-1.2</td>
<td>-3 → 3</td>
</tr>
</tbody>
</table>

*Table 7.17: Scores for Group C for all trips*

This group did not hold strong attitudes towards using Tramlink. Table 7.18 shows how it varied for different trip types. It does not seem to be an important factor that led to their decisions to use it or not to use it; unlike for the previous two groups. However, as already stated, the diversity of Group C means that these scores are misleading: the group is composed of people who have very different intentions regarding Tramlink use.

<table>
<thead>
<tr>
<th>Trip types</th>
<th>Mean score</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commuter Trips</td>
<td>-0.6</td>
<td>-3 → 1</td>
</tr>
<tr>
<td>Non-Work Trips to Croydon</td>
<td>-0.1</td>
<td>-3 → 2</td>
</tr>
<tr>
<td>Non-Work Trips from Croydon</td>
<td>0.5</td>
<td>-3 → 2</td>
</tr>
<tr>
<td>Work Trips made from Croydon during the day</td>
<td>0.3</td>
<td>-3 → 3</td>
</tr>
</tbody>
</table>

*Table 7.18: Attitude scores for Group C*

Group C was most positive about the non-work trips from Croydon that Tramlink would allow them to make. For the most part, these were new trips that the
interviewees intended to make because Tramlink would make it easier to get to places like Wimbledon and because the Tramlink routes allowed them to change to train at several points to get into various parts of London. As Chapter 5 described, Tramlink allowed better access to East Croydon, West Croydon and Wimbledon station, all of which are important interchange points for trains to London.

As mentioned above, part of the reason that there is no indication of strong attitudes being held by Group C is because of the diversity of this group. People intended to use Tramlink for very different reasons. For example, an individual could have a very positive attitude about using Tramlink for trips from work but a negative attitude about Tramlink use on all other trips. His or her positive attitude would not become apparent in Tables 7.17 and 7.18, as there were so many other people in the group who were not going to use Tramlink for trips from work.

Table 7.17 also shows the scores for Group C’s subjective norm, motivation to comply and perceived behavioural control. People’s perceived behavioural control in this group was quite low (-1.2). This group were not going to use Tramlink very often. Therefore, Tramlink use would only be easy for them on the specific trip types that they would use it for.

The subjective norm score (1.2) is reasonably positive although once more people were not particularly motivated to comply with the Council or TCL. When these referents were excluded from the calculation of subjective norm and motivation to comply with referents, the interviewees’ referents were less positive about Tramlink use (0.4) and the interviewees were more motivated to comply with these referents (1.0).

To facilitate the analysis and understanding of the travel decisions of Group C it was decided to examine each trip type separately and to divide the group into subsets, depending on how they intended to use Tramlink. Examining people’s attitudes, subjective norms and perceived behavioural control would then become easier. However, the sub groups were very small and thus, care must be taken with regard to the conclusions reached on the basis of the results of the statistical

208
tests on these groups. Table 7.19 shows the combination of trips that people in Group C intended to make by Tramlink. It is apparent from this that the group members varied extensively in the combination of the types of trips that they intended to make. The most popular trip type was the non-work trip to areas other than Croydon town centre: seven people intended to use Tramlink for this trip type. Most of them intended to use it on a very irregular and infrequent basis, however, and were making it because Tramlink would allow them to make it rather than to replace an existing trip. This subgroup is called Group C1.

<table>
<thead>
<tr>
<th>Trip types</th>
<th>People intending to use Tramlink for these trips</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-work trips to areas other than Croydon centre only</td>
<td>5</td>
</tr>
<tr>
<td>Non-work trips to Croydon centre only</td>
<td>2</td>
</tr>
<tr>
<td>Non-work trips to Croydon centre and non-work trips to areas other than Croydon centre</td>
<td>2</td>
</tr>
<tr>
<td>Work trips from Croydon</td>
<td>1</td>
</tr>
<tr>
<td>Work trips from Croydon and non-work trips to areas other than Croydon centre</td>
<td>1</td>
</tr>
<tr>
<td>Work trips from Croydon and non-work trips to Croydon</td>
<td>1</td>
</tr>
</tbody>
</table>

*Table 7.19: Intention of Group C to use Tramlink for multiple trip types: 12 people in Group C*

Table 7.20 shows the attitude, subjective norm and perceived behavioural control scores of Group C1. These scores are in relation to their non-work trips to areas other than Croydon town centre only. When examining these scores, it is important to keep in mind that the sample size of this group was very small.
In Table 7.20, it is apparent that these people were reasonably positive about using Tramlink for non-work trips to areas other than the centre of Croydon. Their attitudinal score for these trips was 1.4. The range of attitudinal values is also smaller than that shown in Table 7.18 for all of Group C. Table 7.21 shows the top five behavioural beliefs of this group that led to their positive attitude to Tramlink use on non-work trips from Croydon.

<table>
<thead>
<tr>
<th>Behavioural beliefs</th>
<th>People who held this belief</th>
</tr>
</thead>
<tbody>
<tr>
<td>I believe that using Tramlink will make it easier for me to conduct personal business in and around Croydon.</td>
<td>5</td>
</tr>
<tr>
<td>I believe that using Tramlink will make it harder to commute to work as it will cost time</td>
<td>5</td>
</tr>
<tr>
<td>I believe that using Tramlink will improve air quality and the environment in Croydon.</td>
<td>4</td>
</tr>
<tr>
<td>I believe that using Tramlink will increase my chances of being involved in a traffic accident</td>
<td>4</td>
</tr>
<tr>
<td>I believe that using Tramlink will be more convenient than using other modes if I want to travel away from Croydon.</td>
<td>4</td>
</tr>
</tbody>
</table>

Table 7.21: Behavioural beliefs of Group C1: 7 people in Group C1

The beliefs show that the drivers had mixed feelings about using Tramlink. They were happy to use it to travel away from Croydon and they believed it would make some areas that were further away more accessible to them but they were not convinced that it would help them in their commuter trips. The types of trips...
that they intended to make reflected these beliefs: they were positive about using Tramlink for non-work trips to areas outside Croydon town centre but these trips were quite rare. They were more interested in using Tramlink for new trips, as it would go to areas that were poorly served by public transport, rather than for the trips they made already.

Therefore, there are some similarities between Group C1 and Group A and between Group C1 and Group B. For members of Group A and Group C1, there were doubts about the reliability of Tramlink and people did not feel it would be possible to use on commuter trips. In addition, members of both groups expressed concerns about safety on Tramlink and the possibility of accidents occurring. Again, members of Group C1 were well aware of the accidents that Tramlink vehicles had been involved in during practice runs. These accidents had been reported in most local newspapers, some of which are delivered to people's doors in Croydon for free. Therefore, people were not being kept informed of safety by the Council or TCL and the reasons that these accidents occurred were not explained to them. There were also similarities between members of Group B and Group C1, however. Members of Group B intended to use Tramlink for trips other than commuting trips as was shown in the previous section and interviewees in both groups stated that Tramlink would open up new areas for them by providing better links to towns around Croydon.

Members of Group C1 felt that most people wanted them to use Tramlink and they were motivated to comply with their referents. Table 7.22 shows the referents that they mentioned. As with every group, they were most likely to want to comply with family and friends. Table 7.20 shows that they felt that most people wanted them to use Tramlink. When Croydon Council was included as a referent, people's subjective norm was slightly higher and people felt that there referents were more eager for them to use Tramlink (1.1). When they were excluded and only friends and family were included as referents the subjective norm of Group C1 fell to 0.9. People still felt that most of their referents felt positively about them using Tramlink, they did not think that their family and friends held this view so strongly. Their motivation to comply with these referents rose from -0.6 to 1.3, as was shown in Table 7.20. Therefore, as with
all the other groups, members of Group C1 were more inclined to be influenced by the opinions of their friends and family than those of Croydon Tramlink.

<table>
<thead>
<tr>
<th>Referent</th>
<th>In favour of me using Tramlink</th>
<th>Against me using Tramlink</th>
</tr>
</thead>
<tbody>
<tr>
<td>Friend</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Family</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Council</td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>

*Table 7.22: Referents mentioned by Group C1: 7 people in Group C1*

This group felt it had moderately high control over using Tramlink for non-work trips from Croydon. Table 7.23 shows their control beliefs. It is apparent that people were interested in using it to travel away from Croydon for non-work trips because they worked on the route. Therefore, it would be easy to transfer to Tramlink after work. The fact that they would not have to look for parking in areas like Wimbledon and Beckenham meant that they were more likely to consider travelling there to socialise. These were areas that the interviewees did not know very well so travelling there by car would be difficult and they would not know where to find parking. However, the fact that many of them did not live close enough to the route to walk to a stop was a factor in preventing them from using it to travel to work as was the lack of park and ride facilities.

<table>
<thead>
<tr>
<th>Control beliefs</th>
<th>People who held this belief</th>
</tr>
</thead>
<tbody>
<tr>
<td>I work near Tramlink</td>
<td>8</td>
</tr>
<tr>
<td>I do not live close enough to Tramlink to walk to a stop</td>
<td>6</td>
</tr>
<tr>
<td>I do not have to look for parking in areas like Wimbledon</td>
<td>4</td>
</tr>
<tr>
<td>There is nowhere to park my car when I want to transfer to Tramlink</td>
<td>3</td>
</tr>
<tr>
<td>I live near Tramlink</td>
<td>2</td>
</tr>
<tr>
<td>I socialise and shop on the Tramlink route</td>
<td>2</td>
</tr>
</tbody>
</table>

*Table 7.23: Control beliefs of Group C1: 7 people in Group C1*

The second trip type that must be considered for the people who did not intend to commute on Tramlink is the non-work trip to Croydon town centre. There were
five people in this sub-group, referred to as Group C2 in the text below. Again, the sample size of this group was very small. Table 7.24 shows the attitude, subjective norm and perceived behavioural control scores for these people in relation to non-work trips to Croydon town centre only.

<table>
<thead>
<tr>
<th>Component of the Theory of Planned Behaviour</th>
<th>Mean score</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attitude</td>
<td>1.0</td>
<td>-3 → 3</td>
</tr>
<tr>
<td>Subjective norm (1)</td>
<td>1.0</td>
<td>-3 → 3</td>
</tr>
<tr>
<td>Motivation to comply (1)</td>
<td>-0.8</td>
<td>-3 → 3</td>
</tr>
<tr>
<td>Subjective norm (2)</td>
<td>1.0</td>
<td>-3 → 3</td>
</tr>
<tr>
<td>Motivation to comply (2)</td>
<td>2.0</td>
<td>1 → 3</td>
</tr>
<tr>
<td>Perceived Behavioural Control</td>
<td>1.0</td>
<td>-2 → 2</td>
</tr>
</tbody>
</table>

*Table 7.24: Scores for Group C2*

Members of Group C2 did not intend to use Tramlink regularly for non-work trips to Croydon. Table 7.24 shows that the score range for attitude is very broad for the members of this group. However, only one person had the very negative attitude of -3 and was only going to use Tramlink once. The rest of the group had attitudinal scores of between 0 and 3.

The subjective norm and the interviewees' motivation to comply with referents were calculated including Croydon Council and TCL first. The ranges for the subjective norm and motivation to comply are very wide. Once more, a single person intended to use Tramlink once only in order "to try it out" and had a score of -3 for subjective norm and a score of 3 for motivation to comply. The rest of the group had much narrower ranges of scores: between 1 and 3 for subjective norm and between -2 and 1 for motivation to comply with referents. People were again unwilling to comply with TCL and the Council. When these were excluded, their mean motivation to comply with referents rose to 2. Finally, people felt that they had reasonably high control over using Tramlink (1.0).

Tables 7.25 to 7.27 show the behavioural, normative and control beliefs that people held.
<table>
<thead>
<tr>
<th>Behavioural beliefs</th>
<th>Number of people who held this belief</th>
</tr>
</thead>
<tbody>
<tr>
<td>I believe that using Tramlink will make it easier for me to conduct personal business in and around Croydon.</td>
<td>3</td>
</tr>
<tr>
<td>I believe that using Tramlink will make it harder to commute to work as it will cost time</td>
<td>3</td>
</tr>
<tr>
<td>I believe that using Tramlink will not reduce congestion</td>
<td>3</td>
</tr>
<tr>
<td>I believe that using Tramlink will improve air quality and the environment in Croydon.</td>
<td>2</td>
</tr>
<tr>
<td>I believe that using Tramlink will be more stressful</td>
<td>2</td>
</tr>
<tr>
<td>I believe that using Tramlink will be easy for shopping</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 7.25: Behavioural beliefs of Group C2: 5 people in Group C2

<table>
<thead>
<tr>
<th>Referent</th>
<th>Against me using Tramlink</th>
<th>In favour of me using Tramlink</th>
</tr>
</thead>
<tbody>
<tr>
<td>Council</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Friend</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>TCL</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Family</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 7.26: Referents mentioned by Group C2: 5 people in Group C2
<table>
<thead>
<tr>
<th>Control beliefs</th>
<th>Number of people who held this belief</th>
</tr>
</thead>
<tbody>
<tr>
<td>I work near Tramlink</td>
<td>5</td>
</tr>
<tr>
<td>I do not live close enough to Tramlink to walk to a stop</td>
<td>4</td>
</tr>
<tr>
<td>There is nowhere to park my car when I want to transfer to Tramlink</td>
<td>4</td>
</tr>
<tr>
<td>I do not have to look for parking in Wimbledon or Beckenham</td>
<td>3</td>
</tr>
<tr>
<td>I live near Tramlink</td>
<td>1</td>
</tr>
<tr>
<td>I socialise and shop on the Tramlink route</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 7.27: Control beliefs of Group C2: 5 people in Group C2

As with Group C1, the behavioural beliefs were quite mixed. They felt that Tramlink could bring some benefits to the trip but only for particular types of trip: work trips were not considered to be feasible on Tramlink.

Their control beliefs indicated, once more, that Tramlink was perceived as being a mode that they felt would be easy to use on leisure trips where parking might be an issue but not on work trips. This was despite the fact that so few people had free car parking at work. However, people knew Croydon town centre and knew where they would find parking. They did not know Wimbledon or Beckenham and trying to find parking in these areas would have been more difficult. For those who did have car parking at work, using Tramlink or any form of public transport to commute was not seen as an option as they felt it would be more costly.

As with Group C1, people did not live within walking distance of Tramlink stops which was a very important factor in preventing them from using it to travel to work. They felt that other forms of public transport would be easier to use for commuting. In particular, several people in all of Group C stated that they could use park and ride at train stations, which was not available to them for Croydon Tramlink. This was an issue that arose several times in interviews, as people...
questioned when secure park and ride facilities would be made available. There are no plans for park and ride as was mentioned in Chapter 5. There was also some concern that unofficial park and ride would start to take place and that people would park cars in Addington village and other small villages and estates around Croydon.

The final trip type to be examined is the work trip made from Croydon during the day. Only three people intended to make this trip. This is an extremely small group and is only included here to demonstrate that there were people in this group who intended to use Tramlink in this way. No substantive conclusions can be made on the basis of such a small group. They are referred to as Group C3 in the text below. Tables 7.28 to 7.31 show their scores and beliefs for work trips made from Croydon during the day.

<table>
<thead>
<tr>
<th>Component of the Theory of Planned Behaviour</th>
<th>Mean score</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attitude</td>
<td>1.7</td>
<td>1 → 3</td>
</tr>
<tr>
<td>Subjective norm (1)</td>
<td>2.0</td>
<td>2</td>
</tr>
<tr>
<td>Motivation to comply (1)</td>
<td>0.0</td>
<td>-1 → 1</td>
</tr>
<tr>
<td>Subjective norm (2)</td>
<td>1.3</td>
<td>0 → 2</td>
</tr>
<tr>
<td>Motivation to comply (2)</td>
<td>0.7</td>
<td>0 → 1</td>
</tr>
<tr>
<td>Perceived behavioural control</td>
<td>1.0</td>
<td>1</td>
</tr>
</tbody>
</table>

*Table 7.28: Scores for Group C3*

Members of Group C3 felt very positive about using Tramlink for work trips made during the day. Their behavioural beliefs reflected this: they believed that using Tramlink for work trips would be less stressful but they would not use it to commute to work as it would be less convenient. However, one person mentioned that if he used Tramlink during the day for a work trip he might not bring his car into work at all and would commute by train instead:

"At the moment I set myself a personal target of using public transport once a week but I have to make work trips to Sutton and Bromley and now I need the car for that. That South London orbital route is not well..."
served by public transport so that's the gap Tramlink will plug. I may be able to use the train to travel to work more often.”

<table>
<thead>
<tr>
<th>Behavioural beliefs</th>
<th>People who held this belief</th>
</tr>
</thead>
<tbody>
<tr>
<td>I believe that using Tramlink will make it easier for me to conduct personal business in and around Croydon.</td>
<td>2</td>
</tr>
<tr>
<td>I believe that using Tramlink will make it harder to commute to work as it will cost time</td>
<td>2</td>
</tr>
<tr>
<td>I believe that using Tramlink will be less stressful</td>
<td>2</td>
</tr>
<tr>
<td>I believe that using Tramlink will not reduce congestion</td>
<td>1</td>
</tr>
<tr>
<td>I believe that using Tramlink will improve air quality and the environment in Croydon.</td>
<td>1</td>
</tr>
<tr>
<td>I believe that using Tramlink will be easier to get to new areas</td>
<td>1</td>
</tr>
</tbody>
</table>

*Table 7.29: Behavioural beliefs of Group C3: 3 people in Group C3*

They perceived their referents as being in favour of them using Tramlink but they did not see it as a factor that would encourage them to use Tramlink. They were neutral about complying with their referents. When the Council was excluded from the subjective norm, the score was lower and their motivation to comply with referents rose only slightly. Choosing to use Tramlink to make trips during the day was not a decision that was made due to the opinions of friends or family.

<table>
<thead>
<tr>
<th>Referent</th>
<th>In favour of me using Tramlink</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family</td>
<td>2</td>
</tr>
<tr>
<td>Friend</td>
<td>2</td>
</tr>
<tr>
<td>Council</td>
<td>2</td>
</tr>
</tbody>
</table>

*Table 7.30: Referents mentioned by Group C3: 3 people in Group C3*
### Table 7.31: Control beliefs of Group C3: 3 people in Group C3

<table>
<thead>
<tr>
<th>Control beliefs</th>
<th>Number of people who had this belief</th>
</tr>
</thead>
<tbody>
<tr>
<td>I work near Tramlink</td>
<td>3</td>
</tr>
<tr>
<td>I do not live close enough to Tramlink</td>
<td>3</td>
</tr>
<tr>
<td>The routes go where I need to go to during work</td>
<td>3</td>
</tr>
<tr>
<td>I do not have to look for parking in Croydon or Wimbledon</td>
<td>2</td>
</tr>
</tbody>
</table>

In terms of control beliefs, none of them felt that they lived close enough to the Tramlink routes to use it to commute but they believed that using it during the day would be easier than the car as they would not have to find parking and it would bring them where they needed to go.

