Cycling towards Europe

Opportunities for assisting cycling in Dunedin through a developed planning framework

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Abstract

The current dominance of the private car in New Zealand is contributing to a compromised efficiency, connectedness and environment within New Zealand cities. Recognition that future challenges will restrict the availability of current modes emphasises the appropriateness of planning toward the future of our cities. This study investigates how a planning framework can be developed to assist a modal shift toward cycling in Dunedin, New Zealand. Theoretical approaches and international practice on the themes of characteristics important for assisting modal shift, benefits of modal shift and barriers to modal shift are explored in a three part international literature review and case studies. The focus of the international literature and the case studies is primarily on successful cycling cities in Europe to assist in understanding their success and aid in Dunedin’s potential success. A conceptualisation of the characteristics important for assisting modal shifts within theory and practice is then outlined.

Primary research involving key informant interviews was undertaken in Dunedin along with a wider New Zealand context to determine the characteristics, benefits and barriers to a modal shift in Dunedin. The findings indicate that the acceptance of the role of active transportation in the future of Dunedin is increasing, yet is still meeting a significant resistance at both the local and central government levels. This research also identified the most applicable barriers to a modal shift occurring, and highlighted some of the potential benefits of a modal shift in Dunedin. The key findings allowed for the development of a three stage planning framework for assisting modal shift promotion in Dunedin. The planning framework provides detailed insight into a potential direction for Dunedin to assist in modal shift promotion.

The research concludes with recommendations to the Dunedin City Council and the New Zealand Transport Agency that could aid in modal shift promotion to cycling in Dunedin. They include; developing an Active Transport Forum, implementing a ‘cycling champion’, initiating a cycle culture, implementing car restrictions, prioritising pedestrians and cyclists, developing a long term vision, integrating spatial policy and providing more guidance and education at a national level. The significance of this study is evident through the growing concern over the functionality of New Zealand cities personal transport networks, coupled with the extensive benefits that can be experienced with modal shifts to cycling. The
importance of developing a planning framework for modal shift promotion in Dunedin is through the need for discussion and debate on progressing Dunedin’s current personal transport system, to one that can benefit the individual and the city in the future.
I would like to thank all those who have given up their time to assist my research process and to my family who have always been so supportive.
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1. Chapter One Introduction

“Equipped with a bicycle, man is more efficient than all machines and all animals too” (Tolley, 1990, p. 13)

The cycle is a highly efficient means of transport, yet it struggles to gain momentum as an integral personal transport mode globally. This introductory chapter will outline the current experience of personal transport, understood as commuting, leisure and daily activities (Banister, 2005), in both the global and New Zealand contexts. The development of an understanding of current personal transport will aid in the interpretation of the research problem and aim.

1.1 Personal Transport Globally

Tolley and Turton (1995) illustrate that before a journey is undertaken a choice must be made in terms of destination, mode of transport and route. This choice has largely resulted in the use of the private car. Banister (2002) identifies that the rise of the private car has been seen as one of the greatest influences on mobility and spatial planning in cities of the developed world. Modern society has become dependent on the private car for transportation around cities and countries (Tolley, 1990; Whitelegg and Haq, 2003).

The global fascination with the private car is evident through the status it is given in society and through the provisions provided for it within governments (Banister, 2005). The private car is an icon that is associated with the notions of security and freedom. Bruton (1975) identifies that “Building roads has produced a car-oriented society in which the other modal alternatives have little opportunity to co-exist” (p. 239). The increase in awareness of environmental sustainability has put pressure on governments to align their transport policies and objectives in regard to the future (Banister, 2005). The repercussions of this have seen a growth in the promotion of active transportation, understood as walking, cycling and other non-motorised forms of transport (Cox, 2010), in particular countries. The Netherlands is
considered to be one of the leaders in active transportation through its prominent cycle culture (Pucher and Dijkstra 2003; Pucher and Buehler, 2007; 2008; Pucher, Dill and Handy, 2010).

The current car dependence that is apparent in some developed countries, including the United States of America, Australia and New Zealand, will compromise the future transport systems of these countries if other modes of transportation are not integrated successfully (Whitelegg and Haq, 2003; Banister, 2005; Pucher and Buehler, 2009). The increasing recognition of the implications of private car usage has prompted the United States of America, the United Kingdom, Eastern Asia and countries of the European Union to seek to decrease their automobile dependency. This has occurred through generating improved public transport facilities, developing more efficient cars, integrating active transportation modes and imposing carbon taxes (Banister, 2002; Whitelegg and Haq, 2003; Pucher and Buehler, 2007).

There are countries within the European Union (the Netherlands, Denmark and Germany) who are taking a significantly bigger step toward addressing the implications of car dependency. This is through successfully promoting active transportation, particularly cycling in their cities (Pucher and Buehler, 2007). The Netherlands lead the way in modal share, percentage of transport trips by cycle (Pucher et al., 2010), and this contributes to less private cars being on the road (Pucher and Buehler, 2008). Denmark and Germany also possess cities with strong modal shares that are apparent through the provision of appropriate cycle infrastructure (Pucher and Buehler, 2008).

Japan has excelled in providing public transport through an integrated train network, reducing the need for dependency on the private car (Priemus, Nijkamp and Banister, 2001). Austria has succeeded through incorporating an integrated public transport network that includes an underground train network complemented with a comprehensive bus and tram system in its capital, Vienna (Pucher and Kurth, 1996). The identification that countries are successfully undertaking comprehensive measures to improve their transport systems highlights the importance of comprehending how this fits into New Zealand personal transport.
1.2 New Zealand Personal Transport

New Zealand personal transport has become more and more dependent on the private car for personal travel. The high ownership levels of private cars coupled with a transport sector that is focused on private car planning, as opposed to greener options, is contributing to the growing car dependence that is present in New Zealand (Tin, Woodward, Thornley and Ameratunga, 2009). The 2006 New Zealand census confirmed this love for the car, with 607 cars per 1000 population representing one of the highest rates of car ownership in the world (Tin et al. 2009). The high rate of car ownership affirms the identification that New Zealanders have with the car as a primary mode of personal transport. The current Minister of Transport, Steven Joyce, identified that around 86% of New Zealanders either drive or are driven to work everyday (Government Policy Statement on Land Transport Funding, 2009). Therefore, confirming that the high rates of car ownership are transferring into high mode share of the private car in New Zealand.

Additionally, the distances being covered by New Zealanders in their cars is relatively small. Tin et al. (2009) state that “driver or passenger trips account for four-fifths of the overall travel mode share, although one third of vehicle trips are less than two kilometres and two-thirds are less than six kilometres” (Tin et al., 2009, p. 2). The high proportion of trips utilising the private car highlights the dependence on this mode within the New Zealand personal transport system. With the identification that two-thirds of all trips in the private car are less than six kilometres, a real opportunity to integrate active transportation into this proportion of the personal transport mode exists. The challenge lies in the ability to change behaviour and provide for the promotion of a more viable transport mode.

Bell and Johns (2006) identify that New Zealand has inadequately designed public transport networks in its key urban areas, and this has subsequently contributed to the car dependence in these areas. Auckland is facing growing issues with traffic congestion and the implications of this on economic efficiency. The incorporation of an integrated bus network over the last two years, along with the proposed rail link within the central business district, outer suburbs and airport being implemented in the near future, can be viewed as a critical effort to reduce traffic congestion and the negative impact on economic productivity and environmental
sustainability that this congestion has (Bell and Johns, 2006; New Zealand Herald, 12th October, 2010). The level of success that the bus network, along with the proposed rail link, achieves will be an important factor in the viability of Auckland as it seeks to further itself internationally (Bell and Johns, 2006).

The largely dispersed urban centres present in New Zealand result in a greater challenge for transport planners to create personal transport infrastructure that does not rely on the private car. This challenge is one that could be addressed with a focus on cycling in cities if New Zealand wants to minimise its impact on the environment, while benefiting from reduced congestion and improved public health (Ministry of Transport, 2002). The public health benefits of cycling are becoming factors in the promotion of active transportation in cities (Pucher and Dijkstra, 2003). National and local governance are recognising the wider benefits to other areas, including medical costs and general wellbeing (Pucher and Dijkstra, 2003).

Addressing the issue of car dependency will enhance New Zealand’s reputation as a clean and green country, an image that is fundamentally important to a large portion of New Zealand’s Gross Domestic Product through the tourism economy (Ateljevic and Doorne, 2002).

The current car dependence within personal transport in New Zealand and its relation to the global personal transport context has been outlined. This introductory chapter will now consider the role of cycling on a global, New Zealand and then Dunedin scale to aid in the comprehension of the research being undertaken.

1.3 World Cycling

Globally the experience of cycling differs greatly depending on the country or city in which one is cycling. Three countries, the Netherlands, Denmark and Germany, in Europe have excelled in the proportion of cycling’s mode share in their personal transport systems. The Netherlands are seen at the forefront of cycling globally through the presence of a cycle culture and the high mode share that exists (Pucher and Buehler, 2008). The Netherlands is the only place in the world where cycles outnumber people, with an average of 1.11 cycles per person (The Netherlands Ministry of Transport, 2009). Conversely, in the United States of
America cycling has received little support from central and local political levels and subsequently the growth and prominence of cycling in American cities is relatively sparse (Pucher, Komanoff and Schimek, 1999). The potential growth in cycling as an integral mode of personal transport could increase as countries and cities become more aware of issues surrounding traffic congestion and economic efficiency as well as the subsequent sustainability of their cities (Banister, 2005). Cycling has emerged as a smart way of tackling the converging issues of rising fuel costs, climate change, inactivity and congestion in cities (Cycle Promotion Fund, 2008).

Cycling has been inhibited as an integral mode of personal transport in some developed countries through a lack of realisation of the extent to which it can transform a city’s personal transport network (Pucher and Dijkstra, 2003). The future of cycling globally and its potential role as an integral mode of personal transport will depend greatly on political decisions made at a central and local government level (Gaffron, 2003; Banister, 2005; Cox, 2010).

1.4 Cycling for Personal Transport in New Zealand

The steady decline of cycling in New Zealand over the past two decades has impacted on the sustainability of New Zealand’s personal transportation network (Ministry of Transport, 2008). The decline in cycling has levelled out to what was present 20 years ago, around 2% of trips taken (Ministry of Transport, 2009). A drop in the number of people cycling as a transport mode is contributing to higher levels of private car use (Ministry of Transport, 2009). Cycling has been faced with a challenge to promote itself within a private, car-oriented, personal transport sector in New Zealand. While an improvement in policy and planning for cycling is occurring nationally, the number of people cycling is not growing (Ministry of Transport, 2008). The development of cycle strategies at local and regional levels, along with a national cycleway, highlights that the policy and planning for cycling is improving (Ministry of Transport, 2008).

This thesis will seek to promote the development of cycling, by proposing a planning framework for assisting modal shift promotion in Dunedin. New Zealand has aligned itself as
having a clean, green image, yet the current practices in personal transport are far from this. An interest in wanting to enhance the cohesiveness and efficiency of cities along with a continual eye toward the future has inspired this thesis topic. To improve cycling in New Zealand the development of a planning framework for assisting modal shift promotion in Dunedin’s personal transport sector will be undertaken.

1.5 Cycling for Personal Transport in Dunedin

Dunedin has experienced small concentrations of cycle prominence in the late 1980’s, particularly around the University of Otago, but this presence has dwindled over the past two decades (Tertiary Precinct Development Plan, 2008). This thesis will provide recommendations to the Dunedin City Council and New Zealand Transport Agency on the direction required to promote cycling in Dunedin. The decision to focus on Dunedin is through an interest in the city and the perception of the current experience of cycling. The New Zealand census of 2006 identifies that 2.7% of Dunedin’s population cycle to work, as opposed to 78% who drive (New Zealand Census Statistics 2006). The identification that the cycle is not experiencing a prominent role in personal transport in Dunedin is motivating the focus of this thesis.

1.6 Understanding the Problem

New Zealand literature on personal transportation has primarily focused on Auckland and Wellington. “Auckland is one of the world’s most extreme cases of entrenched automobile dependence...This outcome is the result of many decades of transport planning which explicitly rejected alternatives to total dominance by the automobile (Mees and Dodson, 2002: Gunder, 2002, cited in Dodson and Mees, 2003, p. 27). Dodson and Mees (2003), highlighting one of the reasons that Auckland has received more of a focus within New Zealand literature.

Chapman (2008) identifies that New Zealand will find itself in a position where international pressure is placed to reduce transport emissions unless a change in the current direction
transpires. The presence of car dependency is highlighted by Chapman (2008) who identifies “Road transport emissions grew 65% between 1990 and 2005” (Chapman, 2008, p. 95). Kenworthy (2003) highlights that the greatest energy and greenhouse conservation potential is from,

“compact, mixed land use cities, with extensive transit systems operating on a backbone of rail, and that compact land uses combined with attractive environments for walking and cycling will save further energy and CO2 emissions” (Kenworthy, 2003, cited in Chapman, 2008, p. 93).

Chapman (2008) illustrates that whilst the current personal transport systems in New Zealand are not sustainable, recognition can be taken that through the change in transport patterns occurring rapidly over the last few decades, it is not impossible to make further major changes to personal transport habits in New Zealand over the next generation, providing that clear and accurate incentives and directions are present. Harris (2005) also alludes to the issue of private car dependence hampering the opportunity of New Zealand cities. Harris (2005) identifies that transport solutions are required to move New Zealand away from the current car dependence.

The full comprehension over the consequences of inactive lifestyles is becoming more understood. Chapman (2008) identifies that an emerging public health crisis is occurring through the obesity and physical inactivity that is present in a private car dominated society. It is from this problem of cities functionality and the associated costs to both the individual and the society, which measures to design cities to increase active transportation, are important. Chapman (2008) highlights to achieve change a,

“coordinated and integrated mix of measures, including planning and price instruments, supported by a process of raising public awareness of the need for change, and the advantages, in terms of access, health and other outcomes, of living in more compact and better designed cities” (Chapman, 2008, p. 98).

It is through understanding that New Zealand’s current private car dependence is compromising the future of its cities that a thesis looking at assisting a modal shift through developing a planning framework is being incorporated. There is a current gap in the knowledge of modal shift promotion surrounding a city of Dunedin’s context. This research will seek to address this knowledge gap.
1.7 Research Problem

The significance of focusing on the development of a planning framework that assists a modal shift in Dunedin, away from the private car towards cycling, will aid in the vitality and future of Dunedin as a city.

The overall aim of this thesis is to develop a planning framework that will assist local government and transport planners in promoting a modal shift from the private car towards cycling in Dunedin. The focus is on personal travel patterns; including commuting, leisure and daily activities.

In order to achieve this aim a series of research questions and objectives have been developed to guide the research process.

Research Questions:

1. What are the characteristics important for assisting modal shift promotion in Dunedin?
2. What barriers are present in Dunedin that will inhibit a modal shift promotion from occurring?
3. What are the benefits of a modal shift towards cycling in Dunedin?
4. How can a planning framework for assisting modal shift promotion in Dunedin be developed?

In order to answer these research questions a number of objectives have been developed.

Objectives:

1. To review international literature on modal shift promotion, successful cycle cities and planning documents involved in modal shift promotion.
2. To identify important characteristics for assisting modal shift promotion.
3. To develop a conceptual representation of the characteristics identified in the literature and case studies as important for assisting modal shift promotion.
4. To identify the benefits of a planning framework promoting a modal shift in Dunedin.
5. To recognise the barriers to a modal shift promotion occurring in Dunedin.
6. To outline a planning framework for assisting modal shift promotion in Dunedin.
The process undertaken to answer the research questions and objectives is: The Introduction Chapter establishes the aim and focus of this research. Chapter Two will research the international literature on modal shift promotion and incorporate a case studies analysis of successful cycle cities. Chapter Three outlines the research methodology being used in this research. Chapter Four identifies the context of Dunedin, the focus of this research. Chapter Five presents the results of this research. Chapter Six incorporates a discussion on the results of the research and findings from the international literature review and case studies. Chapter Seven provides conclusions and recommendations made as a result of this research.

The introduction to the research topic has been undertaken in this section. The relevance of developing a planning framework to assist modal shift promotion in Dunedin has been outlined. The direction of the research now considers the international literature that has been written on active transport promotion. The international literature review will assist the methodological process being developed in Chapter Three, through identifying the current areas important to this research.
2. Chapter Two Literature Review

“The high levels of cycling in the Netherlands are not the product of freak geographical or social conditions, but the outcome of deliberate policy decisions” (Cox, 2010, p. 122)

A look into the characteristics, benefits and barriers to assisting modal shift promotion will follow. The policy decisions being referred to by Cox (2010) will be elaborated, along with other essential characteristics within a planning framework to assist modal shift promotion.

2.1 Introduction

The transport industry has experienced revolutionary growth over the last century (Banister, 2002). The implications of this growth has attributed to the car dependency that is evident in the developed world (Tolley, 2003, cited in Docherty and Shaw, 2003). The nature of how people travel has changed as technology; coupled with economic prosperity, has contributed to what is considered an ever expanding world (Tolley, 1990). The focus of this research, outlined in the introductory section, involves the development of a planning framework for assisting modal shift promotion in Dunedin. First, the defining of two key terms, modal shift and planning framework will be defined. The chapter then considers characteristics important for assisting modal shift promotion, the benefits of modal shift promotion occurring, and the associated barriers to modal shift promotion. The chapter concludes with case studies on successful cycle cities in Europe.
Defining Key Terms

Two key terms ‘modal shift’ and ‘planning framework’ will be defined for this research. Table 1 outlines the definitions on ‘modal shift’ as identified in international literature.

<table>
<thead>
<tr>
<th>Source</th>
<th>Definition of ‘modal shift’</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pucher and Buehler (2007)</td>
<td>“The increase in the number of people carrying out cycling trips”</td>
</tr>
<tr>
<td>Banister (2005)</td>
<td>“The shift in choice of personal transport from the car to the cycle”</td>
</tr>
<tr>
<td>Litman (2003)</td>
<td>“Substantial shifts from driving to active modes”</td>
</tr>
<tr>
<td>New Zealand Transport Agency (2010)</td>
<td>“The change in a modal split over a period of time”</td>
</tr>
<tr>
<td>Rodrigue, Comtois and Slack (2006)</td>
<td>“A modal shift takes place in a context where from a macro perspective there are changes in the transport supply and from a micro perspective the decisions of individuals and firms are changing”</td>
</tr>
</tbody>
</table>

Table 1: Definitions of modal shift in the international literature reviewed

Through the understanding of the definitions outlined in Table 1 the way modal shift will be understood throughout this research is, the increase in the number of cycle trips as a form of personal transport, including commuting, leisure and daily activities, over the private car. The definition has integrated the important points from the definitions identified in Table 1.

Table 2 provides definitions of the term ‘planning framework’.

<table>
<thead>
<tr>
<th>Source</th>
<th>Definition of ‘planning framework’</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whitelegg and Haq (2003)</td>
<td>“The guidelines, structures and planning tools to establish planning processes”</td>
</tr>
<tr>
<td>Banister (2005)</td>
<td>“The incorporation of policy, guidance and methods to form planning processes”</td>
</tr>
</tbody>
</table>

Table 2: Identification of definitions on planning framework from the international literature reviewed.

Table 2 allows for the interpretation of the way planning framework can be understood. For the purpose of this research, planning framework will be defined as the integration of structures, methods and planning tools to form a planning process.

The development of the way modal shift and planning framework are being defined for this research has been identified. The direction of this literature review now moves to provide a background to modal shift literature.
The large portion of this literature review incorporates academic work undertaken in European countries. The reason for directing the focus on Europe is highlighted through Figure 1 (taken from Pucher and Buehler, 2008) that emphasises the modal share of cyclists.

Figure 1 identifies that cycling in the Netherlands possess around 27 % modal share of trips, with Denmark having 18 % and Germany 10 %. The percentages of modal share have subsequently increased in these countries with the latest figures identifying the Netherlands as high as 37 % (Pucher and Buehler, 2009). The inclusion of Figure 1 provides direct reasoning for focusing on European countries that have achieved modal shifts to enable the understanding and implications for the development of a planning framework for Dunedin.
The first section of this international literature review will look at the characteristics important for assisting modal shift promotion. This will be followed by section two which identifies the benefits of a modal shift occurring. The third section will include the barriers to modal shift promotion. The last section of this international literature review involves a case studies analysis of successful cycle cities in Europe.

2.2 Section One: Identifying Characteristics Important for Assisting Modal Shift Promotion

The understanding of characteristics important for assisting modal shift promotion will be outlined in this section. The decision to focus the international literature review on European literature is through seeking to identify the pertinent characteristics to modal shift promotion in Europe, in an attempt to assist the process in New Zealand. The characteristics identified within the international literature have been incorporated into different groups. There are direct and indirect measures of characteristics promoting modal shifts, as well as integrated characteristics.