#### 7.2.5 Statistical analysis of the results

To examine closely the correlations between the components of the Theory of Planned Behaviour, the beliefs and the intention to use Tramlink and to look at the differences between the various groups that were mentioned in the qualitative analysis a series of statistical tests was carried out. This analysis would also allow a closer examination of patterns in decision-making processes in the groups. In addition, it would help to verify whether or not the theory provided a good framework for examining people’s modal choices. It is important to recall at this stage that the sample sizes involved were small and therefore, the results of any statistical analysis must be treated with caution.

The first test involved examining the correlation between the components of the Theory of Planned Behaviour and the intention to use Tramlink. As was described earlier in this chapter, each interview had been given a score between -3 and 3 for the interviewee’s attitude, subjective norm and perceived behavioural control in relation to using Tramlink. The averages of these scores were reported above. In addition a score was given for the intention to use Tramlink. Table 7.32 shows the scoring system used.
<table>
<thead>
<tr>
<th>Component of the Theory of Planned Behaviour</th>
<th>Scoring system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intention</td>
<td></td>
</tr>
<tr>
<td>-3  = Never use Tramlink</td>
<td></td>
</tr>
<tr>
<td>-2  = Use Tramlink less than 4 times a year</td>
<td></td>
</tr>
<tr>
<td>-1  = Use Tramlink more than or equal to 4 times a year but less than once a month</td>
<td></td>
</tr>
<tr>
<td>0   = Use Tramlink more than or equal to once a month but less than twice a month</td>
<td></td>
</tr>
<tr>
<td>1   = Use Tramlink more than or equal to twice a month but less than twice a fortnight</td>
<td></td>
</tr>
<tr>
<td>2   = Use Tramlink more than or equal to twice a fortnight but less than twice a week</td>
<td></td>
</tr>
<tr>
<td>3   = Use Tramlink more than or equal to twice a week</td>
<td></td>
</tr>
</tbody>
</table>

*Table 7.32: Scoring system for intention*

Using the values from each interview, a multivariate linear regression analysis was carried out with the software package SPSS. In this study the hypothesis has stated that the intention a person forms in relation to using Tramlink is dependent on his or her attitudes, subjective norms and perceived behavioural control.

The simplest case of a linear regression model is when there is only one independent variable:

\[ Y = a + bX \]

*Equation 7.1*

In this equation, \( Y \) is the dependent variable and \( X \) is the dependent variable. A plot of \( Y \) against \( X \) would look something like Figure 7.7.
In the situation that is under analysis in this thesis, there are three independent variables and so the equation becomes:

\[ Y = a + b_1X_1 + b_2X_2 + b_3X_3 \]  

*Equation 7.2*

Where

- \( Y \) = Dependent variable. This is the person's intention to use Tramlink.
- \( X_1 \) .... \( X_3 \) = Independent variables. These are the attitude score, the subjective norm score and the perceived behavioural control score.
- \( a, b_1, \ldots, b_3 \) = Regression coefficients.

This is a multiple linear regression model. The parameter \( b_1 \) represents the expected change in the dependent variable, \( Y \), due to a unit change in \( X_1 \) if \( X_2 \) and \( X_3 \) are held constant. For example, if people always had the same scores for perceived behavioural control and subjective norm this \( b_1 \) would explain how much the variation in the intention score related to changes in the score for attitude. Likewise \( b_2 \) and \( b_3 \) represent the expected change in the dependent variable, \( Y \), due to a unit change in \( X_2 \) and \( X_3 \) respectively. The software package, SPSS, uses the method of least squares and the sample data to calculate the regression coefficients (Montgomery and Peck, 1992).

Table 7.33 shows the results of the regression analysis. The terms that are listed in the table are described below:
Constant = The value of the dependent variable when all the independent variables are held at 0.

$R^2$ = Coefficient of Multiple Determination. It is the proportion of variation in the dependent variable that is described by the model. It is important to note that $R^2$ will always increase as more independent variables are added and therefore, it is possible for models with large values of $R^2$ to be poor (Montgomery and Peck, 1992). However, many software packages, including SPSS, calculate an adjusted $R^2$, called $R^2'$, in the table below, that attempts to prevent this occurring. Both values are quoted here. If $R^2$ and $R^2'$ are very different then too many independent variables have been included (Montgomery and Peck, 1992).

$R$ = This is a measure of the goodness of fit of the model. This is the absolute value of the correlation coefficient between the dependent variable and the actual observed values. If the value is close to 1 the regression model fits the data well.

SE of the estimates = This is a measure of how much the value of the $R^2$ statistic varies from sample to sample.

Beta Coefficients = SPSS calculates standardised regression coefficients which corrects for scaling differences in the independent variables.

Significance = This is also known as the “p value”. This value tells how significant the relationship in the model is. If it is less than 0.05, the relationship is considered to be significant at the 95% level and if it is less than 0.01, it is considered to be significant at the 99% level.
### Table 7.33: Multiple Regression Analysis

<table>
<thead>
<tr>
<th></th>
<th>0.97</th>
<th>0.82</th>
<th>0.83</th>
<th>0.91</th>
<th>1.3</th>
<th>0.69</th>
<th>0.70</th>
<th>0.84</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Included</td>
<td>0.00</td>
<td>0.42</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Nom</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.00</td>
<td>16.0</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Subjective</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Control</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Behavioral</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Perceived</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Attitude</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Estimates</th>
<th>Coef.</th>
<th>Beta</th>
<th>SE of the Beta</th>
<th>R</th>
<th>R²</th>
<th>SE of the R²</th>
<th>p Value</th>
</tr>
</thead>
</table>

Equation: Intention = -0.47 + 0.61 Attitude + 0.42 PBC

Constant = -0.73
Step 1

Equation: Intention = -0.97 + 0.84 Attitude

Constant = -0.84
Step 2
A stepwise regression analysis was carried out on SPSS. This means that on every iteration, the model adds and removes variables until the best fit is found. Table 7.33 shows both iterations of the model.

In the first iteration, only the individual’s attitude to using Tramlink was included as an independent variable. $R^2$ and $R^2*$ are very close so there is no problem with over specification, although a problem would not be expected to arise with a single independent variable. The model shows that 69% of the variability in a person’s intention to use Tramlink can be predicted from the variation in their attitude to using Tramlink. The second iteration included perceived behavioural control as an independent variable. Once more, by comparing $R^2$ and $R^2*$ we see that the model is not over specified. The explanatory value increased to 82%. Attitude to using Tramlink was the variable that explained most of the variance as can be seen from the Beta values.

The subjective norm was omitted by the analysis on both iterations. The relationship between it and people’s intention to use Tramlink was found to be insignificant with a p value of 0.65 on the first iteration and 0.15 on the second iteration.

The statistical analysis supports the conclusions of the qualitative analysis. Both an individual’s attitude to using Tramlink and their perception of behavioural control can be seen as important determinants in the decision-making process. It was seen in the qualitative analysis that the beliefs held by Groups A, B and C about the outcomes of using Tramlink differed and played a role in determining if they would use it and what trips they would use it for. In addition, certain control beliefs played a very important role in determining a person’s intention to use Tramlink. In Group C, it was seen that there were interviewees who did not feel that they could use Tramlink to commute due to the distance to the closest stop whereas for members of Group B, it was felt that Tramlink would facilitate their commuter trips.

The importance of subjective norm in determining intention to use Tramlink was found to be insignificant, however. This may be because people were unwilling to comply with TCL and Croydon Council and so while they believed that these
referents wanted them to use Tramlink they were not always going to comply with them. In order to investigate this further, the multiple regression analysis was re-conducted using the scores assigned to subjective norm when TCL, Croydon Council and Tramstop were excluded. The results are shown in Table 7.34. The first two iterations in SPSS produced the same results as Step 2 in Table 7.33, as these scores had not been changed.
Table 7.34: Multiple regression analysis using recodulated subjective norms

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Subjective norm</th>
<th>Control</th>
<th>Perceived behavioral</th>
<th>Attitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>β Value</td>
<td>0.08</td>
<td>0.35</td>
<td>0.43</td>
<td>0.41</td>
<td>0.26</td>
</tr>
<tr>
<td>R (Goodness of fit)</td>
<td>0.72</td>
<td>0.84</td>
<td>0.83</td>
<td>0.86</td>
<td>0.93</td>
</tr>
<tr>
<td>SE of the Beta Coefficients</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equation: Intention = -0.35 + 0.43 Attitude + 0.41 PBC + 0.26 SN</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant = -0.35</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
To calculate the figures shown in Table 7.34, the subjective norm scores were altered to allow for the fact that TCL and Croydon Council did not have an effect on the interviewees and therefore, should not be considered as relevant referent. When subjective norm is added as an independent variable, 84% of the variability in a person’s intention to use Tramlink is explained by his or her attitudes, subjective norms and perceived behavioural control. All the variables are significant at the 95% level. Therefore, it would appear that people are more motivated to comply with friends and family than with the Council and TCL. This, as was mentioned in the qualitative analysis, is partly due to the poor handling of publicity of these organisations and the lack of information made available.

Behavioural, normative and control beliefs were the determinants of the interviewees’ attitudes, subjective norms and perceived behavioural control according to the Theory of Planned Behaviour. These beliefs and perceptions play an important role in people’s decision making and in determining the impacts that the new light rail system will have on their travel behaviour. Therefore, the scores for the beliefs should differ from each other as people’s intentions, attitudes, subjective norms and perceived behavioural control differ.

To examine the influence of these beliefs on people’s decision-making processes, each interview was studied for the more common beliefs and given a score for this belief. If the interviewee mentioned the belief in a very positive manner a score of 3 was assigned, 2 for a positive manner, 1 for mostly positive, 0 if it was not mentioned, -1 for a mostly negative manner, -2 for a negative manner and -3 for a completely negative manner.

Table 7.35 shows the mean score for the behavioural beliefs for each group.
I believe that using Tramlink

<table>
<thead>
<tr>
<th></th>
<th>Group A</th>
<th>Group B</th>
<th>Group C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Will help to conserve the environment</td>
<td>-0.8</td>
<td>2.2</td>
<td>1.3</td>
</tr>
<tr>
<td>Will make it easier to commute by saving me time</td>
<td>-1.3</td>
<td>1.8</td>
<td>-0.4</td>
</tr>
<tr>
<td>Will make carrying out personal business easier</td>
<td>-0.6</td>
<td>1.6</td>
<td>1.5</td>
</tr>
<tr>
<td>Will allow me to travel further</td>
<td>-0.3</td>
<td>1.4</td>
<td>1.3</td>
</tr>
<tr>
<td>Will be more convenient</td>
<td>-1.3</td>
<td>1.3</td>
<td>0.7</td>
</tr>
<tr>
<td>Will reduce traffic</td>
<td>-0.1</td>
<td>1.2</td>
<td>0</td>
</tr>
<tr>
<td>Will be good for my health</td>
<td>-0.7</td>
<td>0.8</td>
<td>0</td>
</tr>
<tr>
<td>Will be less stressful</td>
<td>-1.4</td>
<td>0.7</td>
<td>0.4</td>
</tr>
<tr>
<td>Will be more comfortable</td>
<td>-1.4</td>
<td>0.4</td>
<td>0.3</td>
</tr>
<tr>
<td>Will decrease my chances of being attacked</td>
<td>-1.1</td>
<td>0.3</td>
<td>0.2</td>
</tr>
<tr>
<td>Will reduce the cost of travel for me</td>
<td>-1.1</td>
<td>0.1</td>
<td>-0.5</td>
</tr>
<tr>
<td>Will make shopping easier</td>
<td>-0.3</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Will decrease my chances of being involved in an accident</td>
<td>-2.1</td>
<td>-0.1</td>
<td>-0.7</td>
</tr>
</tbody>
</table>

Table 7.35: Behavioural belief scores

As can be seen Group A and Group B had very different behavioural beliefs. Group B was particularly in favour of using Tramlink because of its convenience, environmental effects and the easy commute. The scores for Group A for the behavioural beliefs about commuting and convenience were much lower than Group B’s. In addition, Group A had a very low mean score for its behavioural belief relating to accidents and safety but that of Group B was very neutral and it was obviously not a major worry.

A t-test was carried out using SPSS to find out how significant the differences were between behavioural beliefs. The differences between mean scores for the beliefs about accidents on Tramlink, commuting using Tramlink, conducting personal business using Tramlink and the effect of Tramlink use on the
environment were significant at the 99% level. The differences between the mean scores for the beliefs about comfort levels on Tramlink, stress, convenience, travelling to places that were further away on Tramlink and the benefits of Tramlink use for one’s health were all significant at the 95% level.

Both Groups B and C felt positively about the effects of using Tramlink on the environment, about using Tramlink to travel away from Croydon and about using Tramlink to carry out personal business. However, Group B was very positive about using Tramlink for commuting trips, while Group C was negative. On the whole, Group B was more positive about Tramlink use for every behavioural belief except about using Tramlink for shopping.

The t-test showed that the mean scores for each group were statistically different at the 95% for the beliefs about accidents and safety on Tramlink, about the effects of using Tramlink on one’s health and about the effect of Tramlink use on traffic congestion. At the 99% level only the mean scores for the belief that Tramlink was easy to use for commuting were statistically different. This is as would be expected: everyone in Group B intended to use Tramlink to commute and no one in Group C intended to use it to commute. The differences were not significant for any other beliefs, signifying that Group B and C were closer in their beliefs about the outcomes of using Tramlink than Group A and B or Group A and C.

For Groups A and C, Group C were more positive about using Tramlink for every behavioural belief, in particular about Tramlink’s effects on the environment and on using Tramlink for personal business.

The t-test showed that the differences between beliefs were significant at the 99% level for all the behavioural beliefs except the beliefs about commuting on Tramlink and the convenience of using Tramlink which were significant at the 95% levels and those beliefs about the cost of Tramlink, the ease of using Tramlink to shop and Tramlink’s effect on traffic congestion, which were not significant.

The findings reported above show the important role that is played by people’s beliefs about the outcomes of using Tramlink in determining people’s intentions.
about using it. There were significant differences in what people expected of Tramlink for each of the groups. Group B, as expected had the most positive beliefs about using Tramlink. In addition, groups that were positive about using Tramlink were not only positive that it would be good for them but they also felt that it would benefit Croydon by improving the environment and business. The differences in the attitudes of the various groups to using Tramlink could be traced back to the differences in their behavioural beliefs. In particular, the beliefs of Group A differed significantly from those of the other groups.

Table 7.36 shows the mean scores for the normative beliefs for each group.

<table>
<thead>
<tr>
<th>I believe that these referents want me to use Tramlink</th>
<th>Group A</th>
<th>Group B</th>
<th>Group C</th>
</tr>
</thead>
<tbody>
<tr>
<td>TCL</td>
<td>0.1</td>
<td>1.3</td>
<td>0.3</td>
</tr>
<tr>
<td>Friends</td>
<td>-1.5</td>
<td>1.2</td>
<td>0.9</td>
</tr>
<tr>
<td>Family</td>
<td>-1</td>
<td>1.2</td>
<td>0.8</td>
</tr>
<tr>
<td>Council</td>
<td>0.1</td>
<td>1.2</td>
<td>0.4</td>
</tr>
<tr>
<td>Tramstop</td>
<td>0</td>
<td>-0.4</td>
<td>0</td>
</tr>
</tbody>
</table>

*Table 7.36: Normative belief scores for each group*

The t-tests showed that for Groups A and B the differences in the mean scores were significant for all normative beliefs at the 99% level except for the belief about Tramstop where the difference was not significant. For Groups B and C, the difference in mean scores for the normative belief about Croydon Council was significant at the 95% level and the difference in mean scores for the belief about TCL was significant at the 99% level. Group B was more positive in both cases. For Groups A and C, the difference was significant at the 95% level for the belief about family and at the 99% level for the belief about friends.

The results show that the greatest difference was between Group A and Group B. Group B and C were quite close in terms of normative beliefs except that Group B tended to be slightly more positive. Groups C and A differed in their beliefs about what their family and friends thought they should do. Therefore, the subjective norm was determined by the normative beliefs. It is possible to identify significant differences in the normative beliefs of the groups and to see
that they played a role in people's decision-making processes. In particular, the role of family's and friends' opinions was important in determining people's travel behaviour choices, as evidenced by the significant differences in the normative beliefs of Groups A and B in relation to family and friends.

Table 7.37 shows the scores for control beliefs for the groups.

<table>
<thead>
<tr>
<th>Control beliefs proposed for Tramlink</th>
<th>Group A</th>
<th>Group B</th>
<th>Group C</th>
</tr>
</thead>
<tbody>
<tr>
<td>When I travel from work</td>
<td>0</td>
<td>2.5</td>
<td>2.6</td>
</tr>
<tr>
<td>When I travel from home</td>
<td>-1.8</td>
<td>2.4</td>
<td>-1.6</td>
</tr>
<tr>
<td>When I am in a hurry</td>
<td>-1.4</td>
<td>1.7</td>
<td>-0.1</td>
</tr>
<tr>
<td>When the traffic is heavy</td>
<td>0</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>When I am going somewhere with no parking</td>
<td>0</td>
<td>0</td>
<td>1.1</td>
</tr>
<tr>
<td>When the weather is bad</td>
<td>-1.4</td>
<td>-0.2</td>
<td>0</td>
</tr>
<tr>
<td>When I am working overtime</td>
<td>0</td>
<td>-0.3</td>
<td>0.2</td>
</tr>
<tr>
<td>When it is dark</td>
<td>-1.8</td>
<td>-0.4</td>
<td>0</td>
</tr>
<tr>
<td>When I have heavy items to carry</td>
<td>-0.8</td>
<td>-0.4</td>
<td>-0.2</td>
</tr>
<tr>
<td>When I am driving to the stop</td>
<td>-0.6</td>
<td>-0.6</td>
<td>-0.5</td>
</tr>
</tbody>
</table>

**Table 7.37: Control belief scores for each group**

Group B scored very highly on the belief that it would be easy to use Tramlink from home as opposed to the other groups. More members of this group stated that they lived within walking distance of Tramlink than in any other group. Group C scored very highly on the belief that it would be easy to use Tramlink from work, which is reflected in the fact that this group were most likely to use Tramlink for non-work trips to areas other than Croydon town centre. The interviewees often intended to make the trips away from the work place. They also looked upon Tramlink as a mode that would be easy to use when parking was a problem. For Groups B and C, many of the obstacles that were identified have a score that is very close to zero indicating that they were not seen as very big obstacles. Group C's most negative belief concerned accessing the stop from home, which they felt would be difficult. In particular, the lack of park and ride facilities would make accessing Tramlink more difficult. Members of Group A
felt very negative about using Tramlink when it was dark, when the weather was poor or when they were in a hurry.

The t-tests showed that for Groups A and B, at the 99% level, the mean scores were significantly different for the control beliefs concerning Tramlink use from home, from work, when in a hurry and in bad weather. At the 95% level, there was a significant difference in beliefs about Tramlink use when it was dark. Therefore, members of Group B felt they had significantly more control than members of Group A over Tramlink use on many counts.