2.2.1 Direct Measures of Cycle Promotion
Pucher and Buehler (2008) identify that the Netherlands, Denmark and Germany have all developed policies that are innovative and successful in promoting a modal shift to cycling. The success is apparent through the high modal shares of cycling trips within these countries. Pucher and Buehler (2008) identify that success comes through the ability to significantly increase mode share of cyclists. The key political roles and innovative characteristics highlighted by Pucher and Buehler (2008) have been incorporated into Box 1.
Chapter Two Literature Review

Key Policies and innovative measures used in Dutch, Danish and German cities to promote safe and convenient cycling

- Extensive systems of separate cycling facilities
- Intersection modifications and priority traffic signals
- Traffic calming
- Bike parking
- Coordination with public transport
- Traffic education and training
- Traffic laws

Box 1: Adapted from Pucher and Buehler (2008) table on policies and innovative measures for the promotion of cycling.

The significance of elaborating on these seven areas is due to the direct effect they have in assisting a modal shift.

Separate Cycling Facilities

Firstly, Pucher and Buehler (2008) emphasise extensive systems of separate cycling facilities as a key characteristic for the assistance of modal shift promotion to occur. Characteristics of separate cycling facilities include; well maintained, fully integrated paths, lanes and special bicycle streets in cities and surrounding regions (Pucher and Buehler, 2008). The significance of a fully coordinated system of colour coded directional signs for cyclists will further assist the cycle convenience and directly contribute to modal shift promotion (Pucher and Dijkstra, 2000). Harris (2010) debates the extent to which separate cycle facilities can assist modal shift promotion in some cases, and identifies that particular contexts do not allow for the implementation of separate cycling facilities. Although, this could be evident in particular cases, Pucher and Buehler (2008) reaffirm separate cycling facilities as a valuable characteristic entwined in assisting a modal shift.

The discussion surrounding whether it is more applicable to separate private cars and traffic from cyclists is ongoing and dependent on the context. There is, however, general consensus that separate cycling facilities are more appropriate (Banister, 2005; Pucher and Buehler,
2008; Litman, Blair, Demopoulos, Eddy, Fritzel, Laidlaw, Maddox and Forster, 2009; Cox, 2010).

**Intersections**

Secondly, Pucher and Buehler (2008) identify intersection modifications and priority traffic signals as being key characteristics in the assistance of modal shift promotion. Dutch, Danish and German planners have worked continuously to perfect the design of intersections for cycle safety and convenience (Pucher and Buehler, 2008). The intersection designs that have been implemented in these three countries provide significant relevance to others seeking modal shifts. The relevance of providing, or at the very least recognising, these characteristics and the role they play in assisting modal shift promotion is important. Pucher and Buehler (2008) outline that intersections differ between countries and cities, but include most of the characteristics in Box 2.

<table>
<thead>
<tr>
<th>Important Characteristics of Intersections for Assisting Modal Shift Promotion</th>
</tr>
</thead>
<tbody>
<tr>
<td>- special bike lanes leading up to the intersection, with advanced stop lines for cyclists, far ahead of waiting cars;</td>
</tr>
<tr>
<td>- advance green traffic signals for cyclists, and extra green signal phases for cyclists at intersections with heavy cycle volumes;</td>
</tr>
<tr>
<td>- turn restrictions for cars, while all turns allowed for cyclists;</td>
</tr>
<tr>
<td>- highly visible, distinctively coloured bike lane crossings at intersections;</td>
</tr>
<tr>
<td>- special cyclist-activated traffic lights;</td>
</tr>
<tr>
<td>- timing traffic lights to provide a ‘green wave’ for cyclists instead of for cars;</td>
</tr>
<tr>
<td>- insertion of traffic islands and bollards in roadway to sharpen turning radius of cars;</td>
</tr>
<tr>
<td>- realigning bike pathways further away from their parallel streets when approaching intersections.</td>
</tr>
</tbody>
</table>

Box 2: Characteristics of successful intersections catering for cyclists; (Adapted from Pucher and Buehler, 2008, p. 516)

It is the incorporation of the intersection characteristics that Pucher and Buehler (2008) identify that will aid in the assistance of modal shift promotion. Pucher et al. (1999) illustrate the importance of intersection conflicts being mitigated. European designers employ techniques ranging from; brightly painted crossings, raised crossings and outward
displacement of bike paths to ensure that mitigation of conflicts occurs (Pucher et al. 1999). The design and characteristics of intersections are attributed as playing a prominent role in assisting modal shift promotion in the successful cycling countries in Europe.

Traffic Calming

Thirdly, traffic calming is a characteristic important in assisting modal shift promotion through the generation of cycle safety and convenience in Dutch, Danish and German cities. Traffic calming is more predominant in neighbourhood streets as separate cycle facilities are not required and appropriate shared provisions are adequate (Pucher and Buehler, 2008). Dutch, Danish and German cities incorporate traffic calming that results in a speed restriction of 30 km/hr (Pucher and Buehler, 2008), thus creating a much slower traffic environment and promoting safety and allowing convenience to cyclists. Litman (2010) highlights traffic calming as being able to “control vehicle traffic volumes and speeds, and improve road conditions for pedestrians and cyclists” (Litman, 2010, p. 27). The direct result of reducing the speed of traffic is a safer environment for cyclists.

The most advanced traffic calming measures that have been implemented in these countries are where cars are required to travel at walking speed, termed ‘woonerf’ (Pucher and Buehler, 2008). Another form of traffic calming is termed a ‘bicycle street’, where a cyclist can ride anywhere they want, even if that means obstructing cars (Pucher and Buehler, 2008). The popularity of ‘bicycle streets’ is apparent through 12 being implemented in Muenster, Germany in 2007 and the city identifies them as such a success that 10 more are being planned currently (City of Muenster, 2007, cited in Pucher and Buehler, 2008). The types of traffic calming measures implemented by countries successful in generating modal shifts highlight the importance of creating a safer and more convenient environment through traffic calming.

The success of traffic calming is evident through the calmed residential neighbourhoods, car free urban centres, and bicycle streets which further the assistance of modal shift promotion in the Netherlands, Denmark and Germany (Pucher and Buehler, 2008). Banister (2005) identifies that traffic calming should not just involve on-road safety and reduction in traffic speeds. Banister (2005) states that a planning strategy, in relation to traffic calming, should
include design and neighbourhood issues to ensure high quality solutions are produced. The essence of traffic calming involves more than just promoting the cycle, Banister (2005) and Pucher and Buehler (2008) both view it as improving the quality of the neighbourhood. Germany has also pioneered the concept of ‘verkehrsberuhigung’ (traffic calming) in city centres and residential areas (Pucher and Buehler, 2008). The incompatible nature of the car and a viable city was realised, with traffic calming contributing to more liveable streets and cities (Banister, 2002).

_Bike Parking_

Fourthly, bike parking provisions ensure that cyclists are properly provided for once they reach their destination. Pucher and Buehler (2008) highlight that local government and public transport systems directly provide the facilities for cycle parking in the Netherlands, Denmark and Germany. Litman (2010) emphasises that the provision of cycle parking needs to ensure safety from theft and protection from weather, and even showers and lockers when cycle commuting is of high predominance. The success of cycle parking in these countries is furthered by private developers and building owners, as the requirement to provide cycle parking within their facilities is further promoting the safety and convenience of cycling and acting as a characteristic in modal shift promotion (Pucher and Buehler, 2008). The identification that cyclists also need secure, convenient and sheltered parking, just like car drivers, helps ensure that the provisions for cyclists is more than adequately catered for (Banister, 2002). Cycle parking is also important where cycling is integrating with other transport modes. A variety of cycle parking solutions at stations, along with convenient cycle racks, and both covered and secure indoor parking increase cycle facilities and the role of cycle parking as a characteristic assisting modal shift promotion (International Technology Scanning Programme, 2010).
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Public Transport

Fifthly, Pucher and Buehler (2008) highlight the role public transport plays through integration with cycling. Transport planners and public transport providers identify the role in Europe that the cycle is playing as a feeder and distributor service for public transport services (Pucher and Buehler, 2008). Thus, it seems that the recognition of the cycle is becoming fully recognised in Europe, particularly in Dutch, Danish and German cities. Planners and public transport providers are continuing to cater for large number of cycles, through the provision of cycle parking and integrated convenience (Pucher and Buehler, 2008). The characteristic of integration within public transport and cycle facilities is ensuring that modal shift promotion is apparent in these successful cycle countries. Litman (2010) highlights that intermodal integration can encourage modal shift promotion, through the provision of secure cycle storage, park and ride lots, and by allowing cycles to be carried on buses and trains.

Another role of the cycle that stems from public transport is the growing provision of cycle rentals located at main public transport hubs, thus allowing easy convenience of movement around cities. Rental bikes are associated with a growing convenience and safety of inner city travel in many European cities, and the provision of rental bikes within central localities is becoming more fundamental (International Technology Scanning Programme, 2010). The incorporation of rental bikes into particular European cities is contributing to the assistance of modal shift promotion occurring.

Education

Sixthly, Pucher and Buehler (2008) highlight education and training as being a significant characteristic in assisting modal shift promotion. Dutch, Danish and German children all receive extensive training in safe and effective cycling techniques as part of their school curriculum (Pucher and Buehler, 2008). Due to the high number of children who cycle to school, education is prioritised heavily by national governments of these countries. Pucher and Buehler (2008) illustrate the importance of the education being two ways, where motorists are also gaining education on being aware of cyclists and how to avoid endangering cyclists. Cox (2010) also highlights the role of education as a characteristic promoting modal shift where
the opportunities within cycle education for both user and motorists are immense if implemented appropriately. The city of Winterthur Switzerland exemplifies the level that some cities will go to in promoting cycle safety in their cities (International Technology Scanning Programme, 2010). Photograph 1 shows this level of commitment with an educational area, a traffic garden, which allows children to appreciate and understand rules before venturing out into a real setting.

Photograph 1: Image of a traffic garden that allows the development of education and training in a safe and convenient setting. (Image taken from International Technology Scanning Programme on Pedestrian and Bicyclist Safety and Mobility, 2010)

Whitelegg and Haq (2003) discuss how, when education is supplied to motorists about the implications of their choices, behaviour can change, and result in the facilitation of a shift away from the car. Litman (2010) emphasises that encouragement and safety programs that educate people on the benefits and advantages of active transportation can assist in modal shift promotion. It is the characteristic of multifaceted education and training that brings about assisting modal shift promotion through incorporating cycle safety for both cyclists and motorists.
Traffic Laws

Finally, Pucher and Buehler (2008) identify traffic laws as being influential in assisting modal shift promotion in the Netherlands and Germany. The relationship between cyclists and motorists involves the onus of responsibility to avoid accidents falling entirely onto the motorist,

“Motorists are legally responsible for collisions with children and elderly cyclists, even if they are jaywalking, cycling in the wrong direction, ignoring traffic signals, or otherwise behaving contrary to traffic regulations” (German Federal Ministry of Transport, 2002; Netherlands Ministry of Transport, 2006, cited in Pucher and Buehler, 2008, p. 520).

The onus that is put on motorists creates more defensive drivers of cars and contributes to the endangerment of pedestrians and cyclists to be far less apparent in the Netherlands and Germany.

A characteristic that Pucher and Buehler (2008) have not mentioned specifically is the role of the political environment as a characteristic assisting modal shift promotion. The political involvement in assisting a modal shift, whether proposing policies, creating awareness for policies or implementing policies, is extensive (Cox, 2010). A continual theme in international literature on modal shifts is the role governance plays in contributing to the success of that modal shift (Banister, 1999; McClintock, 2002). Political buy-in, where those representing the community believe in what they are promoting, goes a long way toward generating a modal shift, but can often be hard to generate as transport politics can be very rigid (Cox, 2010). Tengstrom (1999) (cited in Low and Gleeson, 2003) illustrates that consultation and community buy-in are fundamental for the promotion of cycling as a mode of personal transport in cities. The policies being adopted in the city must have the support and confidence of the people living there and the other major interest groups in the city (Tengstrom 1999, cited in Low and Gleeson, 2003). This acceptance requires all parties to be involved and empowered by the process. The move toward modal shift promotion being assisted by the political environment will fundamentally change the way in which people get around the city, and such radical changes require political and public support (Banister, 2005).
Litman (2010) highlights that land use policies that are formed within the political environment are pertinent to modal shift promotion. The notions of “Smart growth, new urbanism and transit oriented development refer to land use development policies that create more compact, mixed, multi-modal, walkable communities” (Litman, 2010, p. 28). The implications of land use policies that generate compact, mixed and multi-modal communities that allow for shorter trips are evident in the modal shift promotion toward cycling that occurs.

Cox (2010) identifies the political environment as a wider concept that many characteristics for assisting modal shift fall under. The emphasis extends where Banister (2005) illustrates

“it is through the promotion of green modes of transport (walk and cycle) and the development of the new transport hierarchy that changes in modal split can be made” (Banister, 2005, p. 239)

The identification by Banister (2005) that a new transport hierarchy can occur with the promotion of green modes provides relevance to this research. The political involvement in constructing transport hierarchies is further evident by Cox (2010) who identifies that the political direction at both a central and local scale dictates the transport modes being undertaken. Low and Gleeson (2003) highlight that it is the social institutions and mechanisms coupled with the capability of humans that is transforming society. Governments deliver policies for this very reason as they seek to plan for the future on which they are judged publicly (Low and Gleeson, 2003). The hierarchical approach to transport policies within countries contributes extensively to the opportunities for wider personal transport mode development.

The seven characteristics that Pucher and Buehler (2008) identify and the political environment Banister (2005) emphasises, illustrates the ways of assisting modal shift promotion through integrating these characteristics. While these characteristics can directly affect the cycle experience it is important to identify that there are also indirect characteristics that will contribute to the assistance of modal shift promotion occurring.
2.2.2 Indirect Measures of Cycle Promotion

Pucher and Buehler (2008) provide a summary of the indirect characteristics that encourage cycling. These include automobile speed limitations in cities; road and parking capacity limitations; taxation of automobile ownership and use; and strict land use planning policies. It can be understood that both direct and indirect measures contribute as characteristics assisting modal shift promotion. While this research is addressing a planning framework to assist cycle promotion, it is also important to consider how indirect strategies can aid in the promotion of a modal shift, through the significance of a multifaceted approach. Pucher and Buehler (2008) highlight a number of indirect measures that can subsequently be used to promote a modal shift towards cycling in cities. Box 3 adapts a table by Pucher and Buehler (2008), where the indirect measures promoting cycling and a subsequent modal shift are identified.

<table>
<thead>
<tr>
<th>- Automobile speed limitations in cities</th>
<th>- Road and parking capacity limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>o Traffic calming in residential neighbourhoods</td>
<td>o Limited number of car parking places in city centres</td>
</tr>
<tr>
<td>o Car-free zones</td>
<td>o Replacing car parking facilities with bike parking instead</td>
</tr>
<tr>
<td>o Turn restrictions for cars but not for cyclists</td>
<td>o Combined bus-bike lanes that permit bike use but prohibit car use</td>
</tr>
<tr>
<td>o Strictly enforced speed limits and traffic rules in cities</td>
<td>o Deliberately narrowed roads in city centres</td>
</tr>
<tr>
<td>o Advance stop lines and traffic signal priority for cyclists</td>
<td>o Special bicycle streets that sharply limit car speeds and give cyclists priority</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>- Taxation of automobile ownership and use</th>
</tr>
</thead>
<tbody>
<tr>
<td>o High taxes and fees on car purchase, ownership and use</td>
</tr>
<tr>
<td>o High hourly parking rates in city centre</td>
</tr>
<tr>
<td>o High fees and strict training requirements for obtaining a driver’s license</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>- Strict land use planning policies</th>
</tr>
</thead>
<tbody>
<tr>
<td>o Most land beyond already built-up areas is off-limits for new development</td>
</tr>
<tr>
<td>o Most new development occurs adjacent to already built-up areas, keeping overall population density</td>
</tr>
<tr>
<td>o Transport and land-use planning integrated at several levels of government</td>
</tr>
<tr>
<td>o Mixed-use zoning keeps trip distances short and feasible by bicycle and on foot</td>
</tr>
<tr>
<td>o Enable development of mixed-use neighbourhoods</td>
</tr>
</tbody>
</table>
Box 3: Indirect measures involved in modal shift promotion. (Adapted from Pucher and Buehler, 2008)

The higher costs of automobiles in Europe, whether petrol, registration, license fees, driver training, all amount to a discouragement of use, and therefore indirectly promote a modal shift to cycling (Pucher et al. 1999; Pucher and Buehler, 2008). Land use policies are becoming more important as the effect of low density suburban sprawl and motorway systems is detrimentally contributing to the liveability of cities (Pucher and Buehler, 2008). Banister (2005) identifies the importance of spatial policies when stating, “The intention is not to prohibit the use of the car as this would be both difficult to achieve and seen as being against notions of freedom and choice. The intention is to design cities of such quality and at a suitable scale that people would not need to have a car and would choose to live in a car free location” (Banister, 2005, p. 246)

Land use policies have to be implemented at a political level and depending on the focus of local governance they can determine the viability of cycle promotion in that area (Banister, 2005). The identification of indirect measures as characteristics assisting modal shift promotion highlight the role of integration and the incorporation of a multifaceted approach to modal shift promotion.

The literature also identifies soft characteristics for assisting modal shift promotion. Soft characteristics include the marketing of events and public awareness campaigns (Pucher and Dijkstra, 2003). The promotion of cycle related events and awareness campaigns can provide assistance to modal shift promotion. European cities have excelled in promoting cycling through such measures where the focus is on celebrating cycling and creating wider awareness and interest in modal shift promotion (Pucher et al. 1999; Litman, 2007; Pucher and Buehler, 2008). Low and Gleeson (2003) reiterate the importance of promotion in Europe through the European Car Free Day, where the promotion and change in behaviour attitudes toward active modal choices that can be achieved, highlights the potential continuation of active transportation modes in Europe.

Internationally countries and cities have reacted to the potential increase in liveability associated with successful modal shifts. A move to providing central city bikes is becoming a common feature of internationally regarded cycling cities, and those wanting to become one (Pucher and Buehler, 2008). Amsterdam, Auckland, Delft, Melbourne and Rotterdam (to
name a few), are cities of different sizes, topographies and political environments that are gaining the benefits of incorporating rental and free bikes within their cities. Cities are identifying bike trip planning facilities, cycle maps, and cycle benefits as keys in stimulating the interest in cycling in and around their cities (Pucher et al. 1999; Pucher and Buehler, 2008; Tin et al., 2009; Cox, 2010).

The integration of direct and indirect characteristics emerges as an important component in assisting modal shift promotion in the literature. Banister (2005) identifies characteristics that help promote the cycle as a mode of transport in cities. Banister (2005) highlights that through the investment in public transport infrastructure and facilities for cyclists and pedestrians, a real choice can be provided to the users. Once the choice is developed it is the development of education and awareness that can lead to cycle promotion and growth in urban cities (Low and Gleeson, 2003).

Banister (2005) states four concepts within a model for active transport, of which cycling is an important component. Acceptability, long-term perspectives and holistic views, trigger effects and sequencing of implementation and adaptability were the concepts Banister (2005) identified as influential within a planning framework for modal shift promotion. The multifaceted approach that Banister (2005) illustrates reaffirms the arguments of Cox (2010), Pucher and Buehler (2008) and Low and Gleeson (2003), who all identify the significance of a multidimensional approach to cycle promotion in cities. Dunn (1998) identifies the significance of adaptability within an integrated approach,

“*The role of the transport planner has changed from the provider of roads and additional capacity to exploring the means by which the existing capacity can be better used and allocated to priority users*” (cited in Banister, 2002, p. 208).

The contribution that a supportive political environment can play is realised even in countries that have exhibited high levels of car dependence, such as the United States of America. Political support is required for the adoption and implementation of car-restrictive policies to couple the pro-bicycle policies. Without a multifaceted approach, cycle promotion is much harder to obtain (Tolley, 1997; Banister, 2005; Pucher and Buehler, 2008). It is the coordination of the multidimensional approach to cycle planning that is fundamental in assisting a modal shift.
Hudson’s (1982) attempt to outline the fundamental principles of cycle planning is one of a limited few to explain cycle planning. Hudson’s principles (1982) outline and highlight the relationships in modal shift promotion. The first principle of cycle planning is that it must be integrated with other transportation policy. The second principle is that an appropriate administrative framework for cycle planning is required. The third principle is that cycle planning should aim to be safe and efficient. The fourth principle involves the education and training opportunities for both cyclists and motorists. The final principle requires a cycle perspective to be incorporated into the cycle planning process (Hudson, 1982). These five principles have similar characteristics to those that Low and Gleeson (2003), Banister (2005), Pucher and Buehler (2008) and Cox (2010) all identify. All of the principles that Hudson (1982) developed enhance the promotion of cycling, and are, therefore, assisting modal shift promotion, even though this is indirectly in some of the principles cases.