For Groups B and C, the differences that were significant at the 99% level were those concerning Tramlink use on the trip from work and when in a hurry. This reflected the fact that members of Group B were choosing to use Tramlink for their commuting trips when time would be at a premium. Members of Group C felt that this was impossible and were more likely to pick Tramlink for trips that were less time dependent. Differences were significant at the 95% level for the belief about using Tramlink when parking at the destination was going to be difficult to find. In this case, Group C was more positive about using Tramlink whereas Group B did not mention this in any interview. Finally, for Groups A and C, differences were significant at the 99% level for beliefs concerning Tramlink use from work, in the dark, when in a hurry and in bad weather and at the 95% level when parking was going to be an issue at the destination. In all cases, Group C's control beliefs were more positive that those of Group A.

These results show that there were differences in the beliefs of Groups A, B and C as shown in Table 7.35 – 7.37. On the whole, the beliefs of Group B were more positive that Groups A and C although the differences were less pronounced between Groups B and C. The differences in the beliefs of Groups B and C reflected the types of trips that they intended to make using Tramlink. For Group B things like saving time, ease of use from home and work and making commuting more convenient were important. Group C wanted to use Tramlink for leisure trips, mostly away from Croydon. They believed Tramlink would allow them to travel further without having to look for parking and would be easy to access from work.
The t-tests illustrate these points further and show that there are statistically significant differences between the beliefs of the various groups. This confirms the hypothesis that behavioural, normative and control beliefs are important factors in determining a person’s attitudes, subjective norms and perceived behavioural control and play an important role in people’s decision-making processes.

### 7.2.6 Results of the follow-up study

The objective of this thesis is to examine the potential impacts of new urban public transport on people’s travel behaviour. In addition, it is intended to examine the predictive capability of the Theory of Planned Behaviour and to study how a better understanding of people’s travel decisions can play a role in predicting how they re-act to new public transport. In order to do this, five to six months after the opening of Tramlink, the interviewees were sent questionnaires asking how often they had used Tramlink and what types of trips they had used Tramlink for.

An analysis was conducted to measure the correlation between people’s intentions and their actual behaviour. It was possible to contact 26 interviewees in this study. Table 7.38 shows the number that was contacted in each group. One member of group C who had been contactable could not complete the questionnaire as she had been abroad for the previous few months. Therefore, some parts of the analysis below are based on the responses of the 25 interviewees who were able to complete the entire questionnaire that had been sent out. This will be made clear at each stage of the analysis.
In the first question of the questionnaire, as was shown in Figure 6.4 in Chapter 6, the respondents were asked if they had used Tramlink yet. Of the 25 who had been able to complete this part of the questionnaire, 18 people had used Tramlink at least once. These people were asked what trips they had made on Tramlink and how frequently they had made them. A similar scoring system to that shown in Table 7.32 was used except that this time it was used to measure reported behaviour rather than intended behaviour. Therefore, if a person said that they had used Tramlink more than twice a week they got a score of 3, if they had used it more than twice a fortnight they got a score of 2 and if they had used it more than twice a month they received a score of 1. If a person said that they had used Tramlink more than once a month they got a score of 0, if they had used it less than once a month they got a score of -1 and if they had used it only once they got a score of -2. Those who had never used Tramlink received scores of -3. This is the same system that had been used to measure people’s intention to use Tramlink as was described earlier in this chapter. Table 7.39 shows the average intention and behaviour scores for each group. These mean intention and behaviour scores are based only on the scores of the 25 respondents who were able to take part in the interviews and completed the follow-up study questionnaire fully.

<table>
<thead>
<tr>
<th>Component measured</th>
<th>Group A</th>
<th>Group B</th>
<th>Group C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intention</td>
<td>-3</td>
<td>2.6</td>
<td>-0.1</td>
</tr>
<tr>
<td>Behaviour</td>
<td>-2.4</td>
<td>1.7</td>
<td>-0.8</td>
</tr>
</tbody>
</table>

Table 7.39: Intended and actual behaviour

As can be seen, people in the most negative group, Group A, were the people who had used Tramlink the least while Group B had used it the most. The most
negative group had used Tramlink very slightly more than they had expected to
while Group B had used it less than they expected to. Partly this is because the
survey was carried out so soon after Tramlink had opened so people had not
settled into patterns of using it. Some people who wanted to use it had still not
had a chance to use it. Table 7.40 shows the types of trips that people had made
on Tramlink and the types of trips that they originally intended to make. Only the
25 people who were able to take part in both parts of the survey are included in
this table.
<table>
<thead>
<tr>
<th></th>
<th>Group A</th>
<th>Group B</th>
<th>Group C</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>13</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>11</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>11</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>7</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>8</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Behavior</th>
<th>Intention</th>
<th>Behavior</th>
<th>Intention</th>
<th>Behavior</th>
<th>Intention</th>
<th>Behavior</th>
<th>Intention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Croydon Centre</td>
<td>Non-work trips to areas other than Business trips</td>
<td>Croydon Centre</td>
<td>Non-work trips to areas other than Business trips</td>
<td>Croydon Centre</td>
<td>Non-work trips to areas other than Business trips</td>
<td>Croydon Centre</td>
<td>Non-work trips to areas other than Business trips</td>
</tr>
</tbody>
</table>

Table 7.40: Use of Tramlink.
From Table 7.39 and Table 7.40, it is apparent that for the most part people had used Tramlink in ways and as often as they had intended. In Group A, five people had never used Tramlink and stated that they never would use it. Of those who had used it, one person was much more impressed by it then had originally predicted and was planning to use it more often in the future. The others had simply been trying out Tramlink and stated that they would not use it in the future as it would be too difficult to use:

"I knew my use would be limited because it doesn't go anywhere that I am likely to want to go. The only journey I have made was to find out what the trams were like."

Members of Group B had not used Tramlink as frequently as they had intended to use it. However, five of the seven interviewed were using Tramlink to commute every day and everyone in this group signalled that they would continue to use Tramlink and increase their use in the future. Everyone in the group had used Tramlink. Those who were using it for non-work trips had stated that they would use it for non-work trips in their interviews before Tramlink opened. What is surprising, however, is that five people had used Tramlink to make business trips during the day, despite the fact that no-one in this group had mentioned that they would make trips like this in the interviews. The connections on Tramlink from Croydon centre to outer areas are very efficient and the timetable is quite good, so it may be that some people who had used Tramlink for leisure trips out of Croydon realised that it would be more efficient than using the car for business trips. All of those who had made these trips intended to continue making them in the future.

Members of Group C were using Tramlink much as had been expected. Their trips were infrequent and they were nearly always leisure trips. Two people in this group had not used Tramlink yet but these two people had only intended to use it for non-work trips to areas other than Croydon town centre and in their interviews had stated that these trips might only take place once a year. They still intended to use Tramlink at some stage to make this trip. All those who had made trips on Tramlink had intended to make those trips at the interview stage.
In order to examine more closely the relationship between what people intended
to do and what people actually did, the correlation between the intention scores
and the actual behaviour scores was measured. This was calculated using the
statistics package SPSS. The correlation coefficient measures the strength of the
relationship between two variables. It ranges from -1 to 1. The greater its
magnitude the stronger the relationship is. A positive sign implies that the
relationship is positive and a negative one that the relationship is negative.
Usually, in behavioural analysis correlations in the range 0.3 to 0.5 are
considered to be of moderate magnitude and correlations exceeding 0.5 indicate
strong relationships (Ajzen and Fishbein, 1980). The intention score for each
interviewee, assigned using Table 7.32, and the behaviour score for each
interviewee, assigned as described above, was used to calculate the correlation
coefficient. Table 7.41 shows the results of the analysis. These are based on the
25 fully completed questionnaires.

<table>
<thead>
<tr>
<th>Correlation</th>
<th>Intention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Behaviour</td>
<td>0.8</td>
</tr>
</tbody>
</table>

*Table 7.41 Correlation between intended behaviour and actual behaviour*

This indicates that there was found to be a very strong relationship between how
frequently people said that they would use Tramlink and how often they actually
did use it. The correlation was found to be significant at the 99% level. In the in-
depth interviews, rather than simply asking whether people would use Tramlink
or not, the use of the Theory of Planned Behaviour ensured that people were
asked to think about each element of their decision regarding its use and so they
were able to predict their own behaviour better. Examining the decision-making
process behind the reason for using the new form of public transport, encouraging
people to think about this process in the interview led to a very
strong correlation between people’s intentions and actual behaviour.

As Tramlink had been open for only 5-6 months it was felt that not everyone
might have had a chance to use it as often or in the way that they planned to use
it when they were interviewed. Therefore, in the questionnaire, people had also
expressed how they intended to use Tramlink in the future. People were asked
how often they intended to use it and again they were given a score between -3
and 3 to reflect this. The correlation between this and people’s original intention was also measured, as shown in Table 7.42. These results are based on the 26 questionnaires that were returned. Again, a strong correlation between people’s intentions before Tramlink was opened and their future intentions was found and again this correlation was significant at the 99% level.

<table>
<thead>
<tr>
<th>Correlation</th>
<th>Intention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Future Intention</td>
<td>0.8</td>
</tr>
</tbody>
</table>

*Table 7.42 Correlation between intended behaviour and future intention*

The analysis so far shows that the intentions people had about using Tramlink and that were revealed by asking people to consider the outcomes of using the system, their referents and the obstacles and facilitators that faced them, correlated very strongly with their actual behaviour. The next stage in the analysis is to examine how the various elements of the decision-making process played a role in determining people’s behaviour. The three elements considered are: attitude to using Tramlink, the subjective norm and perceived behavioural control.

A regression analysis has already been conducted to examine how well they predicted people’s intentions, as described in the previous section. It was found that they served as a very good predictor of people’s intention. The regression analysis was carried out again to examine whether people’s actual behaviour was determined by their attitudes, subjective norm and perceived behavioural control. The subjective norm scores when Croydon Council and TCL were included as referents were used. The analysis was not expected to show as strong a relationship between people’s actual behaviour and the components of the theory as had been shown between people’s intentions and the theory’s components. People’s attitudes, subjective norms and perceived behavioural control had been measured 5-6 months prior to Tramlink opening and almost one year before the follow-up study took place. However, it was expected that these components would be seen to play an important role in determining people’s behaviour.

The results of this regression analysis are shown in Table 7.43. A stepwise regression analysis was performed, as before. On the first step only perceived
behavioural control was included as a variable and it was found to explain 58% of the variance in actual behaviour. When attitude to Tramlink use was included, 71% of the variance a person’s Tramlink use was explained. The influence of both variables was found to be significant at the 99% level although the influence of subjective norm was not found to be significant. Therefore, it has been shown that their attitudes and perceived behavioural control played an important role in determining their actual choices regarding Tramlink. Subjective norm was found to have a lesser effect on people’s actual behaviour, partly due to the fact that people did not wish to comply with Croydon Council and TCL as has already been mentioned. This is a very important result. People’s attitudes to the system and the level of control that they had over using the system had an important role to play in determining their modal choices. However, if the people had been more willing to comply with the Council or TCL and publicity had been handled more adroitly, it may be have been that subjective norm could have been a more important determinant in assessing people’s behaviour.
<table>
<thead>
<tr>
<th>Equation: Intention = 0.43 + 0.24 PBC + 0.44 Attitude</th>
<th>Equation: Intention = 0.44 + 0.77 PBC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 2</td>
<td>Step 1</td>
</tr>
<tr>
<td><strong>R</strong> (Goodness of fit) <strong>R2</strong> <strong>SE of the estimate</strong></td>
<td><strong>R</strong> (Goodness of fit) <strong>R2</strong> <strong>SE of the estimate</strong></td>
</tr>
<tr>
<td><strong>B</strong> (constant) <strong>B</strong> (PBC) <strong>B</strong> (Attitude)</td>
<td><strong>B</strong> (constant) <strong>B</strong> (PBC) <strong>B</strong> (Attitude)</td>
</tr>
<tr>
<td>0.77</td>
<td>0.44</td>
</tr>
<tr>
<td>0.54</td>
<td>0.77</td>
</tr>
<tr>
<td>0.44</td>
<td>0.44</td>
</tr>
</tbody>
</table>
7.2.7 Summary of the results

The analysis above had the following objectives:

1. To investigate the impact of new urban public transport on people’s travel behaviour

2. To examine the decision-making processes behind people’s modal choices.

3. To examine the suitability of the Theory of Planned Behaviour for studying and understanding travel behaviour.

It was hypothesised that using behavioural models like the Theory of Planned Behaviour would allow a better explanation of travel decisions. The analysis of the interviews has identified the behavioural beliefs, normative beliefs and control beliefs of the groups that were interviewed. In addition, the role played by the components of the Theory of Planned Behaviour has been demonstrated. It has been shown that the components have different levels of influence for the groups. It appears that attitude and perceived behavioural control have a greater effect on people’s intentions than subjective norm. However, the role of subjective norm increased when TCL and Croydon Council were excluded as referents. It is interesting to note that many people knew that these groups wanted them to use Tramlink but they were not eager to comply with them. The influences of friends and family were much greater.

The main finding of the qualitative analysis is that the choices that people made in relation to Tramlink were the result of complex decision-making processes. This, as was hypothesised in Chapters 1 and 3, involved looking at the benefits that Tramlink would give the person if they were to use it, how easy it would be to use and, to a lesser extent, what people who were important to the individual thought. The complexity of the decision-making process is further underlined by the fact that people had decided to use Tramlink in many diverse ways. The original questionnaires that were sent out to recruit people for interview showed that 22 people were going to use Tramlink for some purpose. However, the
closer inspection of these intentions that the interviews allowed demonstrated that many of these people intend to use Tramlink on a very irregular basis.

There were several types of way that people said that Tramlink would change their travel behaviour. The impacts on people in Group B were the most significant as these people intended to change mode for their commuter trips. Six people in this group stated that they would stop using their cars to travel to work and would use Tramlink instead.

People also stated that Tramlink would have significant impacts on their non-commuter trips. Several people in Group B and Group C intended to make new trips to areas further away from Croydon simply because they could do so more easily on Tramlink that before it was constructed. In addition, people stated that they would use Tramlink for non-work trips into Croydon centre, most of which people made by car at the time of the interviews.

Therefore, the conclusions of the qualitative analysis are:

- The modal choices made are more complex than originally is apparent in a simple questionnaire. People’s views and intentions vary significantly and this is not always apparent from a questionnaire.

- The intention to use Tramlink is dependent on people’s attitudes to Tramlink and on their perceptions of control over this behaviour. Subjective norm seems to have a lesser role in the decision-making process.

- If people were more motivated to comply with referents like the Council and TCL the importance of subjective norm in the decision-making process could be increased. Several of those interviewed expressed dissatisfaction with these groups’ handling of publicity. Therefore, even though TCL and Croydon Council wanted them to use Tramlink the interviewees did not want to comply with these referents. If people had been in favour of complying with TCL and Croydon Council, their role in encouraging people to use Tramlink might have been strengthened.
• Tramlink would generate new trips to areas outside Croydon centre and
would have a significant impact on people’s car use on non-work trips.

The statistical analysis gave further support to these conclusions by showing that
people’s attitudes, perceived behavioural control and subjective norm correlated
well with their intentions to use the system. It was demonstrated that the
components of the Theory of Planned Behaviour played a significant part in
people’s decision-making processes. In addition, there were shown to be
significant differences in the beliefs and perceptions that people held of Tramlink
depending on how much or in what way they intended to use it.

The follow-up study of people’s actual behaviour allowed the performance of the
time in predicting behaviour and modal choice to be examined. It was found
that people’s use of Tramlink correlated very closely with how they had expected
to use it, both in terms of frequency and trip type. The correlation between the
components, except for subjective norm, of the Theory of Planned Behaviour and
actual behaviour was also significant. This is particularly impressive as these
attitudes, perceptions and subjective norms were measured 6 months before the
system opened and the follow up study took place 5-6 months after it opened. If
people’s attitudes, subjective norms and perceptions and behavioural control had
been monitored more closely throughout the six months closer correlation may
have been found. It is also interesting to note that once more people’s subjective
norm played a lesser role in determining their actual behaviour. This is again
probably due to the lack of useful publicity from Croydon Council and TCL,
which seemed to antagonise members of the public.

People’s actual behaviour reflected their stated intentions very well. People were
using Tramlink for the trips that they had said that they would use it for and at
the frequency with which they had expected to use it. People’s travel behaviour
had also been changed because of Tramlink. Four people had stopped using their
car to commute to work and used Tramlink instead. Tramlink had also had an
important impact on people’s non-work trips. As had been predicted several
people used Tramlink for non-work trips away from Croydon centre, most of
which were new trips. Tramlink had one impact on people’s trips that had not
been predicted: many people were using Tramlink to make business trips during the day.

7.3 The study in Dublin

7.3.1 Introduction

As was stated in Chapter 1, the objectives of this thesis were as follows:

(1) To contribute to and improve existing understanding of people's modal choices and the decision-making processes behind those modal choices, particularly in relation to new modes of transport.
(2) To examine whether the Theory of Planned Behaviour offers a good framework in which to study modal choices and the decision-making processes behind modal choices.
(3) To show that the use of the Theory of Planned Behaviour can be used to make predictions about people's travel behaviour.
(4) To examine the potential impacts of two new urban public transport systems on travel behaviour.

The study in Croydon contributed to achieving these objectives by looking at the potential impacts of a new public transport system and giving an insight into why people chose to use or not to use the system. In addition, the follow-up study allowed the relationship between people's intentions, attitudes, subjective norms, perceived behavioural control and actual behaviour to be examined. The role of people's behavioural, normative and control beliefs in determining their behaviour was also explored. It was found that there was a very close relationship between beliefs and intention and behaviour.

In the Croydon study, in-depth interviews were carried out which showed that the Theory of Planned Behaviour served as a good framework for studying modal choices. However, if the theory is to be used in the future to examine travel behaviour in large-scale surveys, then an alternative, less intensive method of using it is required. In Chapter 3, a method of using questionnaires to measure belief strengths, attitudes, subjective norm, perceived behavioural control and intentions, which has been used to look at several different types of behaviour,
was described. It was decided to explore whether the methodologies used in these questionnaires were appropriate for predicting and explaining people’s attitudes, subjective norms and perceptions of behavioural control. Therefore, the study in Croydon was added to by carrying out another study in Dublin where a new light rail system called Luas is due to open in 2002.

To carry out this study, a questionnaire was designed and distributed as described in Chapter 6. The behavioural beliefs, normative beliefs and control beliefs that were asked about in the questionnaire were selected from the beliefs that were revealed in the analysis of the Croydon interviews. Only commuter trips were analysed in the questionnaire, as it is a major objective of Luas to reduce the number of car trips made during the peak hour.

It was intended that this study could contribute to the objectives of the thesis in the following ways:

(1) In this study, the potential impacts of a light rail system could be examined at a very early stage of the development of that system. It is important to be able to identify problems and negative beliefs at this stage when there may be an opportunity to change them and therefore improve the potential impacts of new urban public transport.

(2) Once more, the Theory of Planned Behaviour was used to analyse the results of the questionnaires with a view to discovering how people’s intentions regarding new public transport are formed and what roles their attitudes, subjective norm, perceived behavioural control and beliefs play in their decision-making processes. It was intended that the study would contribute to improving the understanding of the decision-making processes behind the modal choices of potential users of new urban transport systems. While the use of qualitative interviews in the Croydon study allowed study at a greater depth of people’s decisions, this study would still allow an examination of the relationship between people’s beliefs and their intentions.

(3) It was intended that the study in Dublin would show that the Theory of Planned Behaviour offered a good framework in which to study modal
choices. The Dublin study would offer further validation of the theory in looking at travel behaviour. In addition, it was intended to examine how the theory could be used to predict travel behaviour for large-scale studies and whether the methods, described in Chapter 3, of measuring beliefs, attitudes, subjective norms and perceived behavioural control in a questionnaire were valid.

7.3.2 Behavioural beliefs in the questionnaire

In the pilot study, the respondents were asked if the following outcomes were important to them and if they felt that they were likely to achieve these outcome if they used Luas to travel to work in the future.

- To save time on the trip to work
- To be comfortable on the trip to work
- To save money on the trip to work
- To reduce the likelihood of a road accident on the trip to work
- To conserve the environment
- To increase personal safety on the trip to work
- To improve levels of health and fitness
- To reduce traffic on the trip to work
- To eliminate the worry of having to look for parking at work

These were the more important beliefs that the interviewees had mentioned in Croydon in relation to choosing to use or not to use Tramlink to commute. After the pilot study, respondents were asked to comment on the questionnaire. They felt it was too long, so in the main study it was decided not to question people about all these beliefs. The beliefs concerning health and fitness and parking were omitted. Few people in the Croydon interviews had mentioned that they would use Tramlink to improve their health and fitness. Also, in the Croydon
interviews, parking was more likely to be a problem, which would encourage people to use Tramlink rather than the car on non-work trips. Those people who drove into work already either had free parking or did not think looking for parking was a problem. If people had a problem with finding parking at work they were already using public transport for the trip.

7.3.3 Normative beliefs in the questionnaire

In the pilot study, the respondents were asked whether they felt that their friends, families, work colleagues, the local authority or Dublin Transportation Office felt that they should use Luas. Again, this was because the interviewees in Croydon had mentioned these referents. In the main study this was reduced to their friends, families and Dublin Transportation Office. The local authorities in Dublin had not been involved in promoting Luas at this stage so they were omitted as referents for the main study.

7.3.4 Control beliefs in the questionnaire

In both the pilot study and the main study, the respondents were asked about how various obstacles and facilitators would influence their choice to use Luas on the work trip. These obstacles and facilitators were:

- Having heavy items to carry on the trip
- Encountering heavy traffic
- Travelling in the dark
- Travelling in bad weather
- Being in a hurry
- Living close to the Luas route
- Living far away from the Luas route

7.3.5 Description of the sample

Table 7.44 shows the composition of the sample in the main survey.
Table 7.44: Sex and age of respondents

<table>
<thead>
<tr>
<th>Sex</th>
<th>Age</th>
<th>&lt; 20</th>
<th>20 – 34</th>
<th>35 – 49</th>
<th>50 – 59</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td></td>
<td>3</td>
<td>17</td>
<td>14</td>
<td>3</td>
<td>37</td>
</tr>
<tr>
<td>Male</td>
<td></td>
<td>4</td>
<td>11</td>
<td>7</td>
<td>1</td>
<td>23</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>7</td>
<td>28</td>
<td>20</td>
<td>4</td>
<td>60</td>
</tr>
</tbody>
</table>

Table 7.44: Sex and age of respondents

Table 7.45 shows how many people intended to use Luas to commute once it opened. For the analysis, those who had decided never to use Luas to commute were called Group A. Those who intended to commute using Luas were called Group B. Those who were considering using Luas but were undecided as yet were called Group C. Table 7.46 shows what modes they used to travel to work at the time that the questionnaire was issued.

<table>
<thead>
<tr>
<th>Live to use Luas</th>
<th>I am unlikely to use Luas to travel to work (Group A)</th>
<th>I am likely to use Luas to travel to work (Group B)</th>
<th>Undecided (Group C)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>On Luas route</td>
<td>7</td>
<td>18</td>
<td>8</td>
<td>33</td>
</tr>
<tr>
<td>Off Luas route</td>
<td>17</td>
<td>7</td>
<td>3</td>
<td>27</td>
</tr>
<tr>
<td>Total</td>
<td>24</td>
<td>25</td>
<td>11</td>
<td>60</td>
</tr>
</tbody>
</table>

Table 7.45: Intention to use Luas on commuter trips
<table>
<thead>
<tr>
<th>Current mode</th>
<th>Group A</th>
<th>Group B</th>
<th>Group C</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Car</td>
<td>16</td>
<td>15</td>
<td>7</td>
<td>38</td>
</tr>
<tr>
<td>Walk</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Bus</td>
<td>4</td>
<td>10</td>
<td>3</td>
<td>17</td>
</tr>
<tr>
<td>DART</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>24</td>
<td>25</td>
<td>11</td>
<td>60</td>
</tr>
</tbody>
</table>

Table 7.46: Current mode used on commuter trips and intention to use Luas on commuter trips

7.3.6 The intentions, attitudes, subjective norms and perceived behavioural control of the respondents

According to the Theory of Planned Behaviour, as described in Chapter 3, the respondents’ intentions to use Luas should be determined by their attitudes to Luas, their subjective norms and their perceived behavioural control with respect to using Luas. In the interviews in Croydon, it was shown that there was a strong relationship between the interviewees’ attitudes, subjective norms and perceived behavioural control with relation to using Tramlink and their intention to use Tramlink and also between their attitudes and perceived behavioural control and their actual behaviour. It was shown that these determinants could predict variability in people’s intentions and behaviour.

In this section, the Theory of Planned Behaviour is again being used to study the complexity of travel behaviour. In the case of the Luas system, it is still at a very early stage in development. People had not seen the vehicles running as they had in Croydon and none of the infrastructure was in place at the time of the study. Therefore, it would not be expected that they would have very strong opinions about Luas or for their intentions to be as certain as in Croydon. It is intended to show, however, that these intentions are still determined by their present attitudes to using Luas, their subjective norms and their perceived behavioural control. It is important to know what people’s intentions, attitudes, subjective norms and perceived behavioural control regarding new systems are from an early stage, as
these can then be changed by the actions of the authorities building and promoting the system.

A questionnaire, as has been described in Chapter 6 and in this chapter, was used to measure the components of the Theory of Planned Behaviour. In this section, the correlation between intention to use Luas for commuter trips and these components will be examined. Each respondent gave a score between -3 and 3 indicating whether or not they intended to use Luas for commuter trips. A score of -3 indicated that they would not use Luas and a score of 3 meant that they were very interested in using Luas. If they gave a negative score, indicating that they were unlikely to use Luas, they were placed in Group A in the tables below. If they gave a positive score, they were placed in Group B, indicating that they were positive about using Luas and if they gave a score of 0 they were placed in Group C, indicating that they were unsure of using Luas.

They also gave scores between -3 and 3 to indicate how much they agreed with statements that measured their attitudes, subjective norms and perceived behavioural control. This was shown in Chapter 6 in the description of the questionnaire. Table 7.47 shows the average scores for intention, attitude, subjective norm and perceived behavioural control for the respondents. It is apparent from this table that there were differences between people’s attitudes, subjective norms and perceived behavioural control which determined their intention to use Luas for commuter trips.

<table>
<thead>
<tr>
<th>Component of the Theory of Planned Behaviour</th>
<th>Group A</th>
<th>Group B</th>
<th>Group C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intention to use Luas</td>
<td>-2.5</td>
<td>2.1</td>
<td>0.0</td>
</tr>
<tr>
<td>Attitude to using Luas</td>
<td>-1.5</td>
<td>2.2</td>
<td>0.1</td>
</tr>
<tr>
<td>Subjective norm</td>
<td>-1.3</td>
<td>1.5</td>
<td>0.1</td>
</tr>
<tr>
<td>Perceived behavioural control</td>
<td>-2.5</td>
<td>1.4</td>
<td>0.1</td>
</tr>
</tbody>
</table>

*Table 7.47: Scores for the components of the Theory of Planned Behaviour in the Dublin study.*

Using the values from each questionnaire, an ordinal regression analysis was carried out with the software package JMP. To carry out this analysis the scores
were re-coded for simplicity. This was because the frequency of some of the variables in the original categories was very small. This recoding is shown in Table 7.48. The frequencies in the original categories are shown in Table 7.49.

<table>
<thead>
<tr>
<th>Original score for attitude, subjective norm, perceived behavioural control and intention</th>
<th>New scores for ordinal regression analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>-3</td>
<td>-2</td>
</tr>
<tr>
<td>-2</td>
<td>-1</td>
</tr>
<tr>
<td>-1</td>
<td>-1</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

*Table 7.48: Scores used in the ordinal regression analysis*

<table>
<thead>
<tr>
<th>Score</th>
<th>Intention</th>
<th>Attitude</th>
<th>Subjective norm</th>
<th>Perceived behavioural control</th>
</tr>
</thead>
<tbody>
<tr>
<td>-3</td>
<td>16</td>
<td>12</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>-2</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>-1</td>
<td>3</td>
<td>3</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>0</td>
<td>11</td>
<td>11</td>
<td>20</td>
<td>9</td>
</tr>
<tr>
<td>1</td>
<td>7</td>
<td>6</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>2</td>
<td>8</td>
<td>6</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>10</td>
<td>17</td>
<td>9</td>
<td>8</td>
</tr>
</tbody>
</table>

*Table 7.49: Frequency of scores*

In this study the hypothesis is that the intention a person forms in relation to using Luas is dependent on his or her attitudes, subjective norms and perceived behavioural control. Ordinal regression analysis should be used when the dependent variable is ordinal: an ordinal variable is one whose categories are ranked from low to high but the distances between adjacent categories are
unknown (Long, 1997). Let $S_i$ be a dependent variable that depends on a set of explanatory variables $x_i$ according to a model:

$$S_i = \alpha^* + \beta^*x_i + \sigma \varepsilon_i$$

_Equation 7.2_

The variable $S$ is not observed directly. It is a latent variable. Instead, there is a set of cut points, or thresholds, $\tau_1, \ldots, \tau_{J-1}$ that are used to transform $S$ into the observed variable $y$ according to the following rules:

$$y = 1 \text{ if } \tau_1 < S \leq \tau_2$$

$$y = 2 \text{ if } \tau_2 < S \leq \tau_3$$

$$\vdots$$

$$y = J \text{ if } S < \tau_{J-1}$$

_Equation 7.3_

In the Dublin survey, respondents are asked to express how strongly they agree or disagree that they will use Luas to commute in the future. The response categories are -2, -1, 0, 1 and 2. This is the observed variable $y$, which represents the latent variable $S$. The independent or explanatory variables, represented by $x_i$ in Equation 7.2, are the respondents' attitude, subjective norm and perceived behavioural control scores.

If it is assumed that $\varepsilon_i$ has a standard logistic distribution, then the dependence of $y$ on $x$ is given by a cumulative logit model which is described here. Let $p_{ij}$ be the probability that individual $i$ falls into category $j$ of the dependent variable. The categories are ordered in sequence $j = 1, \ldots, J$. The cumulative probability is given by the following equation:

$$F_{ij} = \sum_{m=1}^{j} p_{im}$$

_Equation 7.4_
This is the probability that individual \(i\) is in the \(j\)th category or lower. Each \(F_{ij}\) corresponds to a different dichotomization of the dependent variable. The model is specified as a set of \(J-1\) equations:

\[
\log\left(\frac{F_{ij}}{1-F_{ij}}\right) = \alpha_j + \beta x_i 
\]

*Equation 7.5*

Where:

\[
\beta x_i = \beta_1 x_{i1} + \ldots + \beta_k x_{ik}
\]

*Equation 7.6*

There is a single set of coefficients but there is a different intercept for each of the equations. The coefficients in Equation 7.5 may be related to the coefficients in Equation 7.2 by:

\[
\alpha_j = \frac{\alpha^* - \tau_j}{\sigma}
\]

\[
\beta = \frac{\beta^*}{\sigma}
\]

*Equation 7.7*

The \(\beta\) coefficients do not depend on the placement of the thresholds. This means that some of the \(\tau\)s may be close together while others may be far apart, but the effect of the explanatory variables will remain the same. The position of the \(\tau\)s will affect the intercepts and the relative number of cases that falls into the categories.

Table 7.50 shows the results of the ordinal regression analysis, carried out using JMP. This package codes the ordinal factors so that the first level of the factor is a control or baseline level and the parameters measure the effect of the response as the ordinal factor is set to each succeeding level.

The first column in Table 7.50 is the parameter coefficient, \(\beta\). It represents the effect of the independent variables on the dependent variable. In this model, as mentioned above, the dependent variable is the intention scores and the independent or explanatory variables are the scores for attitude, subjective norm and perceived behavioural control. The chi-square statistic is a measure of the significance of the relationship between the dependent and independent
variables. If there is no relationship between the independent and dependent variables, the chi-square statistic is very small. The probability of finding a chi-square statistic at least as large as the one in the model is given in Table 7.50 below. If the probability is less than 0.05, the relationship between the dependent and independent variables is significant at the 95% level. If it is less than 0.01, the relationship is significant at the 99% level. The significance of the relationship between intention and both attitude and perceived behavioural control was significant at the 99% level. The effect of subjective norm on the respondents' intentions regarding use of Luas was not significant. The table also shows that as people's attitudes and perceived behavioural control became more positive, they were more likely to have a more positive intention with regard to using Luas.

The intercepts shown in Table 7.50 represent the threshold points, referred to as $\tau$ above. The log likelihood is also quoted. This is a goodness of fit statistic and shows how well the model fits the data. It is a measure of the probability of the observed results given the parameter estimates. If a model fits perfectly the likelihood is 1 and the log likelihood is 0. The log likelihood in this model is $-51.60$. 
<table>
<thead>
<tr>
<th>Intention</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>Chi square</th>
<th>Pr &gt; Chi Sq</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attitude = -1</td>
<td>1.42</td>
<td>1.09</td>
<td>1.65</td>
<td>0.20</td>
</tr>
<tr>
<td>Attitude = 0</td>
<td>0.61</td>
<td>1.04</td>
<td>0.31</td>
<td>0.55</td>
</tr>
<tr>
<td>Attitude = 1</td>
<td>1.05</td>
<td>0.82</td>
<td>1.53</td>
<td>0.20</td>
</tr>
<tr>
<td>Attitude = 2</td>
<td>1.58</td>
<td>0.92</td>
<td>3.14</td>
<td>0.05</td>
</tr>
<tr>
<td>PBC = -1</td>
<td>1.45</td>
<td>0.92</td>
<td>2.39</td>
<td>0.10</td>
</tr>
<tr>
<td>PBC = 0</td>
<td>2.27</td>
<td>1.01</td>
<td>5.38</td>
<td>0.02</td>
</tr>
<tr>
<td>PBC = 1</td>
<td>0.56</td>
<td>0.86</td>
<td>0.43</td>
<td>0.50</td>
</tr>
<tr>
<td>PBC = 2</td>
<td>3.06</td>
<td>1.29</td>
<td>5.39</td>
<td>0.01</td>
</tr>
<tr>
<td>Intercept 1</td>
<td>2.28</td>
<td>0.95</td>
<td>6.02</td>
<td>0.01</td>
</tr>
<tr>
<td>Intercept 2</td>
<td>4.09</td>
<td>1.12</td>
<td>13.84</td>
<td>0.00</td>
</tr>
<tr>
<td>Intercept 3</td>
<td>6.46</td>
<td>1.34</td>
<td>24.35</td>
<td>0.00</td>
</tr>
<tr>
<td>Intercept 4</td>
<td>9.72</td>
<td>1.60</td>
<td>37.81</td>
<td>0.00</td>
</tr>
<tr>
<td>Effect Test</td>
<td>Number of Parameters</td>
<td>Degrees of Freedom</td>
<td>Chi Sq</td>
<td>Pr &gt; Chi Sq</td>
</tr>
<tr>
<td>Attitude</td>
<td>4</td>
<td>4</td>
<td>14.96</td>
<td>0.00</td>
</tr>
<tr>
<td>Perceived behavioural control</td>
<td>4</td>
<td>4</td>
<td>22.73</td>
<td>0.00</td>
</tr>
<tr>
<td>Log likelihood</td>
<td>-51.60</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 7.50: Regression analysis of the questionnaires
Table 7.51 shows the percentage probability of observing values of each intention score, given certain attitude and perceived behavioural control scores. In this table, it is apparent that the more negative a person’s attitude and perceived behavioural control were, the more likely they were to have very negative intentions with regard to using Luas for commuting trips. Perceived behavioural control would seem to have a very strong impact on people’s intentions to use the systems as even when people had an attitude score of 2, if their perceived behavioural control score was -2 they had a 82% chance of saying that they would not use Luas to commute.

The results are also shown in Figures 7.8 to 7.12. Figure 7.8 shows the probability of having an intention score of -2, Figure 7.9 shows the probability of having an intention score of -1, Figure 7.10 shows the probability of having an intention score of 0, Figure 7.11 shows the probability of having an intention score of 1 and Figure 7.12 shows the probability of having an intention score of 2. From these figures certain trends become apparent. Figure 7.8 shows that, within each of the categories of attitude score, an individual is more like to be very negative about using Luas for commuting trips if they have low levels of perceived behavioural control. Similarly, Figures 7.11 and 7.12 show that, within each of the categories of attitude score, a high perceived behavioural control score is likely to lead an individual to have a more positive intention score.

The analysis seems to indicate that higher perceptions of behavioural control and more positive attitudes play a role in determining people’s intentions to use Luas. In the model estimated, the dependent variable is the intention score and the independent variables are the attitude and perceived behavioural control scores. The parameters shown in the table describe the effect of the attitude and perceived behavioural control score on a person’s intention to use Luas.

Thus:

\[ S_i = \alpha + 1.46 \times_1 + 0.61 \times_2 + 1.04\times_3 + 1.58 \times_4 + 1.45 \times_5 + 2.26 \times_6 + 0.56 \times_7 + 3.06 \times_8 + \varepsilon_i \]

Equation 7.8

Where:
\( \alpha \) = intercept

\( x_1 = 1 \) if attitude is \(-1\), and 0 otherwise.

\( x_2 = 1 \) if attitude is \(0\), and 0 otherwise.

\( x_3 = 1 \) if attitude is \(1\), and 0 otherwise.

\( x_4 = 1 \) if attitude is \(2\), and 0 otherwise.

\( x_5 = 1 \) if perceived behavioural control is \(-1\), and 0 otherwise.

\( x_6 = 1 \) if perceived behavioural control is \(0\), and 0 otherwise.

\( x_7 = 1 \) if perceived behavioural control is \(1\), and 0 otherwise.