The focus up to now has been on the direct and indirect characteristics assisting modal shift promotion from the literature. The consideration of future political policies aimed at active transport, which Whitelegg and Haq (2003) identify as important to a planning framework for assisting modal shift promotion will now take place. Box 4 summarises Whitelegg and Haq’s (2003) table of policy direction.

| - Land use planning to move local and regional spatial structures in the direction of reducing the demand for transport |
| - Full internalisation of external costs so that every trip by car, truck and air pays its full cost and pays its own way without requiring tax dollars from those not enjoying the benefits of the journey |
| - Re-engineering of taxation systems to eradicate tax breaks and tax incentives that have the effect of encouraging more car/truck travel and transferring resources from poorer groups to richer groups |
| - Re-engineering cities to make them safe havens for pedestrians and cyclists. This will mean effective speed and emission controls and highway space re-allocation |
| - An end to direct state funding of any aspect of car/truck/aircraft R&D and an end to any direct subsidy of manufacturing/job creation or regeneration involving these technologies |
| - An ethical audit of all transport spending. Projects that transfer wealth from the poor to the rich or damage the health of groups other than those in the cars/trucks/aircraft should not go ahead. Projects that damage children should not go ahead. A better way to solve accessibility and mobility can be found |
| - A very clear carbon reduction strategy for transport so that transport delivers its proportionate responsibility for a 60% cut in greenhouse gas emissions |
Box 4: Direction required for future policy (adapted from Whitelegg and Haq, 2003, p. 282)

The integrative policy approaches that Whitelegg and Haq (2003) highlight are directed toward the future policy directions. The recognition that some of the suggested directions seem drastic, given the current situation, should not deter the importance of such measures being adopted. The multi-dimensional approach is further started with German and Dutch examples highlighting the need for policy to include,

“better facilities for walking and cycling, urban design sensitive to the needs of non-motorists, restrictions on motor vehicle use in cities, rigorous traffic education for both motorists and non-motorists and strict enforcement of traffic regulations protecting pedestrians and bicyclists” (Pucher and Dijkstra, 2003, p. 16)

The identification of the integration within characteristics to assist modal shift promotion as being essential for future direction of political policy is valid. The extension from this integration occurs where the Cycling in the Netherlands (2009) policy document outlines the characteristics required for cycle friendly infrastructure, and subsequent modal promotion. Five characteristics are identified that relate to the infrastructure and the experience of that infrastructure. Safety, directness, comfort, attraction and cohesion were the characteristics that the Cycling in the Netherlands identify as being fundamental to the assistance and continuation of modal promotion. The characteristics of the Cycling in the Netherlands (2009) policy document has similarities to those Banister (2005) and Pucher and Buehler (2008) outline and, therefore, reinforce the range of characteristics important for assisting modal shift promotion.

The lessons from the Dutch Bicycle Master Plan (1999) show that simply providing networks of cycle routes is insufficient in itself for bringing change to assist a modal shift. The requirement for a simultaneous policy that discourages and restricts private car use is deemed necessary to promote a sustainable increase in bicycle use (Dutch Bicycle Master Plan, 1999). The Dutch Bicycle Master Plan (1999) reinforces the significance of integration that has been
emphasised throughout this section on characteristics important for assisting modal shift promotion.

Table 3: Travel impacts of strategies to encourage non-motorised travel (taken from Litman, 2010, p. 28).

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Improves Nonmotorized Conditions</th>
<th>Increases NMT Travel</th>
<th>Reduces Automobile Travel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian &amp; Bicycle Facilities</td>
<td>Significant</td>
<td>Significant</td>
<td>Moderate</td>
</tr>
<tr>
<td>Roadway Improvements</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Small</td>
</tr>
<tr>
<td>Bicycle Parking &amp; Showers</td>
<td>Significant</td>
<td>Moderate</td>
<td>Small</td>
</tr>
<tr>
<td>Traffic Calming</td>
<td>Significant</td>
<td>Significant</td>
<td>Small</td>
</tr>
<tr>
<td>Encouragement &amp; Safety Programs</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Small</td>
</tr>
<tr>
<td>Bicycle-Transit Integration</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Small</td>
</tr>
<tr>
<td>Transit Improvements</td>
<td>Small</td>
<td>Moderate</td>
<td>Significant</td>
</tr>
<tr>
<td>Commute Trip Reduction</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Significant</td>
</tr>
<tr>
<td>Transportation Price Reforms</td>
<td>Small</td>
<td>Moderate</td>
<td>Significant</td>
</tr>
<tr>
<td>Land Use Policy Reform</td>
<td>Significant</td>
<td>Significant</td>
<td>Significant</td>
</tr>
</tbody>
</table>

(*"Moderate" = 1-5% “Significant” = greater than 5%)

This table summarizes the potential impacts of various mobility management strategies. Although many strategies have modest individual impacts, their effects are cumulative and often synergistic (total impacts are greater than the sum of individual impacts). An integrated program that combines several appropriate strategies can significantly improve nonmotorized conditions, increase nonmotorized travel and reduce automobile travel.

Litman (2010) identifies, in Table 3, the different characteristics that can be incorporated to assist modal shift promotion and the relative success in improving conditions, increases in non-motorised travel and reductions in private car travel. It can be determined that land use policy reform is a very important characteristic through its ability to improve conditions for non-motorised travel, increase the occurrence of non-motorised travel, whilst reducing the amount of private car travel. Pedestrian and cycle facilities are also very important as characteristics assisting modal shift promotion. The other characteristics that Litman (2010) identifies also play a prominent role in assisting modal shift promotion and will be considered when formulating a conceptualisation of characteristics important for assisting modal shift at the conclusion of this literature review.

2.2.3 Characteristics Conclusion
The conclusions that can be drawn from this first part of the literature review relate to the multi-faceted approach to characteristics involved in the assistance of modal shift promotion. The characteristics identified above form two main groups. The relationship between direct
and indirect measures toward cycle promotion seem paramount to the successful implementation of modal shift in cities. Table 4 concludes the findings on characteristics important for assisting modal shift promotion from the literature.

<table>
<thead>
<tr>
<th>Summary of Cycle Promotion Characteristics Identified</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Characteristics</td>
</tr>
<tr>
<td>- Extensive separate cycle facilities</td>
</tr>
<tr>
<td>- Intersection modifications</td>
</tr>
<tr>
<td>- Consistency</td>
</tr>
<tr>
<td>- Comfort</td>
</tr>
<tr>
<td>- Safety and efficiency</td>
</tr>
<tr>
<td>- Traffic calming</td>
</tr>
<tr>
<td>- Bike parking facilities</td>
</tr>
<tr>
<td>- Integration with public transport</td>
</tr>
<tr>
<td>- Traffic education and training</td>
</tr>
<tr>
<td>- Traffic laws</td>
</tr>
<tr>
<td>- Adaptability</td>
</tr>
<tr>
<td>- Sequencing of implementation</td>
</tr>
<tr>
<td>Indirect Characteristics</td>
</tr>
<tr>
<td>- Speed limitations</td>
</tr>
<tr>
<td>- Car-free zones</td>
</tr>
<tr>
<td>- Strictly enforced traffic laws</td>
</tr>
<tr>
<td>- Limited automobile parking capacity</td>
</tr>
<tr>
<td>- Taxation of automobile ownership and use</td>
</tr>
<tr>
<td>- Speed limitations</td>
</tr>
<tr>
<td>- Car-free zones</td>
</tr>
<tr>
<td>- Strictly enforced traffic laws</td>
</tr>
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</tr>
<tr>
<td>- Limited automobile parking capacity</td>
</tr>
<tr>
<td>- Taxation of automobile ownership and use</td>
</tr>
</tbody>
</table>

Table 4: Summary of cycle promotion characteristics identified in this section

The extensive array of characteristics identified in Table 4 highlight the complexity associated with promoting a modal shift in cities. The requirement for a large number of these characteristics to be aligned in order to assist a modal shift is therefore pertinent for local and national governments to consider when constructing a planning framework for assisting modal shift promotion. The following section will identify the benefits that can be attributed to a modal shift to cycling.
2.3 Section Two Benefits of Modal Shift Promotion

Cycling in urban cities is one of the most sustainable forms of personal transport modes (Banister, 2005). It is the sustainability of cycling coupled with the extensive benefits, both direct and indirect, that contribute to more liveable and engaging spaces for the public in those cities. Cycling does more than simply provide transport from one place to another (Cox, 2010). This section will outline the benefits that can be experienced when a modal shift occurs. The benefits include health, economic and social advantages that assist the individual and city.

2.3.1 Health Benefits
The occurrence of a modal shift in cities has associated health benefits that are extensive to the individual and the city. The prominence of inadequate physical exercise and growing obesity problems have resulted in medical issues, including cardio-vascular diseases, bone and joint injuries and diabetes (Litman, 2010). It has been identified that “ten times as many people die from these medical problems than from traffic accidents” (Litman, 2010, p. 19). The increase in physical activity through active transportation highlights the benefit of reducing health costs to the individual and New Zealand society. Cycling for personal transport is identified as being one of the most effective and practical ways of increasing physical activity (Tolley, 1990; Shayler, 1993).

The New Zealand Transport Agency has previously funded research on different aspects of active transport. A recent project ‘Valuing the health benefits of active transport modes’ (2008) is important to consider. Genter, Donovan, Petrenas and Badland (2008) detailed the benefits of active transport, particularly to health. Genter et al. (2008) illustrate that active transportation undertaken on a daily level, as a commuter, is more pronounced in health benefits than leisure-time physical activity, largely through the regularity of commuting. Table 5 is modified from Genter et al. (2008) and presents the benefits of active transport modes per kilometre. The benefits were weighted and distributed across the average physical activity profile of the population to produce three scenarios of an annual benefit per person.
### Table 5: Per-kilometre benefits of active transport modes in New Zealand (adapted from Genter et al., 2008, p. 57).

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Annual benefit</th>
<th>Per km walking</th>
<th>Per km cycling</th>
<th>Per km skateboarding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>$3,112</td>
<td>$3.53</td>
<td>$1.77</td>
<td>$2.37</td>
</tr>
<tr>
<td>Medium</td>
<td>$3,765</td>
<td>$4.27</td>
<td>$2.14</td>
<td>$2.86</td>
</tr>
<tr>
<td>High</td>
<td>$4,417</td>
<td>$5.01</td>
<td>$2.51</td>
<td>$3.36</td>
</tr>
</tbody>
</table>

Table 5 illustrates that the benefits of cycling per kilometre are significant, with a $1.77 benefit per kilometre for a low scenario and a $2.51 benefit for a high scenario. The economic benefits for the health sector are significant, with cycling having the potential to play a large role in this. It is important to identify that the health benefits gained by current cycling and active transportation users will be less (the report suggests around half the current figure), therefore emphasising the importance of targeting those who are currently not utilising active transportation. Table 6 goes into more detail about the health benefits of people cycling based on their activity status.

### Table 6: Health benefits of cycling per-kilometre weighted against activity status and scenario (taken from Genter et al. 2008).
Table 6 explains the annual benefits per person once they have been weighted with one’s activity status, the distance they are cycling and the prevalence of this cycling. The annual benefit per person equates to a significant amount of money, to which, if a modal shift of five to fifteen percent took place then the economic benefits to the individual and the health sector would be immense.

Genter et al. (2008) highlights two conclusions that are important to understand in relation to this research. Firstly, “A very small proportion of the population currently walk or cycle for personal transport reasons (less than 10 %), and this proportion has been decreasing steadily for well over a decade” (Genter et al. (2008). Secondly, “When people do walk and cycle for transport they are, on average, active enough (or nearly), to meet the recommended daily minimum of 30 minutes of activity.” (Genter et al. (2008)). These two conclusions illustrate the current failure to reap the health benefits that are apparent through active transportation in New Zealand. It does, however, establish that when people do undertake walking and cycling that the levels of intensity and duration are meeting their daily requirements of physical activity, thus perpetuating the potential health gains of active transportation through commuting.

### 2.3.2 Economic

The economic benefits associated with active transportation and modal shift promotion illustrates the importance of active transportation in cities economic experiences. Banister (2005) identifies that the economic benefits of cycling is evident to the individual cycle user and the retailers. The benefit to the user is apparent through the lower cost of active transport and the direct influence on lower health costs through being more physically active (Litman, 2010). Cycling is a highly affordable transport option through possessing very little recurrent costs once the initial cycle has been purchased (Cox, 2010). To contrast this with the private car which continually requires monetary stimulus to run and maintain, as well as service and adherence to local taxes and registrations, cycling becomes a very affordable opportunity for all residents (Litman, 2010).
The economic benefits do not stop at the individual. The lower cost associated with cycling allows for an increased disposable income (Pucher and Buehler, 2007). It is evident that through an increased disposable income cyclists possess a greater capability to spend more money within the local economy (Cycling in the Netherlands, 2009). The health benefits of active transportation are continued where a Scandinavian study estimated that a physically inactive person who shifts from car to cycle commuting gives an economic benefit to the community of approximately 3,000-4000 Euro per year (Saelensminde, 2002). The quantified economic benefit to the community identified in the Scandinavian study is very significant, especially with a 5 to 15 % shift in transport modes within this group.

The benefits that can be experienced at a retail level, identified by Baniser (2002), go against the thinking of most businesses previously associated with modal shifts. It was identified that businesses in the Netherlands identified the apprehension associated with making central city shopping areas cycle and pedestrian spaces only (Cycling in the Netherlands, 2009). The concerns were due primarily with the private car not being able to access their stores, but this concern was quickly displaced with overall satisfaction and support for the increase in economic viability of their businesses through the spatial use of roads, once the implementation of the central city space was made (Pucher and Buehler, 2007; Pucher and Buehler, 2008; Cycling in the Netherlands, 2009). The general perception by business owners of private cars spending more money has quickly been dismissed in the Netherlands, and now businesses are adapting appropriately with the provision of cycle infrastructure outside their shops to enhance the economic potential of their businesses and align themselves with active transportation (Cycling in the Netherlands, 2009).

The economic benefits to businesses extend to where active employees contribute with a higher productivity. Shayler (1993) identifies “The United Kingdom Traffic Advisory Unit estimated that workplace cycling programs provide $1.33-$6.50 return for each $1 spent in cycle promotion due to increased productivity” (Shayler, 1993, p. 19). The realisation that the economic investment businesses have made to establish and promote active transportation, particularly cycling, has contributed to a significant economic return.

The economic benefit to the community is evident through the lower costs of infrastructure for active transportation. Sheppard (1998) highlights, “American research shows that in terms of
direct road expense, cars cost $US34.10 per mile and cycles $US0.10 per mile” (Sheppard, 1998 cited in Knight, 1998, p. 20). The affordability of cycles reinforces the economic benefit of a modal shift occurring and promotes the move toward active transportation in cities. The individual, community and business economic benefits that have been illustrated in this section of the literature review reinforce the significance of proposing a planning framework for assisting a modal shift in Dunedin.

2.3.3 Social
The social benefits of a successful modal shift are now going to be considered. The social interaction present when driving a motor vehicle is limited at best. Cox (2010) attributes the arrival of the private car as the producer of safety fears around public spaces, through the decrease in cycles and pedestrians, which in turn lowers the level of social surveillance. The social interaction available to a cyclist is far greater. Whether this interaction takes place through vibrancy, atmosphere, shops, cafes, or other cyclists the social interactions that can occur are extensive (Cox, 2010). With an increase in social interaction comes the added advantage of social security.

Cox (2010) highlights that with increasing cycle use comes the benefit of increased perceptions of and actual safety. The wider social benefits flow into individual health outcomes through physical exercise. The World Health Organisation has outlined that cycling is an effective method for reducing depression and anxiety (Dora and Phillips, 2000 cited in Australian Cycling Promotion Fund, 2008). The social benefits on an individual level are significant as increased physical exercise through cycling will aid in the reduction of depression and anxiety, both of which are common medical conditions in the developed world (Litman, 2008). Obesity is another medical condition that threatens the social ability of humans, and active forms of transport like cycling are playing a dynamic role in obesity reduction in leading cycling cities (Pucher and Buehler, 2008). The benefits extend to the physical health of those choosing to cycle as their mode of transport.

Cox (2010) highlights how the human designed environment can aid in the undertaking of walking and cycling which results in further obesity prevention. The social benefits of having
a more active population, which can be achieved through active commuting and cycling are sizeable (Banister, 2002). The social benefits of active transportation are further evident through the socially equitable transport mode of cycling. Litman (2010) identifies that cycling is easily accessible to a significantly larger portion of the population than the private car. The social benefits of providing for active transportation are evident through the social equity, community and individual safety results that are associated with cities that have experienced successful modal shifts (Litman, 2010). Cycling is a socially acceptable means of transport in certain countries at present and the opportunities for other countries to develop modal shifts in order to reap the social benefits of active transportation can be realised.

The health, economic and social benefits of active transportation are evident through Cox (2010) who identifies the burden that car dependence can bring to society. Cox (2010) highlights that the World Health Organisation conducted a report in 2003 that estimated 1.26 million people worldwide died as a result of road traffic injuries in the year 2000. The relevance of the promotion of active transportation is further understood as a benefit when considering the alarming figures Cox (2010) identifies and the dramatically smaller costs of active transportation crashes, due to the lower speeds being undertaken.

Table 7: Estimated Benefits of Non-motorised Transport (Taken from Litman, 2010, p. 25)
Table 7 provides a comprehensive summary of the estimated benefits for non-motorised transport. Litman (2008) outlines the difference between urban peak, urban off-peak and rural. The estimated benefits highlight the contribution that active transportation can make to cities. Litman (2008) identifies that a number of the benefits are not monetised so the actual extent of the benefits of a successful modal shift will be far greater. The table highlights to undertake an average cycle trip (2 miles) at urban peak time, a $5.56 saving is being made to the individual and the city. Table 7 reinforces the significance of assisting modal shift promotion to allow the experience of benefits to occur.

Litman (2010) highlights the benefits that are available to cities that experience modal shifts. Table 8 summarises these benefits of non-motorised transportation.

<table>
<thead>
<tr>
<th>Improved NMT Conditions</th>
<th>Increased NMT</th>
<th>Shift from Car to NMT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improved user convenience and comfort.</td>
<td>Increased public health and fitness.</td>
<td>Reduced traffic congestion.</td>
</tr>
<tr>
<td>Increased travel options.</td>
<td>User enjoyment.</td>
<td>Road and parking cost savings.</td>
</tr>
<tr>
<td>Improved basic mobility for non-drivers.</td>
<td>Increased community cohesion (positive interactions among neighbours).</td>
<td>Consumer cost savings.</td>
</tr>
<tr>
<td>More attractive and liveable communities.</td>
<td></td>
<td>Reduced crash risk to others.</td>
</tr>
<tr>
<td>Improved local property values.</td>
<td></td>
<td>Air and noise pollution reductions.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Energy conservation.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Economic development benefits.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Supports strategic land use objectives.</td>
</tr>
</tbody>
</table>

Table 8: Identification of non-motorised transport (NMT) benefits. (Adapted from Litman, 2010, p. 2)

Table 8 identifies that the benefits for modal shift occurring are extensive. The significance of understanding the range of benefits that is associated with increases in active transport help highlight the need for modal shift promotion to become more predominant.
Chapter Two Literature Review

Tolley (1990) expands on the benefits available with an increase in active transportation. Box 5 illustrates some of the benefits associated with the cycle as a means of transportation.

<table>
<thead>
<tr>
<th>Advantages of the cycle as a means of transport</th>
</tr>
</thead>
<tbody>
<tr>
<td>- The cycle is an environment-friendly means of transport</td>
</tr>
<tr>
<td>- Cycle traffic uses up relatively little space on the street</td>
</tr>
<tr>
<td>- The cycle is a flexible and time-saving means of transport</td>
</tr>
<tr>
<td>- The shift to the cycle has a positive effects on the quality of the local environment in urban areas</td>
</tr>
<tr>
<td>- Facilitates environmental traffic management</td>
</tr>
<tr>
<td>- The cycle is a social means of transport</td>
</tr>
<tr>
<td>- Cycle transport concepts and schemes are also sensible from an economic point of view</td>
</tr>
<tr>
<td>- Cycles have a positive influence on health</td>
</tr>
</tbody>
</table>

Box 5: Tolley (1990) identified some of the benefits associated with the cycle being a means of transportation.

Box 5 identifies health, economic and social benefits of cycling that continue to highlight the benefits of active transportation in cities. The reality that cycles are positively efficient for space, time, cost, health and social dynamics reaffirms the important of cities capitalising on the opportunity present within active transportation and cycles.