\( x_8 = 1 \) if perceived behavioural control is \(2\), and 0 otherwise.
<table>
<thead>
<tr>
<th>Attitude</th>
<th>Pbc</th>
<th>Intention = -2</th>
<th>Intention = -1</th>
<th>Intention = 0</th>
<th>Intention = 1</th>
<th>Intention = 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>-2</td>
<td>-2</td>
<td>91</td>
<td>8</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>-2</td>
<td>-1</td>
<td>70</td>
<td>23</td>
<td>6</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>-2</td>
<td>0</td>
<td>50</td>
<td>36</td>
<td>12</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>-2</td>
<td>1</td>
<td>12</td>
<td>33</td>
<td>45</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>-2</td>
<td>2</td>
<td>20</td>
<td>40</td>
<td>34</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>-1</td>
<td>-2</td>
<td>70</td>
<td>23</td>
<td>6</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>-1</td>
<td>-1</td>
<td>36</td>
<td>42</td>
<td>20</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>-1</td>
<td>0</td>
<td>20</td>
<td>40</td>
<td>34</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>-1</td>
<td>1</td>
<td>36</td>
<td>41</td>
<td>20</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>-1</td>
<td>2</td>
<td>10</td>
<td>30</td>
<td>48</td>
<td>11</td>
<td>1</td>
</tr>
<tr>
<td>0</td>
<td>-2</td>
<td>84</td>
<td>13</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>-1</td>
<td>23</td>
<td>42</td>
<td>30</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>3</td>
<td>13</td>
<td>51</td>
<td>31</td>
<td>2</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
<td>8</td>
<td>44</td>
<td>43</td>
<td>3</td>
</tr>
<tr>
<td>0</td>
<td>2</td>
<td>20</td>
<td>40</td>
<td>34</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>-2</td>
<td>31</td>
<td>42</td>
<td>23</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>-1</td>
<td>10</td>
<td>30</td>
<td>48</td>
<td>12</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>1</td>
<td>5</td>
<td>35</td>
<td>56</td>
<td>5</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>30</td>
<td>25</td>
<td>63</td>
<td>9</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>31</td>
<td>67</td>
</tr>
<tr>
<td>2</td>
<td>-2</td>
<td>67</td>
<td>15</td>
<td>7</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>-1</td>
<td>2</td>
<td>10</td>
<td>47</td>
<td>39</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>11</td>
<td>67</td>
<td>21</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>7</td>
<td>61</td>
<td>31</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>9</td>
<td>91</td>
</tr>
</tbody>
</table>

Table 7.51 Probability of intention score given attitude and pbc score

Expressed as percentages.
Figure 7.8: Probability of an intention score = -2 (expressed as %)

Figure 7.9: Probability of an intention score = -1 (expressed as %)
Figure 7.10: Probability of an intention score = 0 (expressed as %)

Figure 7.11: Probability of an intention score = 1 (expressed as %)
7.3.7 Beliefs of the respondents in the Dublin study

The attitudes, subjective norms and perceptions of behavioural control that have been discussed in the previous section should be determined by a person’s behavioural, normative and control beliefs. Therefore the different groups should have different beliefs about Luas. Chapter 6 showed how respondents gave a score between −3 and 3 to various behavioural, normative and control beliefs. As in the Croydon survey, t-tests were carried out in order to ensure that there were significant differences in people’s beliefs, depending on whether they chose to use Luas or not. In the questionnaire, as was described in Chapter 6; respondents were asked to indicate agreement with beliefs. Tables 7.52 – 7.54 show the mean scores for each group of people.

For Group A, the most negative belief that they had was that Luas would not save them time. In Croydon, people who were not going to use Tramlink to commute had also stated that they did not think that it would save them time on their commuter trips. Safety was less of an issue for people in Dublin than in Croydon, although they still felt that using Luas would mean that they were more likely to be involved in an accident. In Croydon, people were more aware of the safety issues involved with using Tramlink as they had been exposed to reports of accidents during the testing period. It is a belief that could become more important for people in Dublin as the construction of Luas continues.
<table>
<thead>
<tr>
<th>I believe that using Luas on my work trip</th>
<th>Group A</th>
<th>Group B</th>
<th>Group C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Will improve the environment</td>
<td>0.3</td>
<td>2.1</td>
<td>1.3</td>
</tr>
<tr>
<td>Will be more comfortable</td>
<td>-1.0</td>
<td>1.9</td>
<td>0.9</td>
</tr>
<tr>
<td>Will reduce traffic</td>
<td>0.2</td>
<td>1.8</td>
<td>0.8</td>
</tr>
<tr>
<td>Will save me time</td>
<td>-1.4</td>
<td>1.8</td>
<td>0.5</td>
</tr>
<tr>
<td>Will save me money</td>
<td>-0.9</td>
<td>1.4</td>
<td>-0.3</td>
</tr>
<tr>
<td>Will decrease my chances of being involved in an accident</td>
<td>-0.6</td>
<td>1.2</td>
<td>1.3</td>
</tr>
<tr>
<td>Will improve my personal safety</td>
<td>-0.8</td>
<td>1.2</td>
<td>0.2</td>
</tr>
</tbody>
</table>

Table 7.52: Behavioural beliefs of the Dublin respondents

Group B who were most positive about Luas and intended to use it for work trips also had the most positive behavioural beliefs. In particular, they felt that using the new form of public transport would be environmentally friendly. This was a belief that had been strongly held by people intending to use Tramlink to commute in Croydon. Members of Group B also felt that using Luas would be more comfortable, reduce traffic and save time. The majority of people in this group currently use the car to travel to work so it is interesting to see that they expect Luas to be more comfortable than this mode. The beliefs of this group are very similar to those of people who intended to use Tramlink to commute in Croydon.

Members of Group C were positive that Luas was good for the environment and that it was safer. The other beliefs they held were quite neutral and it is apparent that they were still reserving judgement on whether or not they would use it to commute. Group C is a very important group: knowing what their behavioural beliefs are at an early stage in the development of Luas means that these beliefs can be influenced and made positive by addressing their concerns.

From Table 7.52, it is very apparent that there are differences in the beliefs of those in Group B and those in Group A. Group B who intend to use Luas to travel to work believe that using it will have positive outcomes. When the t-test was carried out, the differences between the means scores of all the beliefs of Group A and Group B were significant at the 99% level.
Group C had very neutral mean scores for their behavioural beliefs. Their mean scores for their beliefs about saving time, saving money, benefiting the environment, improving personal safety and reducing traffic were significantly different from those of Group B at the 99% level. In all cases, Group B had more positive beliefs. Group C’s beliefs about saving time on the work trip, being comfortable, preventing accidents, improving the environment and improving personal safety were significantly different from those of Group A at the 99% level. In each case, their beliefs were more positive than those of Group A.

Table 7.53 shows the mean scores for beliefs for the normative beliefs held by the three groups.

<table>
<thead>
<tr>
<th>These referents want me to use Luas to travel to work</th>
<th>Group A</th>
<th>Group B</th>
<th>Group C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dublin Transportation Office (DTO)</td>
<td>0.9</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Family</td>
<td>-0.7</td>
<td>1.2</td>
<td>0.3</td>
</tr>
<tr>
<td>Friends</td>
<td>-1.0</td>
<td>0.8</td>
<td>0.4</td>
</tr>
</tbody>
</table>

*Table 7.53: Average normative belief scores for Dublin survey*

This table shows that all groups felt that the DTO wanted them to use Luas. Group B and C were most sure that the DTO wanted them to use Luas. Group A felt that their friends and family did not want them to use Luas while Group B felt that they wanted them to use Luas. As in the Croydon study, this shows that people seem to be more ready to comply with the beliefs of their friends and families. Even though Group A knew that the DTO was promoting the use of Luas to commute they did not intend to use it. Meanwhile, Group C felt that their friends and family wanted them to use Luas but these beliefs were not held very strongly.

The t-test showed that the difference between Group A’s and Group B’s mean scores for their beliefs about the opinions of their friends and family were significant at the 99% level. For Group C and Group A, there were significant differences between the mean scores for their beliefs about what their friends and family wanted them to do, at the 99% and 95% level respectively. There were no significant differences between the beliefs of Group B and Group C and there
were no significant differences between any of the groups' beliefs concerning the DTO. All the groups were aware that the DTO would want them to use Luas.

Table 7.54 shows the mean scores for the control beliefs of the three groups.

<table>
<thead>
<tr>
<th>I believe that it would be easy to use Luas to travel to work if</th>
<th>Group A</th>
<th>Group B</th>
<th>Group C</th>
</tr>
</thead>
<tbody>
<tr>
<td>I lived near Luas</td>
<td>1.3</td>
<td>2.4</td>
<td>1.8</td>
</tr>
<tr>
<td>I worked near Luas</td>
<td>0.5</td>
<td>2.4</td>
<td>1.8</td>
</tr>
<tr>
<td>I was travelling in heavy traffic</td>
<td>-0.7</td>
<td>1.8</td>
<td>0.5</td>
</tr>
<tr>
<td>I was in a hurry</td>
<td>-0.9</td>
<td>1.6</td>
<td>1.1</td>
</tr>
<tr>
<td>I had heavy goods to carry</td>
<td>-0.5</td>
<td>1.2</td>
<td>-0.6</td>
</tr>
<tr>
<td>The weather was bad</td>
<td>-1.1</td>
<td>1.0</td>
<td>0.6</td>
</tr>
<tr>
<td>I was travelling in the dark</td>
<td>-0.5</td>
<td>0.8</td>
<td>0.8</td>
</tr>
</tbody>
</table>

*Table 7.54: Average control belief scores for Dublin survey*

From this table, Group A obviously felt that using Luas would be difficult under many circumstances. They were most negative about using Luas in bad weather. The beliefs that they held are similar to those who did not think that they would use Tramlink to commute. They felt that living near Luas would make it easier to use it to travel to work but only 30% of those in Group A lived on the Luas route.

Group B and Group C both felt that using Luas would simplify their trip. Members of both groups agreed that living and working near Luas would make it easy to use. All the respondents worked on the Luas route while 72% of those in Group B and 72% of those in Group C lived on the Luas route. In Croydon, as was discussed in the previous sections, many people who did not intend to use Tramlink to commute had stated that they lived too far away from it and that the stops were inaccessible to them. Therefore, it is apparent that accessibility is a very important factor in determining people's willingness to use new urban public transport.

People in Group B were positive about the efficiency of using Luas. They felt it would be easy to use when hurrying or when traffic was bad. Similarly in
Croydon, people intending to use Tramlink to travel to work felt that it was easy to use in heavy traffic and when time was a premium.

For Group A and B, the differences between the mean scores for their beliefs about using Luas when carrying heavy goods, when traffic was heavy, when in a hurry, when the weather was bad or when one worked near Luas were significantly different at the 99% level. There were significant differences at the 95% level between the mean scores for beliefs about using Luas when it was dark or when one lived near the Luas route. Group B felt that Luas would be particularly easy to use if one lived or worked near the route.

Group C and Group B had significantly different mean scores for their control beliefs about using Luas in heavy traffic and when carrying heavy goods. The mean scores were significantly different at the 99% level. Members of Group C were slightly negative about using Luas to carry heavy items on the trip to work. They were quite positive that Luas would be easy to use if in a hurry or if one lived or worked near Luas.

The mean scores for the control beliefs of Groups A and C were significantly different at the 99% level for the beliefs about using Luas in the dark, when traffic was heavy, when in a hurry or when the weather was bad. There were significant differences at the 95% level about how easy it would be to use Luas when one worked near the route. In all cases, Group C felt that Luas would be easier to use to travel to work than Group A, as would be expected. Group A have decided not to use Luas and therefore, according to the Theory of Planned Behaviour, their control beliefs should be quite negative.

In addition to measuring the interviewees' intentions and belief strengths, the questionnaire also measured people's outcome evaluations, motivations to comply with referents and perceived facilitation or inhibition effects, as described in Chapter 6. According to the Theory of Planned Behaviour, it is these factors and the belief strengths that determine a person's attitude, subjective norm and perceived behavioural control, as was explained in Chapter 3. The method in which they are combined in order to provide a measure of attitude, subjective norm and perceived behavioural control was described in Chapter 3.
when the Theory of Planned Behaviour was explained. In order to serve as a reminder, a brief description will be given here.

To measure the factors that have lead to an attitude, people are asked to express agreement with a behavioural belief. This is a measure of their belief strength. For example:

\[
\text{I believe that using Luas will save me time when I commute to work.}
\]

\[
\begin{array}{ccccccc}
3 & 2 & 1 & 0 & -1 & -2 & -3 \\
\end{array}
\]

3 = Agree strongly, -3 = Disagree strongly

Then they are asked to evaluate this outcome:

\[
\text{Saving time when I commute to work is:}
\]

\[
\begin{array}{ccccccc}
3 & 2 & 1 & 0 & -1 & -2 & -3 \\
\end{array}
\]

3 = Extremely good, -3 = Extremely bad

By multiplying the belief strength by the outcome evaluation, this should give an indication of attitude. The process is repeated for each belief and outcome evaluation pair. It is then possible to sum the products. If the sum is positive then the attitude should be positive, if it is negative the attitude is negative.

A similar exercise is used to measure people’s subjective norm and perceived behavioural control. For subjective norm, people’s agreement with a normative belief is measured. That is, they are asked whether they believe various referents would like them to behave. Then, their motivation to comply with the referents is measured. For each belief, the normative belief score and motivation to comply scores are multiplied. The sum of these products indicates how positive or negative people’s subjective norms are.

For perceived behavioural control, people are asked whether various factors would make it easy or difficult to use Luas on a work trip. They give a score to show how these factors would help or hinder them. This is their belief strength. They are then asked how to give a score indicating how likely they are to meet
those factors in the course of a work trip. This is the perceived facilitation or inhibition effect. For each belief, these scores are multiplied and added to give an indication of a person’s perceived behavioural control.

Figures 6.18 – 6.19 shows how these factors were measured in the questionnaire used in Dublin. Tables 7.55 – 7.57 show the mean belief strength multiplied by the mean scores for outcome evaluations, motivation to comply and likelihood of meeting obstacles and facilitators on a trip, for each belief for the 3 groups. It is obvious from these tables that there are differences between the groups.
<table>
<thead>
<tr>
<th>Outcome evaluations</th>
<th>I believe that using Luas on my work trip</th>
<th>Group A</th>
<th>Group B</th>
<th>Group C</th>
</tr>
</thead>
<tbody>
<tr>
<td>A comfortable journey on my trip to work is important to me.</td>
<td>Will be more comfortable</td>
<td>-2.3</td>
<td>5.3</td>
<td>2.4</td>
</tr>
<tr>
<td>Saving time on my trip to work is important to me.</td>
<td>Will save me time</td>
<td>-3.2</td>
<td>5.2</td>
<td>1.6</td>
</tr>
<tr>
<td>To decrease my chances of being involved in a traffic accident on my trip to work is important to me.</td>
<td>Will decrease my chances of being involved in an accident</td>
<td>-2.3</td>
<td>4.5</td>
<td>3.1</td>
</tr>
<tr>
<td>To reduce the amount of traffic on the roads on my trip to work is important to me.</td>
<td>Will reduce traffic</td>
<td>1.71</td>
<td>3.9</td>
<td>2.5</td>
</tr>
<tr>
<td>To save money on my trip to work is important to me.</td>
<td>Will save me money</td>
<td>-1.6</td>
<td>3.9</td>
<td>-0.27</td>
</tr>
<tr>
<td>To conserve the environment is important to me.</td>
<td>Will improve the environment</td>
<td>-0.2</td>
<td>3.7</td>
<td>3.5</td>
</tr>
<tr>
<td>To increase my sense of personal safety on the trip to work is important to me.</td>
<td>Will improve my personal safety</td>
<td>-1.0</td>
<td>2.1</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>Total: Attitude</strong></td>
<td></td>
<td>-8.9</td>
<td>28.7</td>
<td>12.7</td>
</tr>
</tbody>
</table>

*Table 7.55 Behavioural beliefs multiplied by outcome evaluations*
<table>
<thead>
<tr>
<th>I want to comply with these referents</th>
<th>These referents want me to use Luas to travel to work</th>
<th>Group A</th>
<th>Group B</th>
<th>Group C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family</td>
<td>Family</td>
<td>0.0</td>
<td>2.3</td>
<td>-0.1</td>
</tr>
<tr>
<td>Friends</td>
<td>Friends</td>
<td>-0.3</td>
<td>1.3</td>
<td>-0.4</td>
</tr>
<tr>
<td>Dublin Transportation Office (DTO)</td>
<td>Dublin Transportation Office (DTO)</td>
<td>-2.8</td>
<td>-0.1</td>
<td>-4.6</td>
</tr>
<tr>
<td>Total: Subjective norm</td>
<td></td>
<td>-3.1</td>
<td>3.5</td>
<td>-5.1</td>
</tr>
</tbody>
</table>

*Table 7.56 Normative beliefs multiplied by motivation to comply*
When I make my work trip | I believe that it would be easy to use Luas to travel to work if | Group A | Group B | Group C
--- | --- | --- | --- | ---
I make it to a workplace on the Luas route | I worked near Luas | -0.6 | 5.8 | 0.3
I often encounter heavy traffic | I was travelling in heavy traffic | -0.3 | 4.6 | 1.1
I make it from my home which is on the Luas route | I lived near Luas | -3.9 | 3.9 | -0.8
I am often in a hurry | I was in a hurry | -0.5 | 3.7 | 3.6
I often carry heavy goods | I had heavy goods to carry | -0.9 | 2.6 | 1.9
I often encounter bad weather | The weather was bad | -0.8 | 1.7 | 2.1
I often travel in the dark | I was travelling in the dark | 0.3 | 0.6 | 3.1
**Total: PBC** | | **-6.7** | **22.9** | **10.7**

Table 7.57 Control beliefs multiplied by perceived facilitation or inhibition effect

People's scores for subjective norm, intention, attitude and perceived behavioural control are shown in Table 7.47. In the tables above, the scores in the final row should serve as an alternative measure of a person's subjective norm, attitude and perceived behavioural control. The more negative they are the more negative the subjective norm, attitude and perceived behavioural control are. In order to test this, Pearson's Correlation analysis was conducted for each component of the Theory of Planned Behaviour using SPSS. This measures the linear correlation between two variables. The correlation coefficient ranges from -1 to 1 and the sign indicates the direction of the relationship. The bigger the number is the
stronger the correlation is. Usually, in behavioural analysis correlations in the range 0.3 to 0.5 are considered to be of moderate magnitude and correlations exceeding 0.5 indicate strong relationships (Ajzen and Fishbein, 1980). In these tests, the relationships between attitude, subjective norm and perceived behavioural control as measured directly and attitude, subjective norm and perceived behavioural control as measured using Tables 7.55 to 7.57 were examined. Table 7.58 shows the results.

<table>
<thead>
<tr>
<th>Component</th>
<th>Correlation coefficient</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attitude</td>
<td>0.61</td>
<td>Significant at the 99% level</td>
</tr>
<tr>
<td>Subjective norm</td>
<td>0.35</td>
<td>Significant at the 95% level</td>
</tr>
<tr>
<td>Perceived behavioural control</td>
<td>0.63</td>
<td>Significant at the 99% level</td>
</tr>
</tbody>
</table>

Table 7.58 Correlation between direct and indirect measures

As this table shows, there is very strong correlation between the direct and indirect measures of attitude and perceived behavioural control. There is a moderate correlation between the direct and indirect measures of subjective norm. The fact that this is only a moderate correlation might be explained by the fact that people had been unwilling to comply with the publicity from the DTO, much in the same way that people in Croydon were unwilling to comply with the Council or TCL. However, the fact that the correlation between indirect measures of the components of the theory and the direct measures of the theory range from moderate to strong indicate that measuring people’s attitudes, subjective norms and perceived behavioural control using the system used in the Dublin questionnaires is valid. In Chapter 3, the fact that this method can be difficult to understand and not always intuitive was commented on and an example of a situation where using this method may give unexpected, but correct results was described. Therefore, when using the Theory of Planned Behaviour to examine people’s travel behaviour it is always important to include direct measures of attitude, subjective norm and perceived behavioural control which allow the validity of the indirect measures to be examined. In this study in Dublin, people’s beliefs, attitudes, subjective norms and perceived behavioural
control correlated well. Their attitudes, subjective norms and perceived
behavioural control correlated also predicted their intentions and there were
significant differences between the beliefs of the different groups, demonstrating
the fact that the theory provided a good framework for studying travel behaviour
and modal choice.

7.3.8 Conclusions

In this section, the analysis of results collected from the study of potential users
of a light rail system in Dublin has been conducted. The analysis showed that
people's intentions about using Luas for their commuter trips were very closely
linked with their attitudes, subjective norms and perceived behavioural control,
as the Theory of Planned Behaviour predicts. This compares favourably with the
study in Croydon, where the analysis of the interviews showed that there was a
close link between a person's intention to use Tramlink and their attitudes,
subjective norm and perceived behavioural control. As in Croydon, subjective
norm, while it is a factor that affected people's intentions, does not have the same
weight of influence on intentions as people's attitudes to using Luas or their
perceived behavioural control. According to the Theory of Planned Behaviour,
different components of the theory will have greater or lesser effects depending
on the decisions that are made.

According to the Theory of Planned Behaviour, there should be significant
differences between the beliefs of those who intend to use Luas and those who do
not intend to use Luas. The analysis that was described above showed that there
were significant differences in these beliefs. Again, this was the same as in the
Croydon study.

Finally, an opportunity existed in the Dublin study to test the performance of the
Theory of Planned Behaviour using questionnaires, which was not allowed in the
Croydon study. It was possible to examine the correlation between a direct
measure of attitude and the indirect measure of attitude using belief strengths,
motivations to comply, outcome evaluations and likelihood of meeting obstacles
on the work trip. This analysis showed very strong correlations between the
direct and indirect measures of attitude and perceived behavioural control. There
was a moderate correlation between the direct and indirect measures of subjective norm. This would seem to show that the indirect measures used in the Theory of Planned Behaviour give a very good indication of people's attitudes, subjective norms and perceived behavioural control.

7.4 Summary

The objective of this thesis is to examine the potential impacts of new urban public transport on people's travel behaviour and modal choices. In particular, it is intended to examine whether a better understanding of people's modal choices would help to predict how many and in what way people would use new forms of public transport.

In this chapter, an attempt has been made to look at the intentions of potential users of two new light rail systems. The objective of these studies has been to find out how people made the decision to use or not to use the new public transport systems.

The first study, conducted in Croydon, used qualitative interviews in order to assess people's attitudes, subjective norms and perceived behavioural control. A follow-up study of those people who had been interviewed was conducted in order to assess how many people had done what they said that they intended to do and whether the components of the Theory of Planned Behaviour served as good predictors of this behaviour.

The study in Dublin was carried out in order to contrast the modal choices of potential users of a new system at a much earlier stage in its development. In this case, questionnaires were used to measure the components of the Theory of Planned Behaviour and these allowed further analyses of its use and the validity of its use to be conducted.

The results have been analysed in this chapter. The Theory of Planned Behaviour has shown itself to be a good model of people's decision-making processes. In Croydon, it was possible to find a person's behavioural, normative and control beliefs from the qualitative interviews. Both studies showed significant differences in the beliefs held by people with different intentions regarding to
Tramlink and Luas. The studies also showed differences in the attitudes, perceived behavioural control and subjective norms of the groups and showed how these components had an effect on people's intentions.

The behavioural beliefs of people in Croydon showed that those who intended to use Tramlink were particularly positive about its effect on the environment and the fact that it would make commuting easier. In Dublin people were only questioned about work trips and once more those who intended to use Luas were most positive about its effect on the environment. For those who did not intend to use the system, the most negative behavioural belief held in Croydon was that it would increase their chances of them being involved in an accident. This was not the same in Dublin, where people were most concerned about time loss on Luas. This may be because people in Croydon has seen Tramlink in operation and had become worried by how quiet it was and a few minor accidents that had occurred during its test runs. In Dublin, however, no one had ever seen Luas in operation and therefore, had not considered there to be a safety risk. For both groups who had decided not to use the systems, loss of time and low levels of comfort were important factors.

People's control beliefs showed that living near the route was considered to be a very important facilitator in using the system. Most of the people in Croydon who intended to use the system but not for commuting said that part of the reason was because they did not leave close enough to the route. In both studies, people who were not going to use Tramlink or Luas were particularly negative about using it when the weather was bad or when they were in a hurry. On the other hand, people who were going to use the systems were quite positive about using it when in a hurry and in Dublin people who were going to use Luas felt that it would be very easy to use in bad weather.

It was found in both studies that subjective norm had a lesser effect on people's intentions to use new public transport. In Croydon, people were very unwilling to comply with Croydon Council and TCL; while in Dublin, people were unwilling to comply with the DTO. This raises interesting questions about how new public transport schemes are publicised. In both these studies, people who intended to use the new public transport were doing so despite the fact that they did not want
to comply with the authorities publicising the systems. In Croydon, people felt that the Council had not given them enough information about the system and this had antagonised them. In Dublin, the Luas scheme has been held up at many points in time by inquiries and bureaucracy and so people may not feel obliged to do what the local authorities think they should do.

The studies, therefore, show some similarities in the types of beliefs that were held by people intending to use the systems. By looking at these beliefs, in each case, it gave the opportunity to show why people held the attitudes, subjective norms and perceptions of behavioural control that they held and gave greater understanding of people's decision-making processes.

Both studies also allowed some exploration of how valid it was to use the Theory of Planned Behaviour to investigate modal decisions. In Croydon, the follow-up study showed how well people's beliefs, attitudes, subjective norms and perceived behavioural control correlated with their actual use of the system. The intentions of the interviewees correlated very well with their actual behaviour in terms of they types of trips that they said that they would make and how often they would make them. This shows that when people were asked to consider the outcomes of using Tramlink, the ease of using it and what those around the thought they were able to predict their behaviour accurately. In addition, there were strong correlations between people's attitudes and perceived behavioural control and their actual behaviour.

In the Dublin study, an opportunity existed to examine how well the direct measures of attitudes, subjective norm and perceived behavioural control corresponded with people's behavioural, normative and control beliefs. The correlations were found to be good, in particular for attitudes and perceived behavioural control.

In conclusion, therefore, the analysis of the results of the two studies shows that people's intentions to use new public transport systems are closely connected to their attitudes, subjective norm, perceived behavioural control and beliefs. An objective of this thesis has been to gain a greater understanding of modal choices. Using the Theory of Planned Behaviour in Croydon has allowed the steps in
individuals' decision-making processes to be traced. The qualitative interviews gave a large amount of information about the modal choices that people made. The follow-up study showed that the Theory of Planned Behaviour predicted people's travel decisions quite well. The study in Dublin showed how the Theory of Planned Behaviour could be used in the form of a questionnaire in order to examine people's modal choices. While the interviews in Croydon yielded a lot of very interesting data, it was important to show the use of the theory in a form that could be used for large-scale studies.

Chapter 8 will examine whether the work carried out for this thesis has achieved the objectives that were originally set out in Chapter 1. It will demonstrate how the analysis of the results from three studies: the interviews with car drivers described in Chapter 4, and the two studies described in this chapter, have contributed to achieving those objectives. In addition, future work that is planned to examine the potential impact of new public transport and the use of the Theory of Planned Behaviour will be described.
Chapter 8:

Discussion, conclusions and further work
8.1 Introduction

In Chapters 1 and 2, the traffic problems that are faced in many cities today were described. These problems are the result of increasing levels of traffic, car ownership and car dependence. To reduce these problems, levels of private car use need to be reduced. One way to achieve this is to offer people alternative modes to the car.

Several cities and towns in the UK have built light rail systems or are planning to build them in order to reduce car dependency. However, these systems have met with varying levels of success in reducing congestion.

As was stated in Chapter 1, the objectives of this thesis were:

(1) To contribute to and improve existing understanding of people's modal choices and the decision-making processes behind those modal choices, particularly in relation to new modes of transport.

(2) To examine whether the Theory of Planned Behaviour offers a good framework in which to study modal choices and the decision-making processes behind modal choices.

(3) To show that the use of the Theory of Planned Behaviour can be used to make predictions about people's travel behaviour.

(4) To examine the potential impacts of two new urban public transport systems on travel behaviour.

To fulfil these objectives three elements of work were conducted: an analysis of the modal choices of car drivers, a study of the intentions and the actual behaviour of people in relation to Tramlink in Croydon and a study of potential users of Luas in Dublin. Each element of the work contributed to achieving the objectives of the thesis as has been described in preceding chapters and will be summarised in this chapter.
8.2 Outline of work done

In order to fulfill the objectives outlined above, studies have been conducted of the intentions of potential users of two new light rail systems in Croydon and Dublin. Initially, however, analysis using the Theory of Planned Behaviour was conducted of data collected during a study of car drivers' modal choices (Mackett and Ahern, 2000). There were three main reasons for doing this.

As has been mentioned, a major objective of this thesis is to examine people's modal choices and the motivations behind them. This study collected a lot of information about how and why drivers chose to use their cars and why they rejected alternative modes on real, specific trips. Therefore, it was felt that analysis of this data gave an insight into the decision-making processes involved in modal choice.

Another objective of the thesis is to examine the potential impact of new urban public transport systems on travel behaviour. The drivers in this survey had given suggestions for improvements to public transport that would encourage them to use it. Therefore analysing the data helped to show what factors would help to make a new public transport system successful.

Finally, it was decided to test the use of the Theory of Planned Behaviour on an existing body of data before designing the studies in Croydon and Dublin. This application of the theory to existing data identified what types of questions would have to be asked in the studies and also demonstrated whether it was valid to use the Theory of Planned Behaviour in these studies.

In the Croydon studies, interviews were conducted with potential users of the new light rail system there called Tramlink. These interviews were conducted in the 6 months prior to the opening of Tramlink. The interviews were analysed using the Theory of Planned Behaviour in order to study how people had made the choice to use or not to use Tramlink. It was intended to show that the theory could model the decision-making process behind people's modal choices. The qualitative format of this study was intended to lead to greater understanding of why people made certain choices and what motivated them to make those choices.
A follow-up study of the interviews was conducted 6 months after Tramlink opened in order to see how many of them had used Tramlink and to see how well their behaviour correlated with their intentions. The results were studied to examine how well the Theory of Planned Behaviour had predicted people's behaviour.

In addition to the study conducted in Croydon, a study was conducted of the intentions of potential users of a new light rail system in Dublin called the Luas. The first phase of Luas is not due to open until 2002. The reason that this study was conducted was to examine whether the Theory of Planned Behaviour could be used to explain people's modal choices and intentions at a much earlier stage of the development of a light rail system, when it is very important to establish whether there is sufficient support for the system. This study was conducted using questionnaires. It was intended to demonstrate that the Theory of Planned Behaviour could be applied in a format that would allow the collection of large amounts of data, which the interviews in Croydon would not allow. A comparison has been made of the results of the two studies and differences and similarities in people's decision-making processes have been described.

8.3 Factors that motivated people's modal choices

(1) The results reported in Chapter 4 showed that public transport was rejected due to inflexibility, unreliability and inconvenience while the car was chosen as it allowed people to make difficult trips easily.

(2) In all the studies, it was found that for commuter trips, time and frequency were important factors when choosing a mode.

(3) For non-work trips to areas that were away from Croydon town centre the advantage of not having to look for parking was important for people intending to use Tramlink.

(4) For non-work trips, the presence of extensive routes and of good interchanges between Tramlink and train was very important in Croydon.
In Croydon, concerns about safety of the system played an important role in determining the decisions of those who intended not to use Tramlink.

In Dublin and Croydon, the systems were seen to be beneficial to the environment by those intending to use Luas and Tramlink. However, those not intending to use Tramlink in Croydon felt that it was detrimental to the urban environment.

People were less likely to want to comply with Croydon Council and TCL in Croydon and the DTO in Dublin than with their friends and relatives.

For work trips, people would only use Tramlink and Luas if the stops were easily accessible from home, either on foot or through a park and ride site.

For non-work trips away from Croydon town centre, people were more willing to travel further to stops, as these trips would generally be less frequent.

8.4 Describing the decision-making process using the Theory of Planned Behaviour

An attempt was made to describe this decision-making process using the Theory of Planned Behaviour, which was described in Chapter 3. The thesis has identified a close relationship between the components of the Theory of Planned Behaviour and the intention to use Tramlink.

The qualitative analysis of the Croydon interviews and the regression analysis showed that positive attitudes to using the systems, social pressure from those around potential users to use the system and a system that was perceived as being easy to use played an important role in determining a person’s intentions to use Tramlink.

The study in Dublin also showed that positive attitudes, social pressure from those around potential users to use the system and a system that was perceived as being easy to use played an important role in determining a person’s intentions to use Luas.
(3) Social pressure from those around them to use the systems had a lesser role to play in people's decision-making processes than their attitudes or their perceptions of how easy it would be to use Tramlink and Luas.

(4) The statistical analyses of the results in Dublin and Croydon showed statistically significant differences in the respondents' beliefs about the outcomes of using Luas and Tramlink, in their beliefs about what their friends and family wanted them to do and in their beliefs about how easy it was to use the systems, depending on what use they intended to make of them.

(5) The analysis of the study of car drivers' choices described in Chapter 4 indicated that beliefs about the outcomes of using public transport and beliefs about how easy it was to use it played an important role in determining whether or not a person felt that they could use it on a trip.

8.5 Using the Theory of Planned Behaviour to make predictions about modal choice

(1) The follow-up study in Croydon showed there were strong correlations between what people had intended to do and what they had actually done, both in terms of how they had used Tramlink and the frequency with which they had made trips on Tramlink.

(2) The follow-up study also looked at what people said that they would do in the future and once more a strong correlation was found to exist between people's intentions at the interview stage and their intentions for future use of the system at the time of completing the questionnaire.

(3) A regression analysis indicated that positive attitudes to using the systems and a system that was perceived as being easy to use at the interview stage were predictors of actual use of Tramlink.

(4) In Dublin, it was shown that the methods that Ajzen and Fishbein (1980) recommend to use to predict and measure people's intentions, beliefs, attitudes, their perceptions of the social pressures on them to use a system and their perceptions of how easy it is to use a system were accurate.
8.6 The potential impact of new urban public transport on travel behaviour

(1) It was concluded that Croydon Tramlink would be a successful system that people would use for several different trip types: commuter trips to Croydon, business trips made away from the place of work in Croydon during the day, non-work trips made from home to Croydon town centre and non-work trips made to areas other than Croydon town centre.

(2) The interviews demonstrated that Tramlink would potentially generate extra trips, in particular non-work trips, to areas outside of Croydon.

(3) Several people had chosen to use Tramlink for business trips made away from the office or workplace during the day instead of using their cars.

(5) Tramlink was predicted to have a lesser, although still important, effect on people’s commuter trips than on their other trips. The follow-up study showed that some people had stopped using their cars to commute to work.

(6) In Dublin the introduction of Luas into a mainly road based public transport service was predicted to have a significant effect on people’s commuter trips: 42% of respondents planned to use it to travel to work and another 18% were considering using it. Of those who were going to use Luas to commute, 60% currently travelled to work by car.

8.7 Conclusions and future work

The thesis has used the Theory of Planned Behaviour to examine the potential impacts of two new urban public transport systems, Croydon Tramlink and Dublin Luas, on people’s travel behaviour. It was pointed out in Chapter 2 that there have been discrepancies between the forecasts of patronage on new urban public transport systems and the actual patronage in the past. These discrepancies have arisen for several reasons, as was illustrated in Chapter 2 in the descriptions of the forecasts for Manchester Metrolink and Sheffield Supertram. Some of the errors were due to incorrect representation of the supply conditions at the time of opening. However, even when allowances were made for the changes in the exogenous factors, there remained significant differences between the forecasts.
and the reality for the two systems. This was particularly the case for the
disaggregated forecasts. In both these cases, the forecasting studies pointed out
that there were problems with the assumptions made about the behavioural
responses of potential users to new public transport systems. For this reason, it
was decided to examine the impacts of these systems using a method from social
psychology, called the Theory of Planned Behaviour.

Earlier in this chapter, some of the results that were obtained using this theory
were summarised and the performance of the theory was briefly discussed.
However, if this theory is to be used in the future and has a role to play a
supplementing existing demand forecasts more work will be required.

The Theory of Planned Behaviour has been shown to be good at highlighting
areas of modal choice that may be overlooked by more conventional methods of
travel behaviour forecasting. Both the Theory of Planned Behaviour and
conventional methods recognise the importance of attributes of a mode on
decisions and also of constraints on modal choices. Conventional models use
actual measures of the modal attributes while the Theory of Planned Behaviour
looks at people's beliefs concerning attributes and at how these play a role in
determining modal choices. The Theory of Planned Behaviour also allows for
social norms to have an impact on people's travel choices. In this study, the
negative impact of the publicity from Croydon Council on people's choices has
been highlighted. In addition, the impact that constraints have on people's travel
behaviour in the Theory has been clearly illustrated as it looks at people's
perceptions of behavioural control and how these impact on their travel
decisions.

However, the Theory of Planned Behaviour is insufficient to replace existing
demand forecasts. In its present format it is too simplistic. In the past, the theory
has largely been used to look at behaviour such as voting behaviour in American
Presidential elections, where choices are binary and decisions take place on a less
frequent basis. Travel choices are more complicated. They take place every day
and there are many factors involved in those choices. For example, the effect of
habit and inertia on people's modal choices cannot be overlooked. It may be
necessary to these effects into the Theory of Planned Behaviour in the future, to improve its predictive capabilities.

In addition, the trip-maker is faced with a much wider range of choices than the voter in an election. He or she can choose different modes, different locations and different activities, for example. The Theory of Planned Behaviour only allows the researcher to look at the trip-makers' use of the new system in relation to their existing decision. To overcome this problem in future uses of the theory to predict changes in travel behaviour, it may be useful to present respondents with sets of different scenarios where sometimes destination or time of day of the trips were altered, rather than simply mode, and to rate their attitudes, subjective norms, perceive behavioural control and beliefs in relations these different scenarios.