Chapman (2005) conceptualises the way benefits of active transportation can be determined within urban design. Figure 2 identifies a framework model linking urban design, physical activity and well-being outcomes. The health, social and environmental benefits being identified by Chapman (2005) further the significance of promoting a modal shift. The urban design components of density, connectivity, local character, mixed use, high quality public realm and greenery have partially come up in the characteristics section of the literature review. The benefits of modal shift promotion and active transportation, as identified by Chapman (2005) influence a wide range of benefits.
2.3.4 Conclusion of Benefits
The experience of modal shift promotion in cities can be furthered through the health, economic and social benefits that are associated with such a modal shift. The reduction of medical diseases through an increase in physical activity could significantly reduce the burden
on the health system. The economic benefits at both the individual level, through lower costs, and the society level, through cheaper infrastructure and more spending, illustrate the importance of assisting modal shift promotion in cities to enable the experience of such benefits. The importance of recognising that the extent of the benefits will depend on the mode share associated with the modal shift. The ability for modal shifts to occur in the population that are currently burdening the health system, with cardio-vascular diseases, bone and joint injuries, obesity and diabetes (Litman, 2010) will contribute to more extensive benefits being experienced. Active commuting enhances social cohesion, community liveability and transport equity, improves safety to all road users, reduces fuel dependency and lowers private car emissions (Tolley, 1990). The recognition that the benefits seem to outweigh the costs perpetuates the importance of developing a planning framework for assisting modal shift promotion in Dunedin.

The development of a planning framework for assisting modal shift promotion requires the consideration of barriers to this promotion. The next section of this literature review will consider the barriers that could affect modal shift promotion.
Section Three Barriers to Modal Shift Promotion

The first two sections of this literature review have considered characteristics important for assisting modal shift promotion and the benefits of a modal shift. The direction will now move to the barriers that could inhibit modal shift promotion from occurring in cities. The barriers to be discussed in this literature review section include cultural, political, physical and environmental.

2.4.1 Cultural
Banister (2002) identifies the cultural barriers that are obstacles to successful modal shifts. Public attitudes to the car must change for there to be an incorporation of active transport policy into reality (Banister, 2002). In order to address the cultural barriers present globally, primarily associated to the fascination with the private car, significant action will be required by national and international governments (Banister, 2002). Cox (2010) considers that whilst a lot of advantages are present within cycle mobility, the ability to overcome the historical barrier that is entrenched within the love for the private car will prove one of the most difficult.

The cultural barriers to cycling implementation are being furthered through the lack of recognition of the benefits of cycling amongst adults (Pucher and Buehler, 2008). Young children are being deprived the opportunity to explore and learn through walking and cycling to school as they are being chauffeured in an isolated, deemed safe, environment (Ministry of Transport New Zealand, 2010). This is perpetuating the future social isolation of children away from the daily interactions of community life (Cox, 2010). Copenhagen, in Denmark, has recently stated that ‘cycling is as natural for Copenhageners as brushing their teeth’ (Copenhagen Cycle Account 2008), thus maintaining the significance that cultural roles can play.

Cultural barriers extend to car dependency, where the identification of cycling as a personal transport option is often limited. Litman (2008) emphasises that the presence of car dependence in western countries is preventing the opportunities for other modes of transport.
The identification of a worldview that is driven on the ideal of the private car (Tolley 1990), demonstrates the cultural barriers that are present to modal shifts occurring in cities.

2.4.2 Political
The political barriers affecting modal shift promotion include both the roles of central and local politics. The direction of the central political environment plays a prominent role as a barrier to modal shift promotion. Litman (2008) identifies that central policies provide direction to, and constraints on, lower levels, and could, therefore, restrict the opportunity for the development of favourable cycle policies at a local level. The European Conference of Ministers of Transport (2004) highlights that central level tends to focus on economic opportunity and associated closely with this is the mobility of the population. The direction of economic opportunity at a central level is understood to be a barrier to modal shift promotion, through the lack of recognition of the economic benefits associated with modal shifts (Litman, 2008; Pucher and Buehler, 2008). The mobility that is also considered at a central level is often associated with the private car (Banister, 2002), and consequently excludes the opportunities prevalent in greener modes, like cycling.

Active transportation, including cycling, remains marginal in transport policy discussions in many countries and financial allocation at a central level reflects this status (European Conference of Ministers of Transport, 2004). The general bias toward private car traffic policies are constraining cycling’s potential to possess an appropriate balance in transport modes (Tolley, 1990). It is the barrier present at the central political level that constrains the opportunities for assisting modal shift promotion in cities. The recognition of the role policies play as both instigators and barriers to modal shift signify the roles that central governments play in creating opportunities for modal shifts. The recognition that further road provision will not solve the issues of congestion and will likely further restrict the ability of modal shift promotion from occurring is important for policy makers to realise (Tolley, 1990; Banister, 2005; Pucher and Buehler, 2008; Litman, 2010).

The local level politics that inhibit modal shift promotion will now be outlined. Banister (2005) identifies that Shanghai has banned bicycles from much of its main roads, which is
inhibiting the growth of cycling. The barrier that local politics can play is largely attributed to the focus on the private car (Banister, 2002). Local policies that are formulated for cities can also restrict modal shift promotion from occurring. Cox (2010) highlights this through stressing the importance of having policy makers aware of the implications of their actions to ensure that the direction of the city, in relation to personal transport, is appropriately adhered to in the local level policy development. Gaffron (2005) also highlights the significance of policy makers being aware of their implications. It can be interpreted that local level policy plays a significant role as a barrier to modal shift promotion in cities, whether directly or indirectly. Banister (2002) identifies that the hierarchy which is apparent within local policy is a large barrier to bicycle promotion as,

“The impasse is essentially a political one as policies which might address the congestions and environmental issues are available, but they do not seem politically acceptable” (Banister, 2002, p. 123)

The political responsibility that Banister (2002) is referring to emphasises the ability that local and central governments have within transport policies to act as barriers to modal shift promotion. The barrier transport policies have played towards cycle promotion globally will need addressing if cycling is to experience a growth through political provisions (Cox, 2010). There is a need for an understanding of the central and local barriers that are present within the political environments that are inhibiting modal shift promotion from occurring.

2.4.3 Physical
The physical barriers affecting modal shift promotion include (but are not restricted to) density, spatial design and cycling infrastructure (Pucher et al, 1999). Density is a barrier to modal shift promotion through the influence it plays in restricting the opportunities available for active commuting. Tengstrom (1999) highlights that if low density prevails; there are specific transport problems due to that low density (cited in Low and Gleeson, 2003). The problem often relates to a dependence on the private car, due to a lack of access to other, more sustainable, modes of personal transport (Tengstrom, 1999, cited in Low and Gleeson, 2003). Howden-Chapman, Chapman and Stuart (2010) further Tengstrom’s (1999) argument and identify that low density communities are characterised by a high association with the private
car. Cox (2010) adds to the role density plays through illustrating that denser urban developments help ensure that a physical proximity to amenities prevents characteristics of sprawl and the associated car dependency from occurring. The role that density can play as a barrier is important to consider when proposing a planning framework for assisting modal shift promotion.

Spatial planning is another physical barrier to modal shift promotion in cities (Pucher and Buehler, 2008). The Netherlands have excelled in spatial planning for walking and cycling and consequently the use of the car is relatively limited in its urban centres (Pucher and Buehler, 2007). This affirms that if spatial planning is undertaken appropriately then it can assist a modal shift, yet it is necessary to appreciate that spatial planning can also be a large impediment to modal shift promotion. The obstacle of spatial planning can limit the opportunity for modal shift promotion through the notion of suburban sprawl (Litman, 2003). The significance attached to the provision of roads is further constricting the spatial design of cities. Transport planners need to recognise the significance of spatial planning when promoting sustainable forms of transport (Litman, 2008). Banister (2002) alludes to the requirement for more creativity within spatial planning to ensure future transport demands can be meet. Currently, spatial planning is largely understood as a barrier to modal shift promotion, yet this could change with the reprioritisation of space.

Cycling infrastructure plays a significant role as a physical barrier to modal shift promotion. Pucher and Dijkstra (2003) highlight that one of the biggest impediments to more walking and cycling in the United States of America is “the appallingly unsafe, unpleasant, and inconvenient conditions faced by pedestrians and cyclists in most American cities” (Pucher and Dijkstra, 2003, p. 16). It is the physical infrastructure that is a clear barrier to modal shift promotion if it fails to achieve what it is seeking to create. Cycling infrastructure that looks unsafe, is inappropriate, or is inefficient will further deter people to leave their private car at home (Cambridge Cycle Plan, 2008). Cycling infrastructure must be carried out appropriately so that it enhances the promotion of a modal shift.

The Netherlands have incorporated detection sensors at a distance to register a cyclist in advance, incorporated two green sequences per cycle for cyclists, ensured simultaneous green lights occur and display the time cyclists would have to wait, if they do not receive a green
light (Cycling in the Netherlands, 2009). The role of physical infrastructure extends to the end of the trip where safe bicycle parking that avoids fear of theft and vandalism is imperative (Cycling in the Netherlands, 2009). If physical infrastructure that is evident in the Netherlands is not extended to other countries and cities then the infrastructure present can be seen as a barrier to modal shifts occurring. The role that physical infrastructure can play as a barrier to modal shift promotion is dependent on the appropriateness of the infrastructure in place. The issue globally is that the majority of the infrastructure already in place impacts negatively toward modal shift promotion (Newman and Kenworthy, 1999; Banister, 2005; Cox, 2010).

2.4.4 Environmental
The environmental barriers that are apparent to a modal shift occurring include topography and climate. The topography of a city can play a role in either promoting or restricting a modal shift from occurring (Pucher et al., 1999). The importance of understanding that with topographic barriers comes the requirement for innovate measures to overcome these barriers. The weather is also identified as a barrier to modal shift promotion, yet the extent of this barrier is debated. Pucher et al. (1999) identify that European cities that experience very cold weather in winter still maintain high levels of cycling. Litman (2010) also emphasises that cities in America that possess much harsher winters are still well ahead of cycle numbers in other American cities with warmer climates. Tolley (1990) highlights that the weather can play a role as a barrier to modal shift promotion, but through the incorporation and integration of appropriate infrastructure and facilities, the barrier of weather can be addressed. Topography and the weather can be understood as barriers to modal shift promotion, but the literature has outlined that topography plays a more prominent role as a barrier.

2.4.5 Traffic enforcement
The enforcement of traffic regulations and laws can contribute to the promotion or restriction of cycle use in cities (Banister, 2002). Globally, cyclists are treated as being motorists in most countries where their actions hold them accountable (Pucher and Buehler, 2008). The Netherlands have incorporated a system that ensures that the cyclist is very rarely held accountable for their actions even when they are acting inappropriately (Cycling in the
Netherlands, 2009). This contributes to the fostering of cycle promotion in cities in the Netherlands. Banister (2005) identifies that the role cyclists play is largely inhibited by the view that they do not belong on the road, also utilised by the private car (Banister, 2005). This view largely stems from political and public opinion on the role of the private car, and the lesser role of the cycle (Banister, 2005).

The barriers to modal shift promotion globally have been outlined in this section. The wide array of barriers is important for consideration when proposing a planning framework for assisting modal shift promotion. The challenge of increasing world mobility and overdependence on motorised transport poses the biggest challenge to achieving active transport (Whitelegg and Haq, 2003). It is significant to realise that the provision of cycle friendly infrastructure alone will not create a modal shift (Harms and Truffer, 1999; Harms 2003, cited in Cox, 2010), thus the identification of barriers to modal shift promotion allow a greater understanding of what is required to achieve a modal shift. Private car users will not be tempted out of their cars unless they see a better alternative (Cambridge Cycle Plan, 2008). It is the creation of a better alternative that seeks to overcome the barriers identified in this section that will allow progress toward a more sustainable future for urban transport.

The direction of this literature review has encompassed the characteristics important for modal shift promotion, the benefits of a modal shift occurring and the barriers to modal shift promotion. The move to consider successful cycling cities in Europe will provide insight into the practical characteristics that are important for a planning framework assisting modal shift promotion.
2.5 Section Four Case Studies

The fourth section of this literature review will assess cities that have achieved successful modal shifts. The determination of what is deemed successful comes from the continual identification by international literature on active transportation and cycling that the Netherlands, Denmark and Germany lead the world in, both for provisions and modal share. The relevance of incorporating case studies on successful cycle cities is to allow the fuller understanding of the characteristics that are important to assist the development of a planning framework to assist modal shift promotion.

The Netherlands, Denmark and Germany are all recognised as leading cycle countries (Banister, 2005; Pucher and Buehler, 2008; Pucher et al. 2010; Cox, 2010) and therefore will form the case studies for this section.

Table 9 demonstrates innovative measures that have been implemented by the Netherlands, Denmark and Germany recently to promote safe and convenient cycling. The identification of the large number of innovative measures emphasise the reason for focusing a case study on these three leading countries.
Table 9: Innovative measures recently implemented in the Netherlands, Denmark and Germany to promote safe and convenient cycling (Taken from Pucher and Buehler, 2008)

<table>
<thead>
<tr>
<th>Country</th>
<th>City (population in 1,000)</th>
<th>% Bike Mode Share</th>
<th>km of separated bike paths and lanes</th>
<th>Innovations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>Berlin (3,400)</td>
<td>10%</td>
<td>900 km</td>
<td>- German railway’s “Call-a-Bike” program: 3,000 bikes can be rented by cell phone, paid for by the minute and left at any busy intersection in the city. - Flexible internet bike trip planning tool allows finding the most comfortable or quickest route by bike. - 70 km of shared bike bus lanes and 100km of shared bike-pedestrian facilities. - 3,800km of traffic calmed streets (72% of all roads in the city). - 22,600 bike parking spots at metro and suburban rail stations. - Land use planning enforces good mix of uses and keeps trips short and bikeable: 45% of all trips are shorter than 3km. - Bike path connecting Copenhagen to Berlin encourages bike tourism in both cities. - The “FabRat” bike council provides a platform for opinion exchange among stakeholders from businesses, the bike industry, the city administration, research institutes, universities, bike experts, and citizen advocacy groups. - City policies favor cycling as most cost effective transport in a bankrupt city.</td>
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<tr>
<td></td>
<td>Muenster (278k)</td>
<td>35%</td>
<td>320 km</td>
<td>- Deluxe full-service parking garages for 3,300 bikes at the main train station and for 300 bikes in the main shopping district. - 4.5 km circumferential car-free “bike beltway” around old city. - Extensive bicycling network connecting the city to the suburbs via 26 radial bike routes linked by circumferential bikeway. - Bicyclist priority signals at most intersections. - Hundreds of short cuts for cyclists at intersections, mid-block connections, and dead ends. - Eleven bicycle streets, where bikes have priority over cars. - Statewide integrated, flexible internet bicycling planning tool allows finding the most comfortable route by bike in Muenster and all of the surrounding area. - Fully integrated, separate, and color-coded set of signs for bikes.</td>
</tr>
<tr>
<td>Denmark</td>
<td>Copenhagen (500)</td>
<td>20%</td>
<td>375 km</td>
<td>- Annual bicycle account survey that tracks cyclists’ satisfaction with bike infrastructure. - Bike path connecting Copenhagen to Berlin encourages bike tourism in both cities. - Separated bike paths turn into brightly colored bike lanes at intersections. - 20,500 on-road bike parking spaces in the city. - Free city bikes for cycling within the city. - Traffic signals are synchronized at cyclist speeds assuring consecutive green lights for cyclists with flashing lights along bike routes signal cyclists the right speed to reach the next intersection at a green light. - City provided modern magnetic-electric bike lights to 4,000 cyclists for free. - A special vehicle with laser x-ray technology regularly inspects all bike paths and lanes for potential surface repair needs. - Cyclist short cuts to make right-hand turns at normal intersections and exemption from red traffic signals at T-intersections, thus increasing cyclist speed and safety. - Deluxe bike parking garages at the main train station, with video surveillance, special lighting, and music. - Firms provide free bikes for employees to make trips during work hours. - Many intersections are equipped with advanced bicycling waiting positions (ahead of cars) as well as priority traffic signals. - Free-lance trouble shooting cyclists survey bike infrastructure and are paid for each reported necessary repair.</td>
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<tr>
<td></td>
<td>Odense (185)</td>
<td>25%</td>
<td>500 km</td>
<td>- Special program to prevent bike theft, by engraving owner postal code into the frame of the bike to discourage theft. - Large guarded bike parking garages at all train stations. - “Park and Bike” - discount bike rentals for motorists parking car. - Special cycling courses for immigrants women and children. - Strict land use policies keeps settlement dense (75% of residents and 90% of jobs within 3km. - Europe’s first guarded parking facility opened here in 1982, expanded to 30 guarded facilities by 2007. - Extensive bike parking at all transit stops. - Bike network built to avoid traffic lights and speed up bike travel. - Short cuts for bikes at intersections, mid-block connections, and through dead ends for cars.</td>
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<tr>
<td>The Netherlands</td>
<td>Amsterdam (735)</td>
<td>35%</td>
<td>400 km</td>
<td>- Special program to prevent bike theft, by engraving owner postal code into the frame of the bike to discourage theft. - Large guarded bike parking garages at all train stations. - “Park and Bike” - discount bike rentals for motorists parking car. - Special cycling courses for immigrants women and children. - Strict land use policies keeps settlement dense (75% of residents and 90% of jobs within 3km. - Europe’s first guarded parking facility opened here in 1982, expanded to 30 guarded facilities by 2007. - Extensive bike parking at all transit stops. - Bike network built to avoid traffic lights and speed up bike travel. - Short cuts for bikes at intersections, mid-block connections, and through dead ends for cars.</td>
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<tr>
<td></td>
<td>Groningen (181)</td>
<td>40%</td>
<td>420 km</td>
<td>- Special program to prevent bike theft, by engraving owner postal code into the frame of the bike to discourage theft. - Large guarded bike parking garages at all train stations. - “Park and Bike” - discount bike rentals for motorists parking car. - Special cycling courses for immigrants women and children. - Strict land use policies keeps settlement dense (75% of residents and 90% of jobs within 3km. - Europe’s first guarded parking facility opened here in 1982, expanded to 30 guarded facilities by 2007. - Extensive bike parking at all transit stops. - Bike network built to avoid traffic lights and speed up bike travel. - Short cuts for bikes at intersections, mid-block connections, and through dead ends for cars.</td>
</tr>
</tbody>
</table>
2.5.1 The Netherlands
The Netherlands, more than any other country in the world, is famous for its high levels of cycling. The predominance of cycling infrastructure and facilities emphasise the integrated role cycling plays in the Dutch urban landscape (Pucher and Buehler, 2007).

Amsterdam

Amsterdam is often considered to be synonymous with cycling, with cycling accounting for 37% of all personal trips (City of Amsterdam, 2007, cited in Pucher and Buehler, 2007). The mostly flat and largely dense urban environment, coupled with mixed use make Amsterdam a highly appropriate place for cycling. Pucher and Buehler (2007) identify that “Amsterdam’s topography and spatial development patterns are ideal for cycling” (p. 14). The prominence of the cycle can be seen through 50% of inhabitants using the cycle for daily use (City of Amsterdam, 2003a, cited in Pucher and Buehler, 2007). It is the combination of high levels of cycle ownership, restrictive policies on car use and compact and appropriate mixed used development patterns that actively contribute to the cycle success evident (Pucher and Buehler, 2007).

Photo 2: Amsterdam, the Netherlands (Pucher and Buehler, 2007).
Photo 2 highlights the popularity of cycling and the range of people, with women both young and old seen cycling through Amsterdam.

Importantly, Amsterdam’s cycle culture has not always been strong, during the 1960’s and early 1970’s there was great opposition to cycles (Pucher and Buehler, 2007). The transport needs of Amsterdam were understood to have two possible directions;

“Adapting the development patterns and city structure to the automobile OR limiting car access to the city centre and promoting walking, cycling, and public transportation” (Pucher and Buehler, 2007, p. 15; emphasis added).

The recognition and understanding of transport planners and government officials to promote cycling in their city has allowed the success of cycling to occur in Amsterdam, over the private car (Pucher and Buehler, 2008). It is important to recognise that a newly elected council was required to stimulate the focus on the cycle’s role within the transport network in Amsterdam. The policy focus over the next 30-40 year period has seen cycles at the forefront of thinking (Pucher and Buehler, 2007).

Photo 3: Amsterdam, the Netherlands (Pucher and Buehler, 2007).
Photo 3 demonstrates the advanced facilities available to cyclists including detailing the length of any waits.

The direction of Amsterdam’s transport policies will further allow for cycle success to be experienced. The voting by citizens to continue the decrease in car parking in the city centre and increase the cost of those parks still available, highlight the public support that is present in Amsterdam (Pucher and Buehler, 2007).

**Groningen**

Groningen is considered the most cycling oriented city in the Netherlands. The significance of understanding the success of Groningen will assist in the development of a planning framework for Dunedin.

Groningen is significantly smaller than Amsterdam, with only 181,000 inhabitants, of which a large proportion is made up of students, with 46,000 university students (City of Groningen, 2007, cited in Pucher and Buehler, 2007). Groningen has implemented sustainable land and transport policies over decades to achieve the cycle success that is present. The combination of extensive cycle infrastructure, the city’s compact land use and car restrictive measures have ensured the growth of cycling in daily travel (Pucher and Buehler, 2007).

The focus of transport policy in Groningen is succinctly summarised by Pucher and Buehler (2007) who highlight,

> “the main goal of transport policy in Groningen is the perseveration of cycling as a feasible, safe, and convenient means of local travel, thus providing a sustainable alternative to the private car” (p. 21).

What is clearly evident in Groningen is that the focus on personal active transportation modes is fully backed up with appropriate implementation that ensures the goals of active transport are obtained. The ability to possess both active transport direction and implementation ensures Groningen will remain in the forefront of cycle cities into the future.
Photo 4: Groningen, the Netherlands (Pucher and Buehler, 2007).

Photo 4 illustrates the parking facilities that have been implemented in Groningen, and it is evident through this photo that the facility is highly utilised.

Groningen reaffirms the focus on active transport with cyclists and pedestrians having an absolute priority in the city centre (Pucher and Buehler, 2007). The cycle success of Groningen has been attributed to the multidimensional approach to cycle promotion. It is an integrated approach that is important to understand and incorporate into future cycle planning frameworks.

2.5.2 Denmark

Denmark is considered second only to the Netherlands in overall modal share of cyclists. Denmark, similar to the Netherlands, also possesses largely flat topography and a moderate climate that assist in cycle promotion (Pucher and Buehler, 2007). A look into Denmark’s largest city, Copenhagen, will then be followed by Denmark’s leading cycle city, Odense.
Chapter Two Literature Review

Copenhagen

Copenhagen, Denmark’s capital city, with around half a million inhabitants, has the goal of becoming “the best city in the world for cycling” (City of Copenhagen, 2007b, cited in Pucher and Buehler, 2007, p. 25). The direction to achieve this goal involves the expansion of the cycling network along with cycling maintaining its central role in traffic planning within transport policies (City of Copenhagen, 2007b, cited in Pucher and Buehler, 2007).

The Copenhagen experience contrasts the two Dutch examples where no bicycle streets are present, and traffic calming is not undertaken extensively (Pucher and Buehler, 2007). The real success of Copenhagen is entrenched with those who are partaking. City of Copenhagen (2006) identifies the percentage of Copenhagen residents over the age of 40 who cycle regularly increased from 25 % in 1998 to 38 % in 2005 (Cited in Pucher and Buehler, 2007). The health benefits to this particular portion of the population are immense (Banister, 2005).

The perception and actual safety is an important component that is currently being addressed in Copenhagen. The City of Copenhagen highlights that in 2007 only 57 % of cyclists felt safe cycling and the city has set the target of 80 % by 2012 (City of Copenhagen, 2007b, cited in Pucher and Buehler, 2007).

Cycle promotion is also an important component of Copenhagen’s cycle strategy. The two main promotion measures used involve a free bike rental program and an annual survey of cyclists (Pucher and Buehler, 2007). The success of city rental cycle programs within Europe is driving the implementation of such provisions in many global city centres.
Chapter Two Literature Review

Photo 5: Copenhagen, Denmark (Pucher and Buehler, 2007).

Photo 5 demonstrates the practicality of a green wave which allows cyclists to commute into the city without having to stop, providing they keep to the green wave time. The number of people utilising the green wave highlights its effectiveness.

Copenhagen has gone about addressing safety concerns in the past through the extension and improvement of cycle-ways, yet the direction has shifted to now including a direct focus on intersection safety (Pucher and Buehler, 2007).
**Odense**

Odense is considered the premiere cycling city in Denmark, and is the third largest city with 185,000 inhabitants, of which 40,000 are university students (City of Odense, 2007, cited in Pucher and Buehler, 2007). The cycle movement in Odense has developed significantly over the last three decades. From 1984 to 2002, the total number of cycle trips in Odense grew by an impressive 80% (Dutch Bicycling Council, 2006, cited in Pucher and Buehler, 2007).

Photo 6: Odense, Denmark (Pucher and Buehler, 2007).

Photo 6: Odense succeeds in catering for all ages, with this photo demonstrating that men and women of all ages utilise cycling as a form of transport in Odense, Denmark.

The main direction of transport policy has seen the focus on increasing cycling levels while reducing cycling injuries (Pucher and Buehler, 2007). The focus on safety and increasing numbers does not stand out against the other identified cycle cities so far. What are of particular interest in Odense are the extensive multi-faceted marketing campaigns that are aimed at cycling (Pucher and Buehler, 2007). One of the marketing campaigns involves the
promotion of cycle helmets. Odense provided a 50% subsidy on helmet purchases and also combined this with widely advertised safety advantages of helmet use (Pucher and Buehler, 2007). The success of these campaigns is evident through the increase in helmet use in Odense, particularly within children. Odense has also incorporated an educational cycle-game targeted at children, where they cycle through Odense (on the computer) and identify hazards. This allows the development of greater awareness of cycle safety (Pucher and Buehler, 2008). Odense also encouraged more light use at night by offering cyclists free lights that operate without batteries and generate electricity from the cyclists output (Pucher and Buehler, 2007).

Photo 7: Odense, Denmark (Pucher and Buehler, 2007).

Photo 7 illustrates the innovative ways of marketing cycling, as a cycle counter identifies the number of people that have passed this point that day.
Odense includes car restrictive policies, which see the inability for motorists to pass through the centre of Odense (Pucher and Buehler, 2007). The car restrictive policies coupled with cycle promotion and infrastructural improvements assist cycle growth in Odense. Cycle pumps are located throughout the city centre which highlights the high usage of cycles, along with the recognition of the need to provide for the users.

The Odense example is particularly interesting through the exhaustive approach to cycle promotion that has occurred. Pucher and Buehler (2007) importantly highlight that while such promotion is in place, the people of Odense identify with the infrastructural improvements and traffic priority cyclists receive as being of the most fundamental importance. Thus, while marketing is a key component of modal shift promotion, it seems that improvements in actual cycling conditions provide greatest weighting to the public in Odense.

Photo 8: Odense, Denmark (Pucher and Buehler, 2007).

Photo 8 highlights the effectiveness of the green wave, with the lit up signs allowing the cyclist to identify that the speed they are going will continue them on the green wave.
2.5.3 Germany

Germany provides a distinct contrast to both the Netherlands and Denmark, as Germany does not possess a cycle culture that assists modal shift promotion and implementation. The German dependence on the private car has stemmed from the large production manufacturers that are present within Germany (Pucher, 1997). Thus, it is surprising that German cities have undertaken so many policies to promote cycling in their cities.

Berlin

Berlin is Germany’s capital and with a population of 3.4 million, it is on a completely different scale to both Amsterdam and Copenhagen. What is more important to understand is the division between East and West Berlin, with the wall being only removed in 1989 (Pucher and Buehler, 2007). The different experiences of the two sides of Berlin resulted in the provision of cycle facilities on the Eastern side, but a complete lack of in the West. It is further important to understand that Berlin is much more spread out than Amsterdam and Copenhagen and experiences much harsher winters (Pucher and Buehler, 2007). Currently, Berlin has a 10% mode share of all trips made by cycle and when considering the cold winters, automobile oriented transport policies and the population size this is quite encouraging.

Berlin is, however, reforming its transport policies to ensure that the cycle is placed in higher regard. The main driving force for promoting cycling in Berlin is associated with environmental pollution, air quality and a financial crisis (Pucher and Buehler, 2007). The identification of cycle infrastructure being significantly cheaper than private car or train networks is assisting in the promotion of the cycle in Berlin.

A significant proportion of residential streets in Berlin have been traffic calmed (72%, cited in Pucher and Buehler, 2007). The direction of cycling in Berlin is positive with an immediate short term goal to increase the mode share of cycling to 15% of all trips by 2015 (City of Berlin 2007b, cited in Pucher and Buehler, 2007). The direction of the Berlin cycling strategy involves cycling becoming as convenient and safe as possible (Pucher and Buehler, 2007).
The ramifications of the support that cycling is receiving in Berlin should see a positive increase in the number who utilise cycling as a daily means of travel.

Berlin continues its contrasts with the Netherlands and Denmark. It does not have a car free downtown, it does however utilise parking restricted measures in the central city to decrease car use (Pucher and Buehler, 2007). Berlin does place a strong emphasis on integration with public transport and actively works towards creating a fully integrated transport network (City of Berlin, 2007a and 2007b, cited in Pucher and Buehler, 2007). One aspect of this integration is the bike and ride introduction to train stations that allows the public to rent bikes for a short period of time. The successes of the bike and ride programs launched in Berlin are witnessed through the increase in bike and ride bikes that are being provided (Pucher and Buehler, 2007).

Photo 9: Berlin, Germany (Pucher and Buehler, 2007).

Photo 9 demonstrates the rental bikes that have been incorporated into the central city to increase small trips taken by cycle.

The overall success of Berlin’s cycling is still relatively limited; particularly considering the mode share is 10%. It is important to recognise that focus and attention is being directed
toward the increase in mode share of cycles in Berlin. Thus, it seems the future of Berlin will involve a greater number and enhanced environment for cyclists.

*Muenster*

Muenster is considered Germany’s leading cycle city and with a population of 278,000, of which 55,000 are students, it’s a medium sized city in Germany (City of Muenster, 2004 and 2007, cited in Pucher and Buehler, 2007). The cycling culture present in Muenster differentiates itself from Berlin, as there is a long history of cycling in Muenster (Pucher and Buehler, 2007). The climatic conditions present in Muenster can be identified as barriers to cycling as the predominance of cloud and rain, is a discouragement to some. The extent of this discouragement is clearly minimal as Muenster boasts over 35% mode share in cycles, thus dismissing the validity of climatic conditions as being a valid barrier to cycle promotion in Muenster.

The policy direction of Muenster has been to continually improve the cycle provisions in every way possible (Pucher and Buehler, 2007). The direction and focus on cycling emphasises the role the mode plays within the city’s transport network and the recognition given to its many diverse users.

The perception of safety in Muenster is very high for cyclists and subsequently only 2% of adults wear helmets, and around half the children (City of Muenster, 2007, cited in Pucher and Buehler, 2007). The regulation of safety is further ensured through the strict enforcement of cycling regulations, as tickets are regularly given to cyclists breaking rules. Perhaps even more important is the ticketing of motorists who endanger cyclists and pedestrians (Pucher and Buehler, 2007). Effective enforcement is assisted through

“The widespread presence of police on bikes... further legitimises the rights of cyclists” (Pucher and Buehler, 2007, p. 44)

Thus, it seems the city of Muenster is combining an appropriate mix of enforcement that enables the indirect promotion of cycling within Muenster.
Muenster experiences high levels of cycle theft, also commonly felt in the five other cities identified in this section. The City of Muenster (2007) identifies that around 8000 bikes are stolen every year, and the move to discourage bikes thefts has taken priority in cycle planning in the city (cited in Pucher and Buehler, 2007). The more creative and successful measures include cycles possessing a registration number that can aid in determining its rightful owner. This has enabled police to carry out random cycle checks and further deter the act of theft in Muenster (Pucher and Buehler, 2007).

The car restriction policies in place in Muenster replicate Odense and Groningen, much of the central city is off-limits to motor vehicles. The emphasis on pedestrian and cycle activity within the central city allows the generation of more vibrancy and benefits the local businesses located within the central city (Pucher and Buehler, 2007).

Concluding the success of Muenster it is worth mentioning the intrinsic role cycling plays within daily life for many Muenster residents. Pucher and Buehler (2007) identify this intrinsic relationship with cycling,

“For most residents, cycling is the primary means of travel within the city. Bicycling is the dominant transport mode for women as well as men and among all age groups, professions, and income classes” (p. 50).

Muenster can be considered a true cycling success story through the high prominence of cycling within its mode share. This is furthered through the high income levels and high automobile ownership present (Pucher and Buehler, 2007).

The lessons that can be learnt from the six cities mentioned in this section are vast. Of particular importance is the continual identification of wanting to further the success of cycling provisions in their cities. Pucher and Buehler (2007) state,

“Although they already provide excellent overall conditions for cycling, Europe’s best bicycling cities strive constantly to make things even better for cyclists and thus to raise yet further their already impressive cycling levels” (p. 51)

Berlin does experience a different conclusion through being far greater in size and through not experiencing the prominence of the cycle within its transport history. Pucher and Buehler
(2007) identify that it is the economical constraints of the city, coupled with the environmental and social benefits that are promoting the cycle within Berlin. Berlin has gone about capitalising on the benefits of cycling by identifying itself as a “sexy bankrupt city” (Pucher and Buehler, 2007, p. 51), an appeal fully justified through the increasing cycling presence.

2.5.4 Conclusions from Case Studies

It is the multi-faceted implementation strategy that has enabled the Netherlands, Denmark and Germany to further propel its cycle dominance within transport modes (Pucher and Buehler, 2007).

Table 10 interprets the success of these six cities and highlights the characteristics that have assisted modal shift promotion. The understanding of these characteristics is important for contributing to the development of a planning framework for assisting modal shift promotion in Dunedin. It is important to mention that the context, size and population of Dunedin is different to the European case studies, but the characteristics that have been identified could still be transferable.

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<tr>
<th>Country</th>
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Table 10: Characteristics present form the case studies that assisted modal shift promotion.

Table 10 demonstrates that political leadership, infrastructure, cycle culture, spatial planning, marketing, political environment, enforcement, education, car restrictions and integration are all important characteristics in assisting modal shift promotion. The characteristics identified within the six cities varied, which emphasises the potential role of a city’s context, yet the similarities in the characteristics present in assisting modal shift promotion highlight the validity of their roles. The identification that prominent universities are apparent in the cities with the highest modal share in each country is important to consider when relating the findings of the case studies to the Dunedin context, which also has a university that is substantial in relation to the size of the city.

It is from the interpretation of Table 10 and the findings of the literature review that the development of a conceptualisation of the characteristics important for modal shift promotion can be undertaken. Figure 3 represents the integrated requirement of characteristics important for assisting modal shift promotion, as identified by literature and case studies. The nine characteristics have examples provided that illustrates how the characteristics have been successful in other cities. The characteristics all overlap within integration and each other. This highlights the importance of integration when incorporating the characteristics.
**Figure 3: Characteristics identified in literature and case studies as important in assisting modal shift promotion**

- **Infrastructure**
  - **Intersection modifications:** Advance green waves and stop lines.
  - **High quality cycle facilities:** Parking and changing facilities.

- **Cycle Culture**
  - **Cycle Culture:** The presence of a culture that encourages cycling is fundamental. The incorporation of public buy-in into the modal shift promotion process is critical.

- **Spatial Planning**
  - **Spatial Planning:** The integration of land use planning policies that ensures mixed use and compact urban forms help assist modal shift promotion.

- **Marketing**
  - **Promotion:** Free bike rental program within central city.
  - **Innovation:** Bicycle website with information on routes, activities, health benefits etc.

- **Car Restrictions**
  - **Parking:** Restricting parking assists other modes.
  - **Access:** Preventing easy access to central city.
  - **Cost:** User pays – true cost.

- **Political Environment**
  - **Political Environment:** The introduction of a new political focus. The incorporation of policies that seek to prioritise active transportation and restrict the private car.

- **Enforcement**
  - **Enforcement:** Placing the onus on the motorist so that pedestrians and cyclists have full rights on the road.

- **Education**
  - **Childhood:** Educating children to safe cycle practices.
  - **Motorist:** Creating awareness of private cars users.
2.6 Literature Review Conclusion

The literature review has allowed the identification of characteristics important for assisting modal shift promotion, along with the benefits of a modal shift and the barriers present to a modal shift occurring. The case studies analysis of successful cycle cities has contributed to a practical interpretation of the characteristics identified in section one of this literature review. Figure 3 has summarised the characteristics of both the literature review and the case studies. The literature review has shaped the methodology that follows this chapter. It is in the methodology that an understanding of the research process will occur.
3. Methodology

International approaches to modal shift promotion were explored in the reviews of theoretical and practice based literature in Chapter Two. This included the identification of important characteristics for modal shift promotion, benefits of modal shift promotion occurring and barriers to modal shift promotion. The development of a conceptualisation of characteristics important for modal shift promotion based on the theoretical and practice-based international literature occurred in the previous chapter. This chapter outlines the research methodology designed to develop a planning framework for assisting modal shift promotion in Dunedin. This methodology focuses on identifying the perspectives of different key stakeholders towards the development of a planning framework to assist modal shift promotion. The chapter begins with a description of the general research approach adopted in this study. The ethical considerations, processes of data collection and analysis along with the identification of methodological issues encountered during research will follow the research approach.

3.1 Research Approach

Even if not explicitly articulated, all research is guided by a set of philosophical assumptions that form a theoretical framework (Kitchin and Tate, 2000). The specific theoretical framework subscribed to by researchers shapes how the research is conceptualised and how data is collected, interpreted and reported. It affects the choice of theories, approaches and methods utilised (Gray, 2009). The epistemology, how knowledge is derived or arrived at (Kitchin and Tate, 2000), for this research will involve a critical inquiry of modal shift promotion. The investigation of the mechanisms and structures of social relations will be undertaken to assist in an interpretation of modal shift promotion in Dunedin.

The research approach involves the interpretation of the way theory on active transport planning, cycle planning and cycle practice are interrelated when considering a planning framework for assisting modal shift promotion. Figure 4 represents the three areas of planning theory and practice that are entwined with this research process. Figure 4 demonstrates that in
order to develop a planning framework for modal shift promotion the understanding of their integration needs to occur. It is the interpretation of this integration that has led to the development of the cycle practice case studies in the literature review.

Figure 4: The integration of planning theory and practice that shapes this research on modal shift promotion.

A qualitative approach has been adopted for this research, which will involve an international literature review, case studies and key informant interviews. Sarantakos (1998) illustrates that a qualitative approach to research can allow for the capturing of reality as experienced by key stakeholders in the location being researched. The features of qualitative research were understood to be important for determining the different perspectives on active transport planning, cycle planning and cycle practice that will allow for the development of a planning framework.
3.2 Positionality

The importance of outlining the position of oneself in relation to the research field will assist in the understanding of the direction this research takes (Kitchin and Tate, 2000). The researcher has an upbringing in Christchurch where active transportation was a common mode utilised for daily travel by the researcher. The move to Dunedin to undertake university has contributed to a shift of active transportation modes from cycling to walking. The interest in active transportation has stemmed through the awareness of the current predicaments the world is facing. An attempt has been made to develop a research topic that will assist Dunedin’s active transport in the future. It should be noted that while cycling was common in Christchurch, very limited cycling has occurred in Dunedin. This is why a research study promoting a modal shift in Dunedin to cycling is being undertaken. The understanding of the researcher’s positionality is important to assist the knowledge and implications that can come out of this research.

3.3 Ethical Considerations

Ethical standards are an integral part of any research methodology (Sarantakos, 2005), thus, ethical approval was gained from the University of Otago Ethic’s Committee prior to fieldwork commencement. Likewise, the thesis was designed around the five common principles of ethics presented by Davidson and Tolich (2003). These include; do no harm; voluntary participation; preserve participant’s anonymity and confidentiality; avoid deceit and; analyse and report data faithfully.

All participants in the research participated of their own accord and their participation was entirely voluntary. The details of the research were explained to all participants before interviews took place, they were made aware that they did not have to answer any question if they were uncomfortable doing so, and they could end the interview at any time. This was detailed in an information sheet presented to key informants before their involvement (Appendix A). Written consent was obtained from all participants prior to interviews beginning, apart from phone interviews when verbal consent was gathered. All participants
Chapter Three Methodology

were guaranteed personal anonymity and can obtain a copy of results from the researcher if they wish.

3.4 Research Methods

Triangulation is a process that allows researchers to draw upon many different perspectives and sources through the course of their work, using different bearings to find the correct position (Gray, 2009). Triangulation also allows researchers to utilise the strengths of each method to overcome the deficiencies of the others, thus producing more valid and reliable results and recommendations (Sarantakos, 2005). Therefore, in order to obtain the most valid and reliable results a comprehensive understanding of the characteristics, benefits and barriers to promoting a modal shift in Dunedin will be undertaken through two methods of data collection. The two main research methods used in this study, namely, a literature review and key informant interviews are described in this section.

3.4.1 Literature Review
The aim of a literature review is “multi-faceted”, it states what the research is about, clarifies and organises the research, and demonstrates the relevance of the research by making connections to an existing body of knowledge (Davidson and Tolich, 2003). A good knowledge of relevant literature is vital for the formulation of the research design, as it provides starting points for thought and highlights areas to investigate (Flowerdew, 2005). Secondary data was used to provide an overview of international literature and allow the development of a body of knowledge on modal shift promotion. A general scoping of literature was conducted, before the theme of modal shift promotion was settled on as the research framework for this study. This narrowed the focus of the literature review to the topic areas of characteristics for modal shift promotion, benefits of modal shift promotion and barriers to modal shift promotion. The sources that formed this literature review included academic books and journals, council documents, legislation and online documents. A conscious effort was made to consult the most contemporary sources in each topic area.
Chapter Three Methodology

The case studies were incorporated in the literature review to provide a practical planning application to the promotion of a modal shift. The selection of three different countries that have experienced cycle success allowed for the wider recognition of the characteristics important for assisting modal shift promotion. The case studies further allowed for the development of a gap analysis where the successful characteristics identified in the literature and case studies contribute to the line of questioning within the key informant interviews that allow for determining current deficiencies in the Dunedin context.