The Theory of Planned Behaviour examines people's behavioural beliefs, their normative beliefs and their control beliefs and looks at how these influence intentions and behaviour. In terms of modal choices, the theory looks at people's beliefs about the attributes of modes and the impact these have on their modal choices. However, there is no allowance made to look at the relationship between people's beliefs about these attributes and the actual reality. For example, when potential users of the new system state that they believe it will be more expensive to use than using an existing mode of transport or that trips on the new system will take longer than on an existing mode of transport the theory does not examine the relationship between these beliefs and the reality. To improve the performance of the Theory of Planned Behaviour in the future and to increase the role it can have to play in complementing demand management forecasts, it would be useful to examine the differences between people's beliefs concerning the attributes of modes, such as cost of using the mode and time it takes to make a trip, and the actual values. This would provide a useful addition to conventional demand forecasts. If people's perceptions of the costs of using a mode or the time it takes to use it or of the number of accidents that take place on that mode, are different from the actual, real engineering measures that are represented in demand forecasting models, this could explain some of the differences between forecast and actual patronage.
The surveys that are used in the Theory of Planned Behaviour would have to be altered in order to do this. At present, questionnaires using the Theory of Planned Behaviour present the respondent with broad statements to measure how they feel the attributes of the new mode relate to those of their current mode. In a future questionnaire, it may be more useful to record how much difference people actually believe there was between using their current mode and the new system, so that this can be compared to engineering performance measures.

It is not the belief of this researcher that the Theory of Planned Behaviour could successfully replace the conventional demand forecast techniques, such as those used in Sheffield and Manchester. However, it could complement those techniques. In both Manchester and Sheffield, the conventional techniques encountered problems in estimating the number of people who would transfer from one mode to the new systems. The Theory of Planned Behaviour could be used to highlight what attributes of modes are most important to people’s decision-making processes. In addition, the theory could highlight what control factors and social norms have an impact on people’s choices of mode.

In order to do this, however, changes would be required to the questionnaire, of the type used in the study in Dublin, which has been used in studies of behaviour using the Theory of Planned Behaviour in the past. Examples of the changes required have been described above in this section and can be summarised briefly as follows. Interviews held at an early stage of the construction of a new system could identify those beliefs that were salient to people’s modal choices and these beliefs would form the basis of any questionnaire. The distribution of this questionnaire at regular intervals to a large sample would allow changes in people’s intentions to be monitored. This questionnaire should be altered, however, to take into account the differences between people’s beliefs and the actual engineering performance measures and to examine the impact of habit on people’s travel decisions. It would also be helpful for the respondents of these questionnaires to be presented with different scenarios of the future and for their attitudes, subjective norms and perceptions of behavioural control to be monitored in relation to those scenarios. This would allow the greater complexity
of travel choices to be taken into account, where people can decide not only to change mode, but also to change destination or activity, or time of trip.

The thesis has examined the decision-making processes involved in modal choices. It has provided an insight into the modal choices of car drivers and the potential users of two new light rail systems. By doing this, it has shown the types of impacts that new urban public transport can have on people's travel behaviour and it has demonstrated how those impacts come about. There is still much work to be done in order to improve predictions of the impacts of new urban public transport systems but the research detailed in this thesis has contributed to this work, by addressing the important question of the motivational basis behind people's travel decisions.
References:


*Proceedings of the Institute of Civil Engineers: Transport*, 111, February 24-32.

Behaviour as a Predictor of Exercise, *Journal of Health Psychology*, 4 (4), 
517-529.

of personal long-distance travel, *Transportation Research Record*, 890.

–theoretical foundations and practical applications. In: *Proceedings of the 7th 
Australia Transport Research Forum* 7 (2) 547-592 Hobart.

surveys, *Proceedings of Conference on Walking the 21st Century, Perth, 
February 2001*.

transport awareness campaign. Raising public awareness as a means of 

environmental implications of light rail systems*. UK: Directorate-General for 
Energy (DGXVII) ETSU.

19. CULLINANE, S. (1992) Attitudes towards the car in the UK: some 
implications for policies on congestion and the environment. *Transportation 

Civils. In: *Proceedings of the Seminar on Integration and Rapid Transit, 
Croydon, June 1999*.


290


42. FORWARD, S. (1998b). Modes of transport on short journeys: attitudes and behaviour of the inhabitants of Gothenburg. Swedish National Road and Transport Research Institute

43. Forward, S. (Sonja.forward@vti.se). (17 Aug 2000) Theory of Planned Behaviour. E-mail to A. Ahern (aah@transport.ucl.ac.uk)


67. JAMES, B. (1999). *Travel smart proposal for Perth: Stage 1.* Transport Western Australia

68. JAMES, B., BROG, W., ERL, E. and FUNKE, S. (1999). *Potential for increasing public transport, cycling and walking trips.* Transport Western Australia.


296


Available from: http://rudi.herts.ac.uk/ej/udq/54/ss.html
121. TRAMLINK INFORMATION CENTRE, Tramlink (1999). Produced by Tramlink Information Centre


Appendix A:

In-depth interviews (Steer Davies Gleave)
BEST COPY

AVAILABLE

Poor text in the original thesis.
Some text bound close to the spine.
Some images distorted
### 1998/99 TRAVEL INFORMATION SURVEY

**FORM 1 --- HOUSEHOLD FORM**

--- In Confidence ---

--- Workload Number ---

<table>
<thead>
<tr>
<th>Interviewer No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

#### Travel Dates:

- **Day 1**:
- **Day 2**:

#### SUMMARY OF CALLS MADE TO HOUSEHOLD

<table>
<thead>
<tr>
<th>Before Travel</th>
<th>After Travel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date</td>
<td>Time</td>
</tr>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
</tr>
</tbody>
</table>

#### DO YOU HAVE THE PHONE CONNECTED?

- **Yes**: 1
- **No**: 2

#### Phone No

- **Yes**: 1
- **No**: 2

#### IF THE NEED ARISES, MAY WE PHONE YOU?

- **Yes**: 1
- **No**: 2

#### HOME STRUCTURE TYPE

- **Detached house**: 1
- **Semi Detached**: 2
- **Terrace**: 3
- **Purpose built flat/maisonette**: 4
- **Converted flat**: 5
- **Rooms**: 6
- **Other**: 7

#### COMMENTS


#### APPOINTMENTS FOR INTERVIEW


### WOULD NOW LIKE TO ASK YOU ABOUT THE JOB IN WHICH YOU USUALLY WORK THE MOST HOURS.

<table>
<thead>
<tr>
<th>WHAT KIND OF WORK DO YOU DO (IN YOUR MAIN JOB)?</th>
</tr>
</thead>
<tbody>
<tr>
<td>(IN YOUR MAIN JOB) DO YOU WORK ...............</td>
</tr>
<tr>
<td>FOR AN EMPLOYER FOR WAGES OR SALARY? ..........</td>
</tr>
<tr>
<td>IN YOUR OWN BUSINESS..........................</td>
</tr>
<tr>
<td>WITH EMPLOYEES? ................................</td>
</tr>
<tr>
<td>WITHOUT EMPLOYEES? ............................</td>
</tr>
<tr>
<td>WITHOUT PAY IN A FAMILY BUSINESS .............</td>
</tr>
<tr>
<td>Other ...........................................</td>
</tr>
</tbody>
</table>

AND COULD I HAVE THE EXACT ADDRESS WHERE YOU WORK (IN THIS JOB)?

<table>
<thead>
<tr>
<th>Name: ____________________________</th>
</tr>
</thead>
<tbody>
<tr>
<td>Street No. _______________________</td>
</tr>
<tr>
<td>Street __________________________</td>
</tr>
<tr>
<td>Suburb/Town: ____________________</td>
</tr>
</tbody>
</table>

Other, including no fixed place of work 999
**TRAVEL DAY 1**

**First Travel Date**

NOW I'D LIKE TO ASK YOU ABOUT YOUR TRAVEL FROM 4 O'CLOCK MORNING TILL 4 O'CLOCK MORNING.
BY TRAVEL I MEAN, FOR EXAMPLE, WALKING TO A FRIEND'S PLACE, CATCHING A BUS OR ANYTIME YOU LEFT THE HOUSE, SAY TO BUY A NEWSPAPER.

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Do you have your memory jogger handy?</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Did you go anywhere at all on first day?</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Don't forget this includes even walking down the street to buy some milk or bread... did you stay in the same place all day?</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Where did you start the day on first day?</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>And could I have the address?</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Place</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home (Go to Q. 16)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Work - Main Job (Go to Q. 16)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Work - Other Job</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social/Recreation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hospital/Medical</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**And could I have the address?**

<table>
<thead>
<tr>
<th>Street No.</th>
<th>Street Name:</th>
<th>Identification:</th>
<th>Suburb/Town:</th>
</tr>
</thead>
</table>

**Sequence guide:**
- If traveller, (Code 1 in Q. 12 or Code 2 in Q. 13), go to Q. 17
- If non-traveller (Code 1 in Q. 13), go to Q. 18
Text cut off in original
### Sheet 17

<table>
<thead>
<tr>
<th>Row</th>
<th>Question</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>23</td>
<td>F. HOW FAR WAS IT FROM ____________________________________________ TO ___________?</td>
<td>M, K</td>
</tr>
<tr>
<td>26</td>
<td>G. HOW MANY PEOPLE WERE THERE INCLUDING YOURSELF?</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>H. WHERE DID YOU/ PARK?</td>
<td>Not parked, Off Street: Resident's Property, Private (e.g. business premises), Public, On Street: Time limit, No time limit, Other (specify)</td>
</tr>
<tr>
<td>32</td>
<td>I. HOW FAR WAS IT FROM ____________________________________________ TO ___________?</td>
<td>M, K</td>
</tr>
</tbody>
</table>

### Destination Address
- Street No./ Street:
- Identification:
- Suburb:

### How Many People Were There Including Yourself?
- Not parked
- Off Street: Resident's Property, Private (e.g. business premises), Public
- On Street: Time limit, No time limit, Other (specify)
Text cut off in original
Appendix B:

Croydon recruitment questionnaire
My name is Aoife Ahern and I am a research student at University College London. I am trying to find out how people think the new tram will change their travel patterns. I would be very grateful if you would take some time to complete the following questionnaire. No personal information will be disclosed to any outside bodies.

1. Are you aware of the new Tramlink that is being built in Croydon?
   - Yes _______
   - No _______

2. How do you normally travel to the centre of Croydon for work? Tick the mode used for the greatest distance.
   - Car _______
   - Bicycle _______
   - Walk _______
   - Train _______
   - Bus _______
   - Other (Please specify) _______

3. From what postcode do you usually travel to Croydon town centre?
   ________________

4. How do you normally travel to the centre of Croydon for non-work trips? Tick as many as apply.
   - Car _______
   - Bicycle _______
   - Walk _______
   - Train _______
Bus

Other (Please specify)

5. Do you expect to use Tramlink for any trips in the future?
   Work trips: Yes _____ No _____
   Non-work trips: Yes _____ No _____

6. Would you be willing to take part in an interview in the near future about how Tramlink may influence your travel patterns?
   Yes _____ No _____

7. If so could you please fill in the following details?
   Personal details:
   Name: _______________________
   Gender: Male _____ Female _____
   Age Band: < 20 _____
   20-34 _____
   35-49 _____
   50-59 _____
   60+ _____
   Job title: _______________________
   How many cars do you have in your household? _____
   Do you have a driving license? _____
   Do you have free parking at work? _____
Do you have any children under the age of 19?

Yes  ______  No  ______
Appendix C:

Croydon topic guide
Section 1: Introduction:

My name is Aoife Ahern and I am a research student at University College London. I am interviewing people in Croydon to find out how they feel about Tramlink and the difference they feel it will make to their trips. I want to get as wide a range of views as possible so please feel free to say anything that you want to say. The interview will last between 30 minutes and 40 minutes and no personal information will be disclosed to outside bodies. If at any stage you wish to stop me, let me know and if anything I say is not clear please do not hesitate to stop me and ask me what I mean.

Ask about some general information to put the interviewee at ease

- What are the ages of their children?
- How many employed adults live in the household?
- Do they have a car?
- Do they have a parking space at work?
Section 2: Work Trips:

If this person intended to use Tramlink for any work trips to Croydon town centre or areas outside Croydon town:

Will they use it for commuter trips or for work trips from Croydon during the day? How regularly will they use Tramlink? Are any of these trips newly generated trips? Will they be travelling to a new destination to fulfil a purpose that is currently carried out elsewhere?

A. Attitude

Do they hold a positive or negative attitude to Tramlink use on work trips?

Do they feel Tramlink will be easy or pleasant or enjoyable to use on work trips?

B. Behavioural Belief and Outcome Evaluations

How do they believe Tramlink will benefit their work trip? How will it be better or worse than current mode? (Prompt for advantages or disadvantage: comfort, reliability, flexibility etc.) How important are these advantages or disadvantages? If they intend to make any new work trips because of Tramlink what advantages will these trips bring?

C. Subjective Norms

Do they believe that anyone that they know is in favour or against Tramlink use?

D. Normative Beliefs, Referents and Motivation to Comply.

Do they know anyone who will use Tramlink for work or school trips? Do they know of any people or groups who are promoting or objecting to Tramlink? Would any of these people have any influence on their choices? What do their family and friends and work colleagues think?

E. Perceived Behavioural Control.

Do they think that there are any obstacles that could prevent them from using Tramlink? Will it be easier than using their current mode?
F. Control Beliefs and Perceived Facilitating Effect.

What are the obstacles that could prevent them from using Tramlink on work trips? (Prompt to consider weather, time safety etc.) What could help them use Tramlink on work trips? (Prompt to consider parking issue, easy access to vehicle etc.) How likely do they feel they are to meet these obstacles and facilitators on trips to and from work or on trips made from work during the day?

If this person did not intend to use Tramlink for any work trips to Croydon town centre or areas outside Croydon town centre:

A. Attitude

Do they hold a positive or negative attitude to Tramlink use on work trips?

Do they feel Tramlink will be easy or pleasant or enjoyable to use on work trips?

B. Behavioural Belief and Outcome Evaluations

How do they believe Tramlink would inconvenience their work trip? How would it be better or worse than current mode? (Prompt for advantages or disadvantage: comfort, reliability, flexibility etc.) How important are these advantages or disadvantages?

C. Subjective Norms

Do they believe that anyone that they know is in favour or against Tramlink use?

D. Normative Beliefs, Referents and Motivation to Comply.

Do they know anyone who will use Tramlink for work or school trips? Do they know of any people or groups who are promoting or objecting to Tramlink? Would any of these people have any influence on their choices? What do their family and friends and work colleagues think?

E. Perceived Behavioural Control.

Do they think that there are any obstacles that could prevent them from using Tramlink? How easy is it to use their current mode?
F. Control Beliefs and Perceived Facilitating Effect.

What are the obstacles that could prevent them from using Tramlink on work trips? (Prompt to consider weather, time safety etc.) What could help them use Tramlink on work trips? (Prompt to consider parking issue, easy access to vehicle etc.) How likely do they feel they are to meet these obstacles and facilitators on trips to and from work?
Section 3: Non-Work Trips

If this person intended to use Tramlink for any non-work trips to Croydon town centre or areas outside Croydon town centre:

Will they use it for non-work trips made to Croydon or to areas outside Croydon? How regularly will they use Tramlink? Are any of these trips newly generated trips? Will they be travelling to a new destination to fulfil a purpose that is currently carried out elsewhere?

A. Attitude

Do they hold a positive or negative attitude to Tramlink use on non-work trips?

Do they feel Tramlink will be easy or pleasant or enjoyable to use on non-work trips?

B. Behavioural Belief and Outcome Evaluations

How do they believe Tramlink will benefit their non-work trip? How will it be better or worse than current mode? (Prompt for advantages or disadvantage: comfort, reliability, flexibility etc.) How important are these advantages or disadvantages? If they intend to make any new work trips because of Tramlink what advantages will these trips bring?

C. Subjective Norms

Do they believe that anyone that they know is in favour or against Tramlink use?

D. Normative Beliefs, Referents and Motivation to Comply.

Do they know anyone who will use Tramlink for non-work trips? Do they know of any people or groups who are promoting or objecting to Tramlink? Would any of these people have any influence on their choices? What do their family and friends think?

E. Perceived Behavioural Control.

Do they think that there are any obstacles that could prevent them from using Tramlink? Will it be easier than using their current mode?
F. Control Beliefs and Perceived Facilitating Effect.

What are the obstacles that could prevent them from using Tramlink on non-work trips? (Prompt to consider weather, time safety etc.) What could help them use Tramlink on non-work trips? (Prompt to consider parking issue, easy access to vehicle etc.) How likely do they feel they are to meet these obstacles and facilitators on non-work trips?

If this person did not intend to use Tramlink for any non-work trips to Croydon town centre or areas outside Croydon town centre:

A. Attitude

Do they hold a positive or negative attitude to Tramlink use on non-work trips?

Do they feel Tramlink will be easy or pleasant or enjoyable to use on non-work trips?

B. Behavioural Belief and Outcome Evaluations

How do they believe Tramlink would inconvenience their non-work trips? How would it be better or worse than current mode? (Prompt for advantages or disadvantage: comfort, reliability, flexibility etc.) How important are these advantages or disadvantages?

C. Subjective Norms

Do they believe that anyone that they know is in favour or against Tramlink use?

D. Normative Beliefs, Referents and Motivation to Comply.

Do they know anyone who will use Tramlink for non-work trips? Do they know of any people or groups who are promoting or objecting to Tramlink? Would any of these people have any influence on their choices? What do their family and friends think?

E. Perceived Behavioural Control.

Do they think that there are any obstacles that could prevent them from using Tramlink? How easy is it to use their current mode?
F. Control Beliefs and Perceived Facilitating Effect.

What are the obstacles that could prevent them from using Tramlink on non-work trips? (Prompt to consider weather, time safety etc.) What could help them use Tramlink on non-work trips? (Prompt to consider parking issue, easy access to vehicle etc.) How likely do they feel they are to meet these obstacles and facilitators on non-work-trips?
Appendix D:

Croydon answer sheet
Answer sheet: This was completed by the interviewer while conducting the interviews. The interviews were also recorded on tape. Therefore, this sheet only served as a device to aid in transcribing the interviews from the tapes. It does not contain all the information collected from the interviews.

1. General Information: This information was filled in before the interview from the questionnaires

Name: 
Age band: 
On/Off Tram route: 
Job title: 
Car ownership: 
Car Licence: 
Free parking space at work: 
Number of children under 19:

2. Work trips

Current mode: 
Intention to use Tramlink for work trips: Yes ___ No ___ 
If yes, how often do they intend to use Tramlink? 
Commuting trips ______ Frequency ___ 
Trips away from the office ______ Frequency ___ 

Advantages/disadvantages of using Tramlink for work trips: 
(Tick any that the interviewee mentions in a positive or negative manner.)