3.4.2 Key Informant Interviews

Primary data collection involved semi-structured interviews with key representatives, and occurred in Dunedin and on the phone over the period of the 8th June to 18th of June 2010. Interviews were held with sixteen key informants, who were representatives of the different organisations, agencies and sectors relevant to modal shift promotion within Dunedin and New Zealand. Table 11 lists the key informants and the sector of the community they represent. Potential participants were identified and contacted prior to the commencement of fieldwork, or as a result of snowballing – using one contact to help recruit another (Gray, 2009) – and were approached by either email or phone. Interviews took place in the key informants own environment, at a time that was suitable for them. This helped facilitate a more relaxed conversation, and allowed the researcher a potentially greater understanding and experience of the key informant’s point of view (Gray, 2009). Both face to face and phone interviews were recorded using a dictaphone.

Semi-structured interviews enabled predetermined questions (Appendix B) to be posed to the key informants, at the same time as allowing for flexibility in the way the issues were addressed, and how the interview proceeded (Gray, 2009). This format allowed the key informants to respond in their own terms, and to address areas that had not previously been considered by the researcher (Gray, 2009).
### Key Informant Number

<table>
<thead>
<tr>
<th>Key Informant Number</th>
<th>Representative of</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>New Zealand Transport Agency (Dunedin)</td>
</tr>
<tr>
<td>2</td>
<td>University of Otago</td>
</tr>
<tr>
<td>3</td>
<td>Advocacy Group</td>
</tr>
<tr>
<td>4</td>
<td>University of Otago / Advocacy Group</td>
</tr>
<tr>
<td>5</td>
<td>Dunedin City Councillor</td>
</tr>
<tr>
<td>6</td>
<td>Dunedin City Council</td>
</tr>
<tr>
<td>7</td>
<td>Advocacy Group</td>
</tr>
<tr>
<td>8</td>
<td>New Zealand Transport Agency (National)</td>
</tr>
<tr>
<td>9</td>
<td>New Zealand Transport Agency (Dunedin)</td>
</tr>
<tr>
<td>10</td>
<td>New Zealand Police (Dunedin)</td>
</tr>
<tr>
<td>11</td>
<td>Advocacy Group</td>
</tr>
<tr>
<td>12</td>
<td>Otago Regional Council</td>
</tr>
<tr>
<td>13</td>
<td>Advocacy Group</td>
</tr>
<tr>
<td>14</td>
<td>Dunedin City Council</td>
</tr>
<tr>
<td>15</td>
<td>Dunedin City Council</td>
</tr>
<tr>
<td>16</td>
<td>Cycle Planning Consultancy (Christchurch)</td>
</tr>
</tbody>
</table>

Table 11: List of Key Informants.

### 3.5 Data Analysis

The aim of data analysis is to search for “patterns and regularities in the data collected” (Davidson and Tolich, 2003, p. 154). Data analysis is undertaken to make sense of the information collected and to identify the meaning contained in that information. Davidson and Tolich (2003) identify three steps to data analysis: data reduction, data organisation and data interpretation. The data analysis process is undertaken for the key informant interviews that make up the primary research on modal shift promotion.
3.5.1 Data Reduction
Data reduction involves reducing the vast volumes of data collected into a manageable form (Davidson and Tolich, 2003). The first steps of data reduction occurred while still in the field with transcripts being transcribed, enabling the researcher to build upon emerging themes in further interviews, and recognise and steer away from irrelevant themes and topics. As the majority of the data collected was qualitative in nature it was necessary to compile summaries of interview transcripts.

3.5.2 Data Organisation
Data organisation is the organisation of information around themes (Davidson and Tolich, 2003). This involved the formulation of key themes on the characteristics, benefits and barriers of modal shift promotion. Interview transcripts were coded in light of these themes, and quotes and concepts were compiled into lists and matrices. The three key themes were then broken down into sub-themes. The data organisation process allowed for interpretation of the themes and their relationships.

3.5.3 Data Interpretation
Data interpretation is the use of the organised data to make and draw conclusions (Davidson and Tolich, 2003). Data was presented in two different sections based on characteristics and barriers of modal shift promotion in Dunedin and benefits of modal shift promotion in Dunedin. The results were presented within these sections under sub headings and through the use of quotes and tables. The patterns and regularities identified through the organisation of the data collected were used to draw conclusions and make recommendations to the Dunedin City Council and New Zealand Transport Agency. Further support for the conclusions and recommendations was gained from reference to existing academic literature in the Discussion Chapter.
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3.6 Reflections

The research design and methods discussed above were chosen as the most appropriate means of addressing the aim and objectives of the research in light of the context and available resources. A number of limitations encountered during the research will be identified. It is important that limitations are understood and acknowledged to further inform those utilising this research.

The research design of this study could have been improved if a more comprehensive gap analysis was undertaken. This would have allowed for the identification of the current inefficiencies of Dunedin’s cycle facilities which would have assisted the interpretation of the gap between theory and practice. The gap analysis that was undertaken was limited in scope and would have been more comprehensive if ground assessments of Dunedin cycling infrastructure and facilities occurred, and, therefore, enabled the direct comparison between the theory and practice identified on infrastructure and facilities within the literature review.

Another limitation in the research design was evident through the reliance on European literature on the characteristics important for modal shift promotion. The substantial portion of academic literature that was incorporated into the literature review was from a European context. The limitation that predominance may have on this research is hard to determine, but a wider look into the field of characteristics from less successful cycling cities may have in turn strengthened the research process.

Finally, data collected from key informants was at times difficult to analyse and compare due to the interviews being semi-structured and the extensive variance between key informants, both in role, knowledge, relevance to subject, and their willingness to share knowledge and opinions. Such limitations are expected when using semi-structured interviews, and as such were expected. Despite this, semi-structured interviews were the most appropriate method to use within the qualitative research framework employed.
3.7 Conclusion

This chapter outlined and justified the methodological framework employed to carry out the research. It discussed the theoretical framework, ethical considerations, research methods and processes of data analysis. It also reflected upon the limitations of the overall research process. Despite the limitations identified the methodological framework was appropriate and successful, allowing the research questions and objectives to be addressed. The following Chapter presents the context of this research.
4. Chapter Four Context

This Context Chapter provides an assessment of the current state of cycling in New Zealand and Dunedin. Statistical data outlining travel modes, cycling levels and differences within these will be outlined. The political environment will be considered, along with the associated policies and strategies. The focus will then shift to the Dunedin context, the focus of this research, where statistical data, the political environment and the University of Otago will all be incorporated into the contextual understanding. The relevance of undertaking a Context Chapter is through the ability to understand the background of the research within the context being looked at.

4.1 Comparing Personal Travel Modes in New Zealand

New Zealand has experienced a drop in cycling numbers over the last two decades however this drop is beginning to plateau. The Ministry of Transport undertakes an annual Household Travel Survey of 4600 households (prior to 2008 it was only 2200 households) (Ministry of Transport, 2009). Every person in the household is interviewed about their travel and travel-related information. The New Zealand Household Travel Surveys

“Are the most comprehensive source of information on national patterns of travel, and the most recent survey illustrates how car dependent this country is. 81 percent of total travel time was spent as a passenger or driver in a private motor vehicle, 12 percent on foot, and about 1 percent travelling by bicycle” (Woodward and Lindsay, 2010; cited in Howden-Chapman et al., 2010, p. 58)

The significance of utilising and understanding these household travel figures on transport assists in providing a contextual background to the New Zealand situation.
The Household Travel Survey provides statistical information on the types of personal travel modes that New Zealanders utilise for daily travel. It is important to interpret the findings of these surveys to allow for an understanding of the current cycling context in New Zealand. Figure 5 highlights the predominance of the private car over 2005-2009 periods, within New Zealand’s mode of choice. Figure 5 identifies 76% of the total travel time for those surveyed occurs as either the driver or a passenger in a private car or van. In contrast to the private car, the cycle accounts for only 2% of the total travel time of those surveyed.

Figure 5: Share of Transport (Taken from Cycling for Transport; Ongoing New Zealand Household Travel Survey 2005-2009)

Figure 6 emphasises the change in annual travel time over the last two decades. The increase in the car/van driver and passenger travelling time identifies the growing role the private car is playing in New Zealand society. The annual time spent cycling has decreased over this period.
Figure 6: Trends in annual travel time by mode (Taken from Cycling for Transport; Ongoing New Zealand Household Survey, 2009)

A New Zealand Transport Agency research report on the state of walking and cycling in New Zealand, surveyed over 8000 respondents to determine people’s willingness to change their mode of transport. Table 12 illustrates the mindset of New Zealander’s willingness to change mode of transport when undertaking a short journey in fine weather conditions with nothing to carry.

<table>
<thead>
<tr>
<th>Stage of change</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not even consider using a bicycle [Precontemplation]</td>
<td>41.1</td>
</tr>
<tr>
<td>Realise that you could use a bicycle but wouldn't actually do it [Contemplation]</td>
<td>13.6</td>
</tr>
<tr>
<td>Think seriously about the pros and cons of cycling but rarely do it [Ready for action/Preparation]</td>
<td>8.0</td>
</tr>
<tr>
<td>Try cycling on some occasions [Action]</td>
<td>17.6</td>
</tr>
<tr>
<td>Cycle quite often [Maintenance1]</td>
<td>9.8</td>
</tr>
<tr>
<td>Almost always cycle [Maintenance2]</td>
<td>4.7</td>
</tr>
<tr>
<td>Not answered</td>
<td>5.2</td>
</tr>
<tr>
<td>Total (n=8163)</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table 12: Identifies respondent’s mindset to change mode of transport when the conditions are conducive for change (Sullivan and O’Fallon, 2006).

It is important to understand this behavioural choice as it contributes to the interpretation of characteristics important to considering assisting modal shift promotion. Table 12 indicates that over 40 % of people did not even consider using a cycle, along with a further 13 % who realised the opportunity to utilise a cycle but would not act on this realisation. The results suggest that the opportunity to change modal choice for these trips is possible to a significant portion of the population, with 25 % either thinking seriously or cycling on occasions. The results from this New Zealand Transport Agency research report indicates that the behavioural culture present in New Zealand should be considered when developing a planning framework for modal shift promotion (Sullivan and O’Fallon, 2006).
4.2 Current Political View

The current political view towards cycling and active transport can be interpreted through both the Government Policy Statement on Land Transport Funding (2009) and the New Zealand Transport Strategy (2008). The New Zealand Transport Strategy (2008) has become largely void due to the change in central government and the published Government Policy Statement (2009) has taken precedence. It is the Government Policy Statement on Land Transport Funding (2009) that outlines the current focus on spending on transport funding and the vision for the next ten year period.

“The government’s priority for its investment in land transport is to increase economic productivity and growth in New Zealand... Investing in high quality infrastructure projects that support the efficient movement of freight and people is critical” (GPS, 2009, p. 1)

The direction of the incoming central government in 2008 changed the focus of transport funding and its impact on active transport in New Zealand. Figure 7 highlights the significance of the Government Policy Statement and shows its integration and relationship with other key statutory requirements.
The Government Policy Statement also highlights Roads of National Significance (commonly known as RONS), of which there are seven, all of which “are essential and require significant development to reduce congestion, improve safety and support economic growth” (GPS, 2009, p. 9). While the Government Policy Statement (2009) has outlined the focus on economic growth and freight mobility, it is significant to outline that a reduction in congestion, improvement in safety and support for economic growth can all occur when a move toward active transport is undertaken, as identified in the literature review.

The Minister of Transport, Steven Joyce, illustrates that “84% of people go to work by car, truck, or motorbike, so we need good roads to move freight and people” (GPS, 2009, p.1). The direction of the current central government toward transportation can be understood through the provision of roads for this 84%. This approach had been undertaken by the United States of America decades ago, and the consequence of this approach led to an automobile dependence which is only now being addressed (International Technology Scanning Programme, 2010).

The Land Transport Management Act (2003) requires the Government Policy Statement to contribute to the aim of achieving an “affordable, integrated, safe, responsive and sustainable land transport system, and also to each of the following:

- Assisting economic development
- Assisting safe and personal security
- Improving access and mobility
- Protecting and promoting public health
- Ensuring environmental sustainability”

The emphasis of the Government Policy Statement (2009) is quite clearly on economic development and this is at the cost of wider social mobility, public health and particularly the environment, all of which are identified as being important within the Land Transport Management Act (2003).

The New Zealand Transport Strategy (2008) was implemented by the previous government and provides a long-term perspective and direction to the transport sector. The current
government and Government Policy Statement identifies that “it generally supports the overall intent of the New Zealand Transport Strategy, but considers that moving too quickly on modal shift will have a negative impact on environmental and economic efficiency” (GPS, 2009, p. 11). Therefore, the direction that the previous central government were heading involved a move toward a modal shift, whereas this is not apparent within the current central government.

The New Zealand Transport Agency outlines the goal of “increasing the availability and use of public transport, cycling, walking, and other shared and active modes”. This goal is not one that is prioritised in the current government’s regime. The New Zealand Transport Strategy reaffirms its direction when stating,

“Increasing the use of public transport, cycling, walking, and other shared and active modes are important in reducing congestion, fossil fuel consumption and greenhouse gas emissions from transport. Active modes will also contribute to improving public health and the vibrancy of urban areas. Increasing the availability and accessibility of shared and active modes will help improve people’s ability to participate in society” (NZTS, 2008, p. 8)

It is the identification that the previous government made within the New Zealand Transport Strategy that highlights the potential future of transport in New Zealand, if that government had stayed in place. The identification of an objective that outlines an “Increase walking, cycling and other active modes to 30% of total trips in urban areas by 2040” (NZTS, 2008, p. 17) affirms the priority the previous government had toward active transport and a modal shift.

The New Zealand Transport Strategy while being overshadowed by the Government Policy Statement is still fundamental to consider with regard to the direction the previous government was heading. The longer focus of the New Zealand Transport Strategy, having a 30 year vision, shows commitment to a solution for New Zealand transport, and whether the vision is shared by all is clearly going to contribute to its ability to achieve the objectives.

The current New Zealand government has incorporated the development of the national cycleway project into its agenda, whilst primarily aimed at tourism; it will also assist in the promotion of cycling as a form of transport in New Zealand (Ministry of Transport, 2010). The significance of a national cycleway is that it could enhance the experience of cycling in
New Zealand and consequently have an effect on the direction of future policies. It can be understood as an economic investment currently with the focus of generating cycle tourism, yet this does have positive aspects to everyday cycling in New Zealand also.

4.3 Current Policy

The previous government commissioned a New Zealand walking and cycling strategy – best practice in 2005 Land Transport New Zealand Research Report 274 (MacBeth, Boulter and Ryan, 2005) with the finished product outlining the direction required for both local and central government toward achieving modal shift promotion. The recognition initially within this document, now slightly outdated, identified the change occurring within the New Zealand transport network.

“A number of significant policy and legislative changes in recent years have occurred such that walking and cycling are now being actively encouraged, at both a national and local level” (MacBeth et al., 2005, p. 7).

The identification that times were changing and that New Zealand was moving towards being able to achieve forms of modal shift, towards active transportation, were outlined (MacBeth et al., 2005). The direction and impetus within this document has become overshadowed by the current central government focus, and the funding associated with the new government direction.

The Government Policy Statement (2009) outlines activity class funding ranges for the 2009/10-2018/19 period. Walking and cycling facilities receive a funding range of $10-25 million and this range extends to $12-30 million over the next ten year period. In contrast the public transport services and public transport infrastructure receive a combined funding range of $205-315 million in 2009/10 up to $320-405 million in 2018/19, thus highlighting the extensive funding being put into public transport, despite the modal share being similar to that of walking and cycling.
The 2005 best practice guideline to walking and cycling states that “a strategy is only as good as its implementation. Successful implementation will take hard work, perseverance and collaboration amongst all its stakeholders” (MacBeth et al., 2005, p. 9). The collaboration that is being referred to is an important characteristic for assisting modal shift promotion, as identified in the literature review. It is the vision toward an increase in walking and cycling for enjoyment and transport that is sought. The Land Transport New Zealand Research Report 274 (2005) guideline also importantly highlights that walking and cycling are

“the most sustainable modes of transportation; easily affordable relative to private motor vehicles and public transportation systems; easily integrated with other transport systems and modes; responsive and adaptable to changes such as fuel shortages and price increases; intrinsically safe – only when motor vehicles dominate in terms of speed or traffic volumes do walking and cycling have negative safety implications” (MacBeth et al., 2005, p. 10)

The identification of the appropriateness of walking and cycling within New Zealand society stresses the role active transportation should play to ensure New Zealand can succeed as a country. The Land Transport New Zealand Research Report 274 (2005) also distinguished between a strategy and strategic plan. It determined that

“A walking and cycling strategy is a high level document that provides for the framework and direction of walking and cycling. A walking and cycling strategic plan is a document at the local level that has the purpose of identifying activities that encourage more people to walk or cycle” (MacBeth et al., 2005, p. 10).

The understanding of the distinction between a strategy and a strategic plan is required at both local and national level government when working towards planning development in the future, and recommendations that result from this research.

The consideration of the New Zealand context for active transport and cycling, along with the national level political environment has been outlined. The direction now considers the Dunedin context which is the case specific study for this research.
4.4 Dunedin

Dunedin has an urban population of 115,000 people, which makes it the second largest city in the South Island. The 20,000 student population is growing and adds to the vibrancy of Dunedin (Campus Master Plan, 2010). The private car is the main mode of transport utilised in Dunedin, with over 75% of daily trips utilising the private car (Statistics New Zealand, 2006).

4.4.1 Dunedin Cycling Strategy

The Dunedin Cycling Strategy was implemented in 2004. The direction and vision of this strategy is important to outline in this context, due to the focus on Dunedin. While this strategy is significant in understanding the direction of cycling in Dunedin over the past 5-6 years, there is currently a new Dunedin Cycling Strategy being drafted so the previous document will not be drawn on in detail.

The Dunedin Cycling Strategy outlines the requirements for cycle growth in Dunedin where it states,

“Cycling must be promoted within an integrated transport system for Dunedin. This integration will be achieved by ensuring that the policies and strategies relating to amenity, traffic management, road safety, parking, public transport, walking and cycling are effective and properly integrated” (DCS, 2004, p. 2)

The direction outlined in the Dunedin Cycling Strategy identifies the impetus that is beginning to develop in Dunedin. Three objectives within this strategy are: Objective 1 states “increase the proportion of people who cycle to work from 2.9% of all commuters in 2001 to 3.8% (increase of 30%) by 2006 and to 4.9% (increase of 70%) by 2011”; Objective 2 is “Increase the numbers of people participating in cycling for recreational, health and fitness purposes by 2010”; and Objective 3 states “Decrease the number of casualties resulting from crashes between cyclists and vehicles by 6% per annum” (Dunedin Cycling Strategy, 2004, 4). The direction of the objectives are positive, yet the question over whether these objectives have been meet needs to be addressed to ensure that cycling in Dunedin is moving forward.
The Otago Daily Times, local newspaper in Dunedin, recently published a feature on ‘planning to pedal’ in which it assessed the experience of cycling in Dunedin. The Dunedin Cycling Strategy set a target for the Council to create 5 km of new cycleway each year with Table 13 outlining the achieved distances to date. The table outlines that the 5km target has been meet in 2 of the last 6 years.

<table>
<thead>
<tr>
<th>Distance Achieved</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002-03</td>
</tr>
<tr>
<td>2003-04</td>
</tr>
<tr>
<td>2004-05</td>
</tr>
<tr>
<td>2005-06</td>
</tr>
<tr>
<td>2006-07</td>
</tr>
<tr>
<td>2007-08</td>
</tr>
</tbody>
</table>

Table 13: Identifying the distance of cycleways built in Dunedin each year since the Dunedin Cycle Strategy implementation in 2004 (taken from Otago Daily Times, Saturday July 10th, 2010).

The new Dunedin Cycle Strategy will be released next year, with hope that it will have a stronger impact on the Dunedin setting to ensure that cycling experiences continued growth.

4.4.2 Lessons for Dunedin
The Dunedin City Council undertook a funded research report looking at the United Kingdom Cycling Demonstration Towns Initiative and determining the transferable lessons for Dunedin in commencing the review and redevelopment of the Dunedin Cycling Strategy. The transferable lessons for Dunedin will be outlined in this context to help further understand the Dunedin environment.

One of the conclusions emphasised in the report was that the key to increasing the number of people cycling is through addressing a behaviour change in Dunedin (Dunedin City Council, Research Report on UK Demonstration Towns, 2009). Another conclusion drawn from this
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research report was that a community based social marketing approach would be beneficial over traditional promotional methods.

The report also highlighted characteristics important for cycling in Dunedin. These included political and public buy-in, community consultation, education, workplace and school travel plans, low cost infrastructure and further identification of the economic potential of cycling (Dunedin City Council, Research Report on UK Demonstration Towns, 2009). The recognition that aspects of these conclusions will be important to incorporate into the development of a planning framework assisting modal shift promotion in Dunedin highlights the appropriateness of their inclusion in this Context Chapter.

4.4.3 University of Otago
The University of Otago, as Dunedin’s largest employer, plays a dynamic role in the city. The current stance on cycling within the university is constricted through not being able to ride on campus. The University of Otago has recently had a Master Plan developed to provide direction and vision for the next 20 years. The developed Master Plan recognises the need for a sustainable campus and further identifies the universities role within Dunedin. “Universities as educators are seen as leaders rather than followers by their communities and might therefore be expected to play a vital role in moving the sustainability agenda forward” (University of Otago Master Plan, 2010, p. 166). The identification of the role that the University of Otago could play within Dunedin provides consideration when assessing the context of Dunedin. The prominence of cycling in the developed University of Otago Master Plan (Master Plan) is limited. The Master Plan identifies three points for the university to consider on cycling.

“Firstly, confirm the current campus cycling policy which identifies areas on campus where cycling is prohibited in order to assure pedestrian safety. Secondly, introduce a new policy for the provision of built-in bicycle racks as part of all new building works. Thirdly, strengthen existing, and provide new cycle paths as part of the street landscaping upgrades” (University of Otago Master Plan, Chapter Three Dunedin Master Plan Frameworks 2010, p. 53).

The identification within the Master Plan that provisions for cycling is important needs to be integrated in practice. The realisation that the current campus cycling policy inhibits the
experience of cyclists on campus will be important to address if cycle growth on campus is to occur.

The Master Plan provides an outline of the current transport modes utilised by staff and students to the Dunedin Campus along with targets for 2020 and 2030 within the Master Plan. Table 14 outlines these transportation targets alongside the current transport being utilised in Dunedin to campus.

<table>
<thead>
<tr>
<th>Transport Modes to Dunedin Campus</th>
<th>Current</th>
<th>Mid-Term 2020</th>
<th>End Term 2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>79% students walk</td>
<td>79% students walk</td>
<td>79% students walk</td>
<td></td>
</tr>
<tr>
<td>18.5% staff walk</td>
<td>25% staff walk</td>
<td>25% staff walk</td>
<td></td>
</tr>
<tr>
<td>3% students cycle</td>
<td>11% students cycle</td>
<td>10% students cycle</td>
<td></td>
</tr>
<tr>
<td>9% staff cycle</td>
<td>17% staff cycle</td>
<td>11% staff cycle</td>
<td></td>
</tr>
<tr>
<td>1% students use bus</td>
<td>10% students use bus</td>
<td>17% students use bus</td>
<td></td>
</tr>
<tr>
<td>6% staff use bus</td>
<td>25% staff use bus</td>
<td>10% staff use bus</td>
<td></td>
</tr>
<tr>
<td>16% students drive</td>
<td>0% students drive</td>
<td>0% students drive</td>
<td></td>
</tr>
<tr>
<td>66% staff drive</td>
<td>33% staff drive</td>
<td>0% staff drive</td>
<td></td>
</tr>
</tbody>
</table>

Table 14: Adapted from University of Otago Master Plan, Chapter Ten, p. 167)

It can be interpreted from Table 14 that the current transport modes to the Dunedin Campus mainly involve walking and driving. Currently 79 % of students walk to university, compared with just 18.5 % of staff. The significant difference in walking to campus is primarily associated with students living within walking distance and staff not. Just 3 % of students currently cycle to university compared with 9 % of staff. The low percentage of students that currently cycle could be attributed to the provisions for cycling, the university cycle policy and the proximity of their homes to the university, and therefore walking. The role of the private car is seen through 16 % of students and 66 % of staff driving to campus. The
sustainability of such a dependence on the private car is emphasised by the Master Plan that seeks to reduce these percentages to 0% by 2030.

The Master Plan does outline,

“It is proposed that there be ongoing active promotion of alternative travel methods including walking and cycling, public transport, car sharing and active strategies to encourage an increase in the population density of residential precincts close to the University through managed development within achievable walking distance of the campus” (University of Otago Master Plan, 2010, p. 57).

An appreciation of the current and future University of Otago transport uses coupled with the role of the university as an integral part of Dunedin has been understood through this Master Plan.

4.4.4 Tertiary Precinct Development Plan
The Tertiary Precinct Development Plan (2008) identifies transportation objectives and issues within the North Dunedin area. Three of the objectives are worth identifying for this research;

“Create a pedestrian and cycle oriented tertiary precinct with good links to the campus area and the city; Develop an environment that reduces car dependency and encourages alternative forms of transport; and Short-term solutions are developed to encourage pedestrian priority and ease car dominance in the campus area” (Tertiary Precinct Development Plan, 2008, p. 20).

The three objectives highlighted all identify positive attitudes toward addressing the car dominance alluded to. The Tertiary Precinct Development Plan (2008) also identifies current transportation issues. Again there are three issues that are important to highlight for the Dunedin context;

“From 1991 to 2001 there was a 495% increase in dwellings with three or more cars in the North Dunedin area, compared to 21% in the rest of Dunedin; High dependence on cars as a form of transport; and Lack of continuous cycling routes through the campus” (Tertiary Precinct Development Plan, 2008, p. 20).

The objectives and issues that the Tertiary Precinct Development Plan (2008) identifies are relevant for providing an understanding of some of the current issues in Dunedin. The
recognition that there are issues within the current personal transport in North Dunedin highlights the importance of integrating the University of Otago into the planning framework.

4.4.5 Advocacy Groups
Dunedin has three main advocacy groups that promote cycling. Spokes Dunedin, Two Tunnels Trust and Mountain Bike Otago all partake prominently in promoting cycling in Dunedin. The knowledge and enthusiasm that is present in some of these advocacy groups make them a worthwhile consideration when incorporating a planning framework within Dunedin.

4.5 Conclusion of Context Chapter
This Context Chapter has established the current New Zealand and Dunedin environments and allowed for an understanding of the way cycling is currently experienced at a national and local level in Dunedin. The next chapter in this research is the Results Chapter that identifies the research results.
5. Chapter Five Modal Shift Promotion in Dunedin

5.1 Introduction

This result’s chapter addresses the first three research questions in turn, namely, to identify the important characteristics to assist modal shift promotion in Dunedin, to illustrate the barriers to a modal shift occurring in Dunedin and to identify the benefits of a modal shift in Dunedin. The results presented in this chapter involve that of primary research conducted through Key Informant interviews. Six predominant themes emerged as characteristics important for assisting modal shift promotion, and barriers to a modal shift occurring in Dunedin. These six themes are; infrastructure, political environment, education, culture, funding and university. Other characteristics and barriers will also be identified in this results chapter. The results of benefits of modal shift promotion occurring will be outlined following the characteristics and barriers. The main themes for benefits of modal shift promotion are health, economic and social.

This results chapter begins with Table 15 summarising the perceptions by Key Informants when asked about the opportunity for an increase in cycling in New Zealand. The results indicate unanimous support across Key Informants for cycling growth in New Zealand.

<table>
<thead>
<tr>
<th>Key Informant</th>
<th>Do you believe that there is an opportunity for an increase in the number of people cycling in New Zealand?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>“I think there is room for a modal shift”</td>
</tr>
<tr>
<td>3</td>
<td>“A lot of people would like to cycle but people don’t feel safe to do so”</td>
</tr>
<tr>
<td>4</td>
<td>“Yes, I think we are starting to see it. There is clearly opposition at the national level to that happening”</td>
</tr>
<tr>
<td>5</td>
<td>“You have got a roading corridor that meets the demand from the community”</td>
</tr>
</tbody>
</table>
“Absolutely. This government in particular is quite short sighted. It seeks only to achieve quick economic returns, it is not thinking long term”

“Absolutely, most definitely, we lag behind in many respects, especially transportation planning. Cycling has moved from a regular form of transportation into an extreme recreational activity, even though this shouldn’t be the case”

“Absolutely, there is a huge opportunity”

“Hugely yes”

Table 15: Identifies the responses by Key Informants when asked about the opportunity for a growth in cycling in New Zealand.

Table 15 highlights the acceptance by Key Informants of the opportunity that exists for cycling in New Zealand. The direction of this results chapter now considers characteristics important for assisting modal shift promotion in Dunedin, the barriers to a modal shift occurring and the benefits associated with a modal shift.
5.2 Characteristics and Barriers of Modal Shift Promotion

5.2.1 Cycle Infrastructure

The views on infrastructure and its involvement as an important characteristic in assisting modal shift promotion are varied. One Key Informant identifies that infrastructure is the starting point, “We need to start with the infrastructure building...provision needs to be made. Build it and they will come” (KI 7, 2010). This view is furthered where another Key Informant identifies, “Build it and they will come. Better to have the infrastructure rather than the impetus then having to provide the infrastructure” (KI 1, 2010). One Key Informant highlights infrastructure having a different role, “Everyone gets a bit caught up with providing infrastructure, whereas you shouldn’t have to promote cycling via putting in infrastructure” (KI 8, 2010). The role of cycle infrastructure in modal shift promotion can be understood as varied. Cycle infrastructure being mixed is further evident where the types used to assist modal shift promotion experience varying success. The difficulty of providing for a diverse group as, “Cyclists are a varied group with recreationalists, commuters and faster cyclists” (KI 3, 2010) all often utilising the same cycle infrastructure but with different needs. Thus, the diverse role of cycle infrastructure as a characteristic assisting modal shift promotion is evident.

The quality of the cycle infrastructure also received attention from Key Informants. One identifies, “if you are going to put the cycle infrastructure in, do it properly the first time” (KI 7, 2010), a view shared by the majority of Key Informants. Another Key Informant highlights “If we have the infrastructure for people to have other options then we can gain from the equality benefits” (KI 4, 2010). The perception of what constitutes ‘doing it right’ is a point that is contentious within this part of the results section as differing views on the appropriate role of cycle infrastructure in assisting modal shift promotion is apparent from Key Informant interviews. It is made clear that “the painted white lines...called a cycleway on the busiest roads in Dunedin. This branding is what is expected to keep us safe” (KI 7, 2010), this is not adequate as an infrastructural characteristic assisting modal shift promotion. One Key Informant also highlights the importance of out of the box solutions when stating “The potential within the cycle tunnel link to Mosgiel is immense; it just needs a little political
support” (KI 7, 2010). The realisation that there are opportunities for cycle infrastructure development was identified by Key Informants.

Key Informants illustrate infrastructure barriers that could affect the role of assisting modal shift promotion in Dunedin. Barriers are seen as, “the streets are laid out, big roads with heavy traffic coming through the central city” (KI 4, 2010), inhibiting the assistance of modal shift promotion. The implemented infrastructure like

“The traffic calming that they have put in place so far has created death traps for cyclists, often forcing the cyclists into the middle of the road. They are designing purely for motor vehicle traffic, not considering cyclists” (KI 7, 2010).

Key Informants emphasise the role infrastructure is currently playing as a barrier to assisting modal shift promotion in Dunedin. The implementation of poor infrastructure results in a barrier to safety of cyclists, “Car doors are second only to intersections with regard to crashes, ban parking next to bike paths” (KI 4, 2010). The infrastructure deficiencies currently present in Dunedin highlight the importance for appropriate infrastructure being implemented, not necessarily the most convenient or affordable.

5.2.2 Political Environment

The political environment is important for assisting modal shift promotion in Dunedin. The views on the role the political environment plays as a characteristic assisting modal shift promotion in Dunedin will include both central and local government.

Central Political Environment

The existence of a central political environment that is supportive of modal shift promotion is a crucial characteristic in assisting modal shift promotion in Dunedin. This significance is seen, “It can happen quickly at the governmental level, the right kind of people listening to others and within a year of Obama getting in the whole transportation focus started to shift. It can happen” (KI 4, 2010). The modal shift promotion that the United States of America is currently undertaking can be applied to the perceived role that a supportive central government in New Zealand can play in modal shift promotion in Dunedin. The role of the
central political environment is furthered, “They are vital. Most of the funding comes from central government” (KI 6, 2010). This role is extended by another Key Informant,

“Where cycling has developed positively, in every single case that I am aware of, there was strong political leadership, in London and New York as current examples, and Berlin as a historical example. Having a big city is not a hurdle, but in every single case you need political leadership, it always comes back to strong political leadership” (KI 16, 2010).

The results highlight the importance of a central political environment that is supportive and assists modal shift promotion in Dunedin. This is furthered, “From the bottom it is only ever going to be incremental change, for one to gain systemic change it has to come from the top. And there has to be a meeting in the middle between the top and the bottom” (KI 11, 2010).

The integration of the two political environments is being emphasised as important for modal shift promotion. It is the interpretation of the central and local integration that another Key Informant draws on,

“I guess the reason that we have to start at the top is that the current set up puts a lot of constraints on the local system, and without that being addressed there is only so much you can do at a local level. However, the best leadership at a national level will not help anything unless there is leadership from a local level” (KI 16, 2010).

A systemic approach is being identified as fundamental to modal shift promotion in Dunedin. It is the existence of a supportive central political environment coupled with a proactive local political environment that is being reiterated as important for modal shift promotion to occur in Dunedin.

Key Informant interviews emphasised current central political barriers that could compromise its role as a characteristic assisting modal shift promotion in Dunedin. Key Informants illustrated that the current central political environment is not conducive to modal shift promotion in Dunedin. Table 16 summarises Key Informants identification of the current central political barriers that are inhibiting modal shift promotion from occurring in Dunedin.
Key Informant | Emphasising the current central political environment as a barrier to modal shift promotion in Dunedin
---|---
1 | “The government has seen transport [motorised] as a bit of a life saver in the recession”
4 | “They are looking backwards, this is the way people have travelled, so we will assume this is how people will travel in the future”
4 | “I left the United States of America which is thought to be conservative, slow moving and right winged, and I come to New Zealand and things are meant to be progressive, yet its very hard to get things done in New Zealand”
5 | “With the change in government 18 months ago, the focus is now on the support of economic development. That has flowed through into the transportation act. Under the previous government there was greater scope for modal shift and more emphasis on choice”
6 | “Our lifestyles are going to change hugely. This government has this information, but they want business to continue as normal”
6 | “This particular central government has changed the focus from modal shift to economic efficiency and reliability”
8 | “Government has not identified a long term focus within the transport sector”
16 | “The single most important barrier is the government”

Table 16: Key Informants views on the current central political environment as a barrier to modal shift promotion in Dunedin.

The views identified in Table 16 illustrate the current central political barriers that are present to modal shift promotion in Dunedin. The consideration of the local political environment will now occur.
Local Political Environment

The significance of a supportive local political environment for assisting modal shift promotion in Dunedin will now be considered. One Key Informant identifies, “The local and regional council are the key to it. The local councils need to be fully involved. The council and local New Zealand Transport Authority need to be actively involved. Coordinated and integrated approach is fundamental” (KI 7, 2010). The role of the local government is extended, “The Dunedin City Council could put together awareness campaigns for cycling, but that would be a political decision” (KI 14, 2010). Another Key Informant contributes that “The council will always entertain an idea. They have not got a fixed view. If it can be proved that it has the benefits for the wider community” (KI 5, 2010). The recognition that a supportive local political environment is fundamental to assisting modal shift promotion in Dunedin has been illustrated. Yet the current local political environment in Dunedin has not been identified as supportive of modal shift promotion.

The current local political environment in Dunedin has been identified by Key Informants as a barrier to modal shift promotion. One Key Informant illustrates, “The politicians we are blessed with are not very productive and forward thinking which inhibits sustainable transport growth” (KI 2, 2010). This view is furthered, “I think this particular council is much more concerned with economics, rather than making the city more sustainable in the long term” (KI 6, 2010). Another Key Informant agrees, “I think cycling is hitting some inertia in the Dunedin City Council” (KI 13, 2010). The concern over the local political environment is continued, “there are not enough councillors in Dunedin that see the benefits, there are some, but there has to be more than half for a change to occur” (KI 11, 2010). The identification of the barrier the local political environment is currently playing in extensively referred to by Key Informants. One Key Informant adds, “I don’t think it would work in Dunedin [speaking of modal shift]. Dunedin doesn’t like change. The Scottish conservative approach” (KI 5, 2010). Key Informants have demonstrated that the current local political environment is not supportive of modal shift promotion, and is restricting the potential growth of cycling in Dunedin.
The central and local political environments have been identified as important for their roles in modal shift promotion in Dunedin.

5.2.3 Education
Education was identified by Key Informants as important for assisting modal shift promotion in Dunedin. The education required is seen where, “If one could prove that businesses would benefit from having a more active population and through having cycling and walking within the main street, then you would see a lot more people promoting the idea” (KI 5, 2010), therefore identifying that a lack of education on the benefits exists. Education is extended to childhood,

“Really have to start at a kindergarten level. They [parents] have experienced a new lease of life. If they learn that getting their child physically active at this stage, rather than car dependent, then it will assist modal shift promotion” (KI 6, 2010).

The role of education as a characteristic assisting modal shift promotion in Dunedin is vast. Key Informants also mentioned motorist education as an important component of modal shift promotion. One Key Informant identifies, “My biggest thing about being a cyclist is that motorists are not educated at being a cyclist – would be nice for motorists to have to use a cycle to understand and experience what it’s like” (KI 11, 2010). It is this motorist education that another Key Informant highlights, “I am a great believer in, if drivers become cyclists they do change. When you’re riding home in the evening because you get acres more room” (KI 8, 2010). Key Informants identify that education needs to play an important role in assisting modal shift promotion in Dunedin. The identification that “We need to get the mentality that motorists need to share the road” (KI 5, 2010), highlights the current predicament that motorists are not educated on driving with cyclists and understanding their capabilities in Dunedin. One Key Informant identifies a cycle simulation that has been developed to education motorists on cyclist’s capabilities. “The ability for motorists to understand what it is like to be a cyclist will assist the experience of cyclists on Dunedin roads” (KI 10, 2010). This Key Informant furthered “that the opportunity for incorporating the cycling simulation into driver license testing would assist the development of a cycle culture” (KI 10, 2010).
The barriers of education to modal shift promotion in Dunedin were identified by Key Informants. It was largely illustrated that motorists were not educated on being aware of cyclists. Table 17 highlights some of the concerns identified by Key Informants during interviews.

<table>
<thead>
<tr>
<th>Key Informant</th>
<th>Identification of Key Informant concern over current education of Dunedin drivers as a barrier to modal shift promotion in Dunedin.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>“Dunedin drivers are a barrier. So frequently I feel unsafe on the road. Being on a bike in Mosgiel is really dangerous, car doors and state highway width lacking”</td>
</tr>
<tr>
<td>1</td>
<td>“Dunedin drivers in particular are not very good drivers, and don’t respect other road users”</td>
</tr>
<tr>
<td>3</td>
<td>“There is a lot of aggressive nature and anger toward cyclists in Dunedin”</td>
</tr>
<tr>
<td>8</td>
<td>“Cycling is painted negatively in the media, the way it’s a cycling crash rather than a car hitting a cyclist”</td>
</tr>
<tr>
<td>10</td>
<td>“Cars underestimate the speed of cyclists”</td>
</tr>
</tbody>
</table>

Table 17: Key Informant concern over current drivers in Dunedin.

The recognition that Key Informants identify with Dunedin drivers being uneducated when it comes to sharing the road with cyclists, exemplifies the importance of incorporating education of motorists into a planning framework designed to assist modal shift promotion in Dunedin. One Key Informant emphasises, “The problem is more that people don’t understand that it is possible, because New Zealand is not Europe, it is not a large enough proportion of decision makers that have seen it in Europe, and you have to see it for yourself” (KI 16, 2010). The opinion that with only a minority of the Dunedin population having witnessed cycle success it could inhibit the overall mindset about whether a modal shift to cycling could occur in Dunedin.
5.2.4 Culture
Culture has been illustrated by Key Informants as an important characteristic for assisting modal shift promotion in Dunedin. One Key Informant identifies, “The ability to develop a culture that enables cycling to be promoted is important” (KI 16, 2010). Another Key Informant illustrates the role culture plays, “Having a culture present that is receptive to change is essential to allow Dunedin to progress” (KI 7, 2010). Both these Key Informants have attributed the role of culture as a characteristic for assisting modal shift promotion in Dunedin. The recognition that culture does change, “Once people have done something for two or three months then they react to, change and adapt” (KI 6, 2010) is also apparent. The importance of a cycle culture is evident. “To implement a modal shift there has to be a development of a cycle culture in Dunedin” (KI 3, 2010). The view of culture as an important characteristics assisting modal shift promotion is furthered where, “The development of a critical mass of cyclists is essential” (KI 15, 2010).

The significance of culture being apparent to assist modal shift promotion was highlighted by Key Informants. It is important to distinguish the role culture plays as a barrier to modal shift promotion in Dunedin. The most prominent barrier within culture identified by Key Informants was the current car dependency that is evident in New Zealand society. Table 18 illustrates Key Informants identification of car dependency as a culture barrier to assisting modal shift promotion in Dunedin.