Efficient ___ Cost ___ 
Fast ___ Lack of comfort ___ 
Reliable ___ Carrying heavy items ___ 
Close to home ___ Time ___ 
Close to work ___ 
Cheaper ___ 
Comfortable ___ 
Convenience ___ 

Other advantages/disadvantages: (List briefly here.)
Referents:
(Tick any that the interviewee mentions in a positive or negative manner.)

Friends: 
Family: 
Work colleagues: 
Local groups: 
Council: 
TCL: 

Other referents: (List briefly here.)

3. Non-Work trips
Current mode: 
Intention to use Tramlink for work trips: Yes ___ No ___

Tick where appropriate
Trips to Croydon centre _____ Frequency ___
Trips away from Croydon centre _____ Frequency ___

Advantages/disadvantages of using Tramlink for non-work trips:
(Tick any that the interviewee mentions in a positive or negative manner.)

Efficient ___ Cost ___
Fast ___ Lack of comfort ___
Reliable ___ Carrying heavy items ___
Close to home ___ Time ___
Close to work ___
Cheaper ___
Comfortable ___
Convenience ___

Other advantages/disadvantages: (List briefly here.)
Referents:
(Tick any that the interviewee mentions in a positive or negative manner.)

Friends: __________
Family: __________
Work colleagues: __________
Local groups: __________
Council: __________
TCL: __________

Other referents: (List briefly here.)
Appendix E:

Follow-up study questionnaire
QUESTIONNAIRE

1. Have you used Tramlink since it opened? Please tick the correct answer.
   
   Yes
   No

   If you have used Tramlink please answer questions 2-6 inclusive.

   If you have not used Tramlink, please answer questions 5-8 inclusive.

2. Have you used Tramlink for:
   
   Trips to and from work
   Non-work trips to Croydon centre
   Business trips
   Non-work trips outside Croydon centre

3. How often have you used Tramlink?
   
   More than twice a week
   More than twice a fortnight
   More than twice a month
   More than once a month
   Less than once a month
   Only once

4. Are you satisfied with Tramlink use? Please comment.

   ____________________________________________________________
   ____________________________________________________________
5. Do you intend to use Tramlink in the future for: (Please tick those trips that you intend to use Tramlink for)

- Trips to and from work
- Non-work trips to Croydon centre
- Business trips
- Non-work trips outside Croydon centre

6. How often have you intend to use Tramlink in the future?

- More than twice a week
- More than twice a fortnight
- More than twice a month
- More than once a month
- Less than once a month
- Only once

7. Why have you not used Tramlink?

___________________________________________________________
___________________________________________________________

8. Would anything encourage you to use Tramlink in the future?

___________________________________________________________
___________________________________________________________
Appendix F:

Pilot study questionnaire
Section 1: Background Information: This information is strictly confidential.

1. What town or village is nearest where you live?

________________________

2. What town or village is nearest where you work?

________________________

3. Please state your gender. Place an X on the relevant line.

Male __________
Female __________

4. Please state your age bracket. Place an X on the relevant line.

<20 __________
20 - 34 __________
35 -49 __________
50 - 59 __________
60+ __________

5. How do you normally travel to work? Please put an X on the relevant line.

Car __________
Bicycle __________
Bus __________
Other (Please specify) __________
In this questionnaire, you will be presented with statements and asked to rate your response to these statements on a scale. Put a circle around the number, which most strongly reflects your opinion.

For example,

It often rains in Ireland

3  2  1  0  -1  -2  -3

3 = Agree strongly

-3 = Disagree strongly

If you agree strongly, put a circle around 3.

If you agree, put a circle around 2.

If you agree more than you disagree, put a circle around 1.

If you neither agree nor disagree, put a circle around 0.

If you disagree more than you agree, put a circle around -1.

If you disagree, put a circle around -2.

If you disagree strongly, put a circle
Section 2: Intention:

I intend to use Luas to travel to work when it opens.

3 2 1 0 -1 -2 -3

3 = Agree strongly    -3 = Disagree strongly

Section 3: Attitude

For me to use Luas to travel to work would be:

3 2 1 0 -1 -2 -3

3 = Very good    -3 = Very bad

3 2 1 0 -1 -2 -3

3 = Very pleasant    -3 = Very unpleasant

3 2 1 0 -1 -2 -3

3 = Very easy    -3 = Very difficult

Section 4: Outcome Evaluations: These statement look at what kinds of outcomes are important to you

Saving time on the trip to work is:

3 2 1 0 -1 -2 -3

3 = Very important    -3 = Very unimportant

A comfortable journey is on my trip to work is:

3 2 1 0 -1 -2 -3

3 = Very important    -3 = Very unimportant
Saving money on my trip to work is:

3  2  1  0  -1  -2  -3

3 = Very important  -3 = Very unimportant

Decreasing the chances of being involved in a traffic accident on my trip to work is:

3  2  1  0  -1  -2  -3

3 = Very important  -3 = Very unimportant

Conserving the environment is:

3  2  1  0  -1  -2  -3

3 = Very important  -3 = Very unimportant

Increasing my sense of personal safety on my trip to work is:

3  2  1  0  -1  -2  -3

3 = Very important  -3 = Very unimportant

Reducing the traffic on my trip to work is:

3  2  1  0  -1  -2  -3

3 = Very important  -3 = Very unimportant

Section 5: Behavioural beliefs: These statement look at how likely you think the outcomes above are likely to happen if you were to travel to work on Luas.

I believe that using Luas would save time on the trip to work:

3  2  1  0  -1  -2  -3

3 = Strongly agree  -3 = Strongly disagree
I believe that using Luas would give me a comfortable journey is on my trip to work:

3  2  1  0  -1  -2  -3

3 = Strongly agree  -3 = Strongly disagree

I believe that using Luas would save money on my trip to work:

3  2  1  0  -1  -2  -3

3 = Strongly agree  -3 = Strongly disagree

I believe that using Luas would decrease the chances of being involved in a traffic accident on my trip to work:

3  2  1  0  -1  -2  -3

3 = Strongly agree  -3 = Strongly disagree

I believe that using Luas on my trip to work would conserving the environment:

3  2  1  0  -1  -2  -3

3 = Strongly agree  -3 = Strongly disagree

I believe that using Luas would increase my sense of personal safety on my trip to work:

3  2  1  0  -1  -2  -3

3 = Strongly agree  -3 = Strongly disagree

I believe that using Luas would reduce the traffic on my trip to work:

3  2  1  0  -1  -2  -3

3 = Strongly agree  -3 = Strongly disagree

I believe that using Luas would provide me with a reliable form of traffic on my trip to work:

3  2  1  0  -1  -2  -3
Section 6: Subjective norm: This statement looks at what you believe those people whose opinions you value think that you should do.

Most people who are important to me think that I should use Luas to travel to work:

3  2  1  0  -1  -2  -3
3 = Strongly agree  -3 = Strongly disagree

Section 7: Normative beliefs: These statements look at what you believe those around you think that you should do.

My friends think that I should use Luas to travel to work:

3  2  1  0  -1  -2  -3
3 = Strongly agree  -3 = Strongly disagree

My family think that I should use Luas to travel to work:

3  2  1  0  -1  -2  -3
3 = Strongly agree  -3 = Strongly disagree

My work colleagues think that I should use Luas to travel to work:

3  2  1  0  -1  -2  -3
3 = Strongly agree  -3 = Strongly disagree

The local authority thinks that I should use Luas to travel to work:

3  2  1  0  -1  -2  -3
3 = Strongly agree  -3 = Strongly disagree
Dublin Transportation Office thinks that I should use Luas to travel to work:

3  2  1  0  -1  -2  -3

3 = Strongly agree   -3 = Strongly disagree

Section 8: Motivation to comply: These statement look at how much you want to do what those around you think you should do.

In general, I want to do what my friends tell me to do:

3  2  1  0  -1  -2  -3

3 = Strongly agree   -3 = Strongly disagree

In general, I want to do what my family tell me to do:

3  2  1  0  -1  -2  -3

3 = Strongly agree   -3 = Strongly disagree

In general, I want to do what my work colleagues tell me to do:

3  2  1  0  -1  -2  -3

3 = Strongly agree   -3 = Strongly disagree

In general, I want to do what the local authority tells me to do:

3  2  1  0  -1  -2  -3

3 = Strongly agree   -3 = Strongly disagree

In general, I want to do what Dublin Transportation Office tells me to do:

3  2  1  0  -1  -2  -3

3 = Strongly agree   -3 = Strongly
Section 9: Perceived behavioural control: This statement measures how easy you feel it is to use Luas.

I believe that it will be very easy to use Luas

3 2 1 0 -1 -2 -3

3 = Strongly agree -3 = Strongly disagree

Section 10: Control beliefs: These statements look at what obstacles could get in the way of you using Luas.

If I had a lot of items to carry on my trip to work I would be more likely to use Luas.

3 2 1 0 -1 -2 -3

3 = Strongly agree -3 = Strongly disagree

If the traffic was heavy on my trip to work I would be more likely to use Luas.

3 2 1 0 -1 -2 -3

3 = Strongly agree -3 = Strongly disagree

If it was dark on my trip to work I would be more likely to use Luas.

3 2 1 0 -1 -2 -3

3 = Strongly agree -3 = Strongly disagree

If I was in a hurry on my trip to work I would be more likely to use Luas.

3 2 1 0 -1 -2 -3

3 = Strongly agree -3 = Strongly disagree

If the weather was bad on my trip to work I would be more likely to use Luas.

3 2 1 0 -1 -2 -3
3 = Strongly agree  
-3 = Strongly disagree

If I lived close to the Luas route I would be more likely to use Luas.

3 2 1 0 -1 -2 -3

3 = Strongly agree  
-3 = Strongly disagree

If I worked close to the Luas route I would be more likely to use Luas.

3 2 1 0 -1 -2 -3

3 = Strongly agree  
-3 = Strongly disagree

Section 11: Perceived facilitating effect: These statements look at how likely you are to encounter the above obstacles

I often have a lot of items to carry on my trip to work.

3 2 1 0 -1 -2 -3

3 = Strongly agree  
-3 = Strongly disagree

The traffic is often heavy on my trip to work.

3 2 1 0 -1 -2 -3

3 = Strongly agree  
-3 = Strongly disagree

It is often dark on my trip to work.

3 2 1 0 -1 -2 -3

3 = Strongly agree  
-3 = Strongly disagree

I am often in a hurry on my trip to work.

3 2 1 0 -1 -2 -3

3 = Strongly agree  
-3 = Strongly disagree
The weather is often bad on my trip to work.

3  2  1  0  -1  -2  -3

3 = Strongly agree  -3 = Strongly disagree

I live close to the future Luas route.

3  2  1  0  -1  -2  -3

3 = Strongly agree  -3 = Strongly disagree

I work close to the future Luas route.

3  2  1  0  -1  -2  -3

3 = Strongly agree  -3 = Strongly disagree

Section 12: If you have any comments about this questionnaire, please tell me.
Appendix G:

Dublin study questionnaire
Section 1:

<table>
<thead>
<tr>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
<th>-1</th>
<th>-2</th>
<th>-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 = Agree strongly.</td>
<td>-3 = Disagree strongly</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

I intend to use Luas to travel to work when it opens.
### Section 2:

<table>
<thead>
<tr>
<th>For me to use Luas to travel to work would be agreeable.</th>
<th>I believe that using Luas will save me time on my trip to work.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 2 1 0 -1 -2 -3</td>
<td>3 2 1 0 -1 -2 -3</td>
</tr>
<tr>
<td>3 = Agree strongly, - 3 = Disagree strongly</td>
<td>3 = Agree strongly, - 3 = Disagree strongly</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Saving time on my trip to work is important to me.</th>
<th>I believe that using Luas will increase my comfort on my trip to work.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 2 1 0 -1 -2 -3</td>
<td>3 2 1 0 -1 -2 -3</td>
</tr>
<tr>
<td>3 = Agree strongly, - 3 = Disagree strongly</td>
<td>3 = Agree strongly, - 3 = Disagree strongly</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>A comfortable journey on my trip to work is important to me.</th>
<th>I believe that using Luas will save me money on my trip to work.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 2 1 0 -1 -2 -3</td>
<td>3 2 1 0 -1 -2 -3</td>
</tr>
<tr>
<td>3 = Agree strongly, - 3 = Disagree strongly</td>
<td>3 = Agree strongly, - 3 = Disagree strongly</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>To save money on my trip to work is important to me.</th>
<th>I believe that using Luas will decrease my chances of being involved in a road traffic accident on my trip to work.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 2 1 0 -1 -2 -3</td>
<td>3 2 1 0 -1 -2 -3</td>
</tr>
<tr>
<td>3 = Agree strongly, - 3 = Disagree strongly</td>
<td>3 = Agree strongly, - 3 = Disagree strongly</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>To decrease my chances of being involved in a traffic accident on my trip to work is important to me.</th>
<th>I believe that using Luas on my trip to work will help to conserve the environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 2 1 0 -1 -2 -3</td>
<td>3 2 1 0 -1 -2 -3</td>
</tr>
<tr>
<td>3 = Agree strongly, - 3 = Disagree strongly</td>
<td>3 = Agree strongly, - 3 = Disagree strongly</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>To conserve the environment is important to me.</th>
<th>I believe that using Luas will help to increase my sense of personal safety on my trip to work.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 2 1 0 -1 -2 -3</td>
<td>3 2 1 0 -1 -2 -3</td>
</tr>
<tr>
<td>3 = Agree strongly, - 3 = Disagree strongly</td>
<td>3 = Agree strongly, - 3 = Disagree strongly</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>To increase my sense of personal safety on the trip to work is important to me</th>
<th>I believe that using Luas will reduce the traffic on the roads on my trip to work.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 2 1 0 -1 -2 -3</td>
<td>3 2 1 0 -1 -2 -3</td>
</tr>
<tr>
<td>3 = Agree strongly, - 3 = Disagree strongly</td>
<td>3 = Agree strongly, - 3 = Disagree strongly</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>To reduce the amount of traffic on the roads on my trip to work is important to me.</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>3 2 1 0 -1 -2 -3</td>
<td>3 2 1 0 -1 -2 -3</td>
</tr>
<tr>
<td>3 = Agree strongly, - 3 = Disagree strongly</td>
<td>3 = Agree strongly, - 3 = Disagree strongly</td>
</tr>
</tbody>
</table>
### Section 3:

Most people who influence my opinions think that I should use Luas to travel to work.

<table>
<thead>
<tr>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
<th>-1</th>
<th>-2</th>
<th>-3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3 = Agree strongly, - 3 = Disagree strongly</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

My family think that it is a good idea for me to use Luas to go to work

<table>
<thead>
<tr>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
<th>-1</th>
<th>-2</th>
<th>-3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3 = Agree strongly, - 3 = Disagree strongly</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In general, I want to do what my family think I should do:

<table>
<thead>
<tr>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
<th>-1</th>
<th>-2</th>
<th>-3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3 = Agree strongly, - 3 = Disagree strongly</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

My friends think that it is a good idea for me to use Luas to go to work

<table>
<thead>
<tr>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
<th>-1</th>
<th>-2</th>
<th>-3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3 = Agree strongly, - 3 = Disagree strongly</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In general, I want to do what my friends think I should do:

<table>
<thead>
<tr>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
<th>-1</th>
<th>-2</th>
<th>-3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3 = Agree strongly, - 3 = Disagree strongly</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Dublin Transportation Office think that it is a good idea for me to use Luas to go to work

<table>
<thead>
<tr>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
<th>-1</th>
<th>-2</th>
<th>-3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3 = Agree strongly, - 3 = Disagree strongly</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In general, I want to do what the Dublin Transportation Office think I should do:

<table>
<thead>
<tr>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
<th>-1</th>
<th>-2</th>
<th>-3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3 = Agree strongly, - 3 = Disagree strongly</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Section 4

| I believe that it will be easy for me to use Luas on my work trips. |
| --- | --- |
| 3 | 2 | 1 | 0 | -1 | -2 | -3 |
| 3 = Agree strongly, - 3 = Disagree strongly |

| If I had a lot of items to carry, I would be more likely to use Luas on a work trip |
| --- | --- |
| 3 | 2 | 1 | 0 | -1 | -2 | -3 |
| 3 = Agree strongly, - 3 = Disagree strongly |

| If the traffic was heavy, I would be more likely to use Luas on a work trip |
| --- | --- |
| 3 | 2 | 1 | 0 | -1 | -2 | -3 |
| 3 = Agree strongly, - 3 = Disagree strongly |

| If it was dark, I would be more likely to use Luas on a work trip |
| --- | --- |
| 3 | 2 | 1 | 0 | -1 | -2 | -3 |
| 3 = Agree strongly, - 3 = Disagree strongly |

| If I was in a hurry, I would be more likely to use Luas on a work trip |
| --- | --- |
| 3 | 2 | 1 | 0 | -1 | -2 | -3 |
| 3 = Agree strongly, - 3 = Disagree strongly |

| If the weather was bad, I would be more likely to use Luas on a work trip |
| --- | --- |
| 3 | 2 | 1 | 0 | -1 | -2 | -3 |
| 3 = Agree strongly, - 3 = Disagree strongly |

| If I lived close to the Luas route, I would be more likely to use Luas on a work trip |
| --- | --- |
| 3 | 2 | 1 | 0 | -1 | -2 | -3 |
| 3 = Agree strongly, - 3 = Disagree strongly |

| If I worked close to the Luas route, I would be more likely to use Luas on a work trip |
| --- | --- |
| 3 | 2 | 1 | 0 | -1 | -2 | -3 |
| 3 = Agree strongly, - 3 = Disagree strongly |

| I often carry a lot of items on my work trip. |
| --- | --- |
| 3 | 2 | 1 | 0 | -1 | -2 | -3 |
| 3 = Agree strongly, - 3 = Disagree strongly |

| The traffic is often very heavy on my work trip. |
| --- | --- |
| 3 | 2 | 1 | 0 | -1 | -2 | -3 |
| 3 = Agree strongly, - 3 = Disagree strongly |

| It is often dark on my work trip. |
| --- | --- |
| 3 | 2 | 1 | 0 | -1 | -2 | -3 |
| 3 = Agree strongly, - 3 = Disagree strongly |

| I am often in a hurry on my work trip. |
| --- | --- |
| 3 | 2 | 1 | 0 | -1 | -2 | -3 |
| 3 = Agree strongly, - 3 = Disagree strongly |

| The weather is often bad on my work trip. |
| --- | --- |
| 3 | 2 | 1 | 0 | -1 | -2 | -3 |
| 3 = Agree strongly, - 3 = Disagree strongly |

| I live close to the Luas route. |
| --- | --- |
| 3 | 2 | 1 | 0 | -1 | -2 | -3 |
| 3 = Agree strongly, - 3 = Disagree strongly |

| I work close to the Luas route. |
| --- | --- |
| 3 | 2 | 1 | 0 | -1 | -2 | -3 |
| 3 = Agree strongly, - 3 = Disagree strongly |