<table>
<thead>
<tr>
<th>Key Informant</th>
<th>Identification of car dependency as a barrier to culture assisting modal shift promotion in Dunedin.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>“It’s going to take a long time for that social paradigm shift to happen. New Zealanders don’t want to share a bus; they can take their car and get a park right outside work”</td>
</tr>
<tr>
<td>2</td>
<td>“New Zealanders are incredibly attached to their cars, they’re part of their identity”</td>
</tr>
<tr>
<td>3</td>
<td>“Perception in Dunedin and New Zealand is that public transport is not for families, there needs to be wider acceptance to utilise other forms of transport”</td>
</tr>
<tr>
<td>5</td>
<td>“I think in Dunedin, with the love for the car, it will be a challenge”</td>
</tr>
<tr>
<td>6</td>
<td>“It’s entrenched within people that they get their driving license at 15”</td>
</tr>
</tbody>
</table>
Table 18: Key Informants highlighting the barrier of culture of car dependency that is present within culture in Dunedin.

Table 18 identifies that Key Informants recognise the culture present in New Zealand as a barrier to the development of a cycle culture assisting modal shift promotion in Dunedin. The car dependency Key Informants identify as evident in Dunedin was witnessed when a public outcry to the implementation of a parking strategy in 2009 occurred. A Key Informant emphasised, “Dunedin drivers will circle around the block to get the closest park” (KI 5, 2010) and that during the initiation of the parking strategy businesses and the public were not impressed with the intentions of the strategy. A view of reducing parking highlighted contention from businesses. “The increase in the number of paid parking spaces became an issue until people accepted why the charges were incorporated” (KI, 9, 2010). The businesses were identifying with the loss of profits, “They thought that the viability of their businesses would diminish if the parking strategy went ahead” (KI 6, 2010).

The car dependent culture is also illustrated when Key Informants mentioned the role that the media play in perpetuating culture in New Zealand. One Key Informant stated, “The cultural change is really needed; the shift between the real and what is portrayed in the media...media portrays the culture that is then reinforced within New Zealand” (KI 11, 2010). The role of the media is further illustrated by another Key Informant, “I don’t think the media helps, cycling is painted negatively in the media” (KI 8, 2010). The points identified by these Key Informants highlight the role the media plays as a barrier to culture assisting modal shift promotion in New Zealand. While the media barrier was identified at a national level there is perceived correlation to the Dunedin context.
Key Informants extended the barrier present within culture in Dunedin to behaviour. It was highlighted that “Public awareness and enforcement can change culture” (KI 13, 2010), two important characteristics for assisting modal shift promotion in Dunedin. A Key Informant also viewed how behaviour can be changed, “Speed restrictions over Queens Birthday weekend, every one slows down, therefore, showing that the public do listen if advertised properly and made important” (KI 2, 2010). The recognition that behaviour change can occur affirms the role culture is currently playing as a barrier. A Key Informant highlighted the behavioural barrier that is present in New Zealand, “Modal shift is essentially about behaviour change. The current government isn’t interested in social change, they want economic gain” (KI 8, 2010). The opinion of fostering a culture, “Developing an accepted cycling culture” (KI 13, 2010), and thus allowing for the assistance of modal shift promotion in Dunedin is considered. It is the development of a cycle culture being alluded to by Key Informant 13 that identifies as an important characteristic for assisting modal shift promotion in Dunedin, but the results indicate a number of barriers to be overcome in order to achieve modal shift promotion.

5.2.5 Funding
Funding is an important characteristic Key Informants identify for assisting modal shift promotion in Dunedin. It is highlighted, “It’s really not until it hits peoples pockets that a change in behaviour occurs” (KI 3, 2010). A view affirmed by another Key Informant, “Making sure that bringing cars is a bit of a disincentive, if you hit people in the pocket then that has a greater chance of people reacting” (KI 5, 2010). Both Key Informants emphasise the role of funding in assisting modal shift promotion in Dunedin through hitting people’s pockets which works as an indirect way of promoting a modal shift.

Funding is also integrated within the processes of marketing and education, with a Key Informant identifying “It all boils down to funding really…and when a prioritising process occurs, cycling seems to miss out” (KI 8, 2010). The ability to fund marketing and education projects that assist modal shift promotion in Dunedin is significant. It is highlighted, “the funding has to be local due to the central focus being unaligned to modal shift promotion at present” (KI 9, 2010). The role of funding as a characteristic is continued,
“Public transport and cycling have similar modal shares in New Zealand, public transport gets at least 10 times as much money, however if you invest money in public transport, the infrastructure you need is so much more expensive than infrastructure for cycling – so if you took the same amount of money and put it into cycling you would get a lot more bang for your buck” (KI 16, 2010).

The identification of the affordability of cycle infrastructure emphasises that the funding associated with assisting modal shift promotion in Dunedin is not extensive.

Key Informant interviews identified barriers to funding assisting modal shift promotion in Dunedin. A view that “It’s about finding the money to do it, that’s the biggest problem with any of the projects” (KI 11, 2010), highlights the role funding needs to play, but currently is not. The significance of funding is highlighted where, “Funding shouldn’t be underestimated though, it’s driving what’s happening” (KI 15, 2010). The ability to have funding to utilise will greatly affect the outcome of modal shift promotion in Dunedin.

It is illustrated that it “Would be nice to have big government dollars” (KI 4, 2010), but the realisation that funding is more appropriately aligned with being a barrier is present. One Key Informant identifies, “There’s no use having policy if there is no funding mechanism, unless there is political will, policy is only part of it, political will to stand by policies and funding is essential” (KI 15, 2010). The identification of funding as a barrier to assisting modal shift promotion in Dunedin emphasises the current role of funding and its contribution to inhibiting the assistance of modal shift promotion.

5.2.6 University
The University of Otago is identified by Key Informants as a hub of cycling activity in previous decades. One Key Informant summarised that “There was definitely a cycle culture at the university back in the late 1980’s” (KI 1, 2010). The demise of cycling in and around campus was attributed to an incident that occurred on campus (KI 2, 2010). Another Key Informant emphasised the potential for cycling within North Dunedin is high given the socio-economic status of students and the short trips that are prevalent (KI 6, 2010). It is also highlighted that the university should consider “how to structure cycling better rather than just not catering for it. There is no good cycle route from the university to town and town to
Key Informants identify that the university has the ability to greatly assist modal shift promotion in Dunedin, through influencing a significant population in Dunedin. This influence was identified where, “The university has the potential to assist cycling in Dunedin, but it is not choosing to recognise this potential” (KI 6, 2010). Key Informant 6 emphasised the current predicament that Dunedin faces, with the university, as a major resource of Dunedin not choosing to assist modal shift promotion. A representative from the University of Otago perceived that the direction the university chooses to take in the future could play a large part in the cycle success of Dunedin, largely through the influence that the university has within Dunedin (KI 2, 2010). This Key Informant also identifies that “Cycling is not considered a priority within the Master Plan” (KI 2, 2010). The university has not incorporated cycling into the Master Plan in significant detail.

The results from Key Informant interviews also identified that barriers exist to the university assisting modal shift promotion in Dunedin. The barrier is evident as “A serious accident occurred on a walkway near St David Café, subsequently full resistance to the idea of people biking through campus” (KI 2, 2010). The barrier is extended through “The way the university has gone about restricting cycling through campus, is restricting the opportunity” (KI 7, 2010). The role of the university as a barrier to modal shift promotion is relatively recent, “When I was at varsity I used to ride my bike everywhere” (KI 13, 2010). The current role of the university as a barrier to assisting modal shift promotion is preventing the growth of cycling in Dunedin. The identification by Key Informants of the opportunity available within the university to assist modal shift promotion is apparent, yet the ability to overcome the barriers present, particularly the fear of safety that is evident through a previous accident, will determine future roles of the university.

The six characteristics that Key Informants identified as important for modal shift promotion, along with the barriers present to modal shift promotion have been illustrated. The direction of this result’s chapter will now move to the characteristics and barriers that do not overlap. The three characteristics identified by Key Informants as important for assisting modal shift promotion in Dunedin, that have not already been introduced, are marketing, integration and enforcement. Also there are three barriers to modal shift promotion in Dunedin that were
identified by Key Informants, but have not yet been presented, topography, weather and safety.

5.2.7 Marketing
The results from Key Informant interviews indicate marketing having a major role as a characteristic assisting modal shift promotion in Dunedin. The ability to develop behaviour change through marketing is emphasised by Key Informants. The appropriateness of strategic marketing that could assist the wider public to buy into cycling and indirectly promote a modal shift in Dunedin is important to consider. Two Key Informants identify with the need to enhance cycling’s image, “Lots of advertising to make cycling more fun” (KI 3, 2010); “Raise the profile of cycling in the central business district, making it seem cool” (KI 15, 2010). The promotion of the image of cycling identified by these two Key Informants is furthered where, “Bikewise is a huge step in the right direction, through encouraging people to get back on bikes” (KI 1, 2010). It is evident that marketing plays an important role as a characteristic for assisting modal shift promotion in Dunedin.

The role of marketing is not limited to enhancing the image of cycling. One Key Informant mentions “You almost have to make it socially unacceptable for taking the car on short trips” (KI 3, 2010). Key Informants also identify that New Zealand “has become a lazy nation, we think we need the car to go a kilometre down the road” (KI 10, 2010). It is promoting “the incidental exercise that is fundamental to our population and move to combat the health benefits” (KI 4, 2010). Marketing is involved in indirect promotion, through incidental exercise promotion. One Key Informant identifies, “The way bikewise has been implemented is encouraging, marketing that is undertaken appropriately is great for modal shift promotion in Dunedin” (KI 1, 2010). Similarly, “Initiatives that target cycle promotion, like bikewise, are very important to cycling in New Zealand” (KI 6, 2010). The success of marketing, like bikewise, is important for assisting modal shift promotion in Dunedin. The implications of national run programmes like bikewise are important for Dunedin to promote and get behind.

Marketing has been outlined in Key Informant interviews as important in assisting modal shift promotion in Dunedin. The role marketing plays is varied, whether aiming directly at
promoting cycling to indirectly promoting cycling through “taking the car of its pedestal” (KI 7, 2010). Further direction in marketing cycling positively will assist modal shift promotion, and to “Encourage changing rooms, lock up facilities for bikes, and potential rewards for cyclists” (KI 3, 2010), will further maximise the opportunities for modal shift promotion in Dunedin.

### 5.2.8 Integration

The results from Key Informant interviews highlight the role integration could play as a characteristic assisting modal shift promotion in Dunedin. The types of integration being referred to by Key Informants range from integration of transport modes, to government integration between departments, to integration of agencies involved in transport planning.

Integration is identified as important within daily personal transport modes. One Key Informant highlights “People are stuck to their cars, there needs to be a backup to cycling to get people out of their cars” (KI 3, 2010), where public transport integration with cycling could play a role. Cycle transport integration is, “Not just promoting cycling, but promoting an integration of transport modes, where bikes racks on buses, free student or cheap student transport, getting people away from the car” (KI 4, 2010). The integration of transport modes is important for modal shift promotion in Dunedin.

The integration between government departments is also important for assisting modal shift promotion in Dunedin. One Key Informant contributes, “The importance of bringing the health sector on board, obesity epidemic and the understanding that active transport plays a big role in this” (KI 4, 2010). The identification by another Key Informant is that, “Currently there is a lack of cross sector integration of various ministries” (KI 8, 2010). Therefore, integration is required for assisting modal shift promotion in Dunedin. One Key Informant highlights, “Very important to plan for the shift, can’t just hope that it’s going to happen” (KI 4, 2010).

Integration is also important at a local level. Current integration should be build upon. “Sport Otago is also working to facilitate modal shift, through producing walking maps and helping promote feet first” (KI 6, 2010). The collaboration of those important for modal shift
promotion needs to occur. One Key Informant identifies, “There needs to be an active transport forum in Dunedin” (KI 3). Another furthers this notion, “Dunedin needs to have an integrated forum that discusses active transport to ensure progress is being made” (KI 7, 2010). The integration of a cohesive local level is important for Dunedin in modal shift promotion.

Integration, or lack of it, is viewed as inhibiting modal shift promotion in Dunedin.

“If we had the model then it would be working” (KI 8, 2010). It was identified that integration of walking and cycling is important for New Zealand, and subsequently Dunedin (KI 8, 2010). The view of Key Informant 8 suggests that no ‘dream model’ for modal shift promotion has been developed, and, therefore, indicating the difficulty in coming up with a similar form of model.

The role of a developed planning framework for assisting modal shift promotion was disputed where, “We have barely started investing in cycling, so in 30 years we should be seeing the benefits potentially that Europe are currently” (KI 15, 2010). A view shared where, “we have come a long way in hindsight…but we are only one step along the way” (KI 8, 2010). The significance of the role integration can play as a characteristic assisting modal shift promotion in Dunedin is summed up,

“The most important thing is to realise that in order to do something for cycling you really have to understand that it requires a systems approach – there is no point in saying we will implement infrastructure as that is not going to cut the mustard” (KI 16, 2010).

The emphasis of integration within transport modes, between government departments and local level transport planning agencies, is interpreted as fundamental to modal shift promotion in Dunedin.
5.2.9 Enforcement
Enforcement is an important characteristic in assisting modal shift promotion in Dunedin. One view is, “I think we need to change the law to give pedestrians and cyclists (in that order) the priority, as simply asking motorists to change will not work” (KI 4, 2010). The reference to the current law not giving priority to pedestrians or cyclists contributes to an environment that is less safe. Speed is a factor in safety, “The number one tool for a safer cycling environment is speed” (KI 8, 2010). The reduction of speed around parts of Dunedin is important where, “The opportunity to reduce speed around campus would further ensure safety for pedestrians and cyclists” (KI 2, 2010). Enforcement has the ability to affect culture, “Public awareness and enforcement can change culture” (KI 13, 2010). The way enforcement is perceived in Dunedin plays an important role in assisting modal shift promotion. The Key Informant interviews suggest the current enforcement that is occurring is not creating an appropriate cycling environment, and subsequently promotes the incorporation of enforcement within a planning framework assisting modal shift promotion in Dunedin.

The results on the three barriers to modal shift promotion in Dunedin that have not been presented will now occur.

5.2.10 Topography
The role topography plays as a barrier to modal shift promotion became evident through Key Informant interviews. Key Informants highlight, “Topography is a big barrier” (KI 1, 2010), and “The hills are a real problem, for people that live on the hills” (KI 15, 2010). Topography as a barrier is furthered where, “To some people the hills in Dunedin are a potential barrier” (KI 13, 2010). The hills were identified by another Key Informant but were coupled with a potential solution, “Dunedin has a good amount of flat land, but people tend to live on hills, but allowing bikes on buses can combat the issues of hills” (KI 7, 2010). The identification of this flat land occurs, “There is a lot of Dunedin that is on the flat, North Dunedin, South Dunedin, Central Business District, but buses need to be able to incorporate bike racks” (KI 3, 2010). An additional barrier that was mentioned, but not so predominantly, involves “No pressure on space in New Zealand, no environmental and economic pressure that occurs within a crowded place” (KI 2, 2010), therefore contributing to a lower population
density and the associated private car dependence. It is the combination of hills along with a dispersed population that Key Informants have identified as being topographical barriers to modal shift promotion in Dunedin.

5.2.11 Weather
The role weather plays was mentioned by Key Informants as a barrier to modal shift promotion in Dunedin. “The weather has a tremendous influence on people’s mode choices” (KI 14, 2010). It is also identified that “If you’re going on your bike, especially in Dunedin, you need good public transport with our weather” (KI 3, 2010). An extension of the weather as a barrier is made where, “The weather is always identified as a barrier” (KI 15, 2010). It is important to recognise that the weather is playing a role as a barrier to modal shift promotion in Dunedin.

5.2.12 Safety
Safety is identified as a barrier to modal shift promotion in Dunedin. The occurrence of “Parents being over protective and driving their children in their four wheel drives” (KI 1, 2010) is apparent. This takes children off the road and reduces the likelihood of a critical mass, which has been identified as important for ensuring safety. The illustration of this critical mass where, “The dangerous cycle of parents thinking that it is unsafe for their kids to be cycling, so they don’t let them cycle, and by taking more cycles off the road it is in turn making the road less safe” (KI 13, 2010). The barrier of not establishing a critical mass is perceived to be detrimental to modal shift promotion in Dunedin by Key Informants.

The emphasis the role safety plays as a barrier is seen, “I was horrified when I came back to Dunedin and tried to get back into cycling” (KI 13, 2010). The concern around safety is extended where, “Yes it’s a really effective barrier, I feel safe when cycling, but I cycle slowly, in my work clothes, in my reflective vests, so people are much nicer” (KI 6, 2010). Safety is also being compromised where, “200 hours community service and lost his license for 9 months... is that a fair punishment for careless driving causing death” (KI 10, 2010). Safety has been identified as a barrier to modal shift promotion in Dunedin, and with the fear
of safety come the further loss of people cycling, which in turn makes it less safe for those who are cycling.

5.2.13 Conclusion
This results section has presented the findings from Key Informant interviews on characteristics identified important for assisting modal shift promotion in Dunedin and barriers to modal shift promotion in Dunedin. The six main characteristics and barriers identified by Key Informants were presented; infrastructure, political environment, education, culture, funding and university. The three other characteristics important for assisting modal shift promotion in Dunedin mentioned by Key Informants were, marketing, integration and enforcement; along with the three other barriers to modal shift promotion in Dunedin, topography, weather and safety. The first two research questions have been addressed, now the results from the third research question will be presented.
5.3 Benefits of Modal Shift Promotion in Dunedin

5.3.1 Introduction
This section on benefits is addressing the third research question that seeks to determine the expected benefits of a successful modal shift toward cycling in Dunedin. The results identify the benefits of modal shift promotion in Dunedin through Key Informant interviews. The benefits have been grouped into three sections, health, economic and social to allow a more comprehensive understanding of the Dunedin context.

5.3.2 Health
The health benefits that are associated with modal shift promotion to cycling were identified. The benefits that can be gained through incidental exercise where, “Bike to the shop rather than taking your car. Promotion of incidental exercise, of which cycling has a definite role” (KI 1, 2010). One Key Informant emphasised the importance on health issues, “Mentally it is far better to engage in active transport, the health benefits are enormous” (KI 6, 2010). The significance of the health benefits were furthered where, “Health gains, most cost benefit analysis have come to the conclusion that the biggest gains are through the health benefits; reduced obesity, reduced heart disease, cardiovascular function and reduced depression” (KI 4, 2010). The health gains alluded to highlight the role of active transport and provide further justification for modal shift promotion in Dunedin.

The health issues are more apparent as “Everyone is worried about obesity; it wasn’t such a problem 30 years ago, now no one uses active transport” (KI 3, 2010). The health benefits that can be achieved through having a more active population were stressed by Key Informants as they felt New Zealand’s population are slipping into dangerous territory in relation to health. The identification that the severity of the health benefits is immense is illustrated by Key Informants. “The health benefits can be maximised by getting those most dependent on the car to change the way they move” (KI 4, 2010);“The burden on the health system will decrease dramatically if modal shift promotion is successful in Dunedin” (KI 10, 2010). The health gains from modal shift promotion being alluded to are significant. The health benefits also extend to injuries, “Injury reduction is really important, if you are moving
slower than your risk, to others and yourself, is lower, as you are much less likely to be seriously injured” (KI 4, 2010). The health benefits were quantified by the New Zealand Transport Agency where the, “New Zealand Transport Authority are only just starting to look at the idea of cycling being considered. The media frenzy from $50 million in cycle tourism, and the New Zealand Transport Authority identified $2.80 saving per kilometre in the health sector” (KI 7, 2010). The health benefits that Key Informants identified stress the significance of modal shift promotion in Dunedin.

5.3.3 Economic
The economic benefits of modal shift promotion identified by Key Informants were varied. One Key Informant highlights the personal monetary saving, “Public transport here is diabolical, Mosgiel to town is $5.60 each way” (KI 1, 2010). The benefit of being able to travel for a minimal cost allows the community to have more expendable income. The benefits of this, “If you are car pooling, cycling or walking you are saving money in your pocket, and therefore it goes into the local economy as you have more to spend” (KI 6, 2010). The identification of affordability at the individual level where the costs associated with transport are reduced through not having to utilise a car, yet this is only apparent if appropriate other modes are present.

The economic boost that can be gained within the local economy is furthered, “Everything is interconnected, delivering a socially cohesive street can have economic spin offs for businesses and wider effects” (KI 14, 2010). The identification of economic benefits was not shared by all with one Key Informant approaching with caution, “The benefits, it’s not obvious that the benefits would out weigh the negatives” speaking of restricting car movements on George Street (KI 5, 2010). Yet, most Key Informants identified the freedom associated with active transport and the subsequent economic benefits, “Time restricted shopping, costs money only having an hour (referring to parking)... if your walking or cycling you have more time to browse” (KI 3, 2010). Dunedin possesses a central main shopping street that can be utilised to its advantage. “The economic potential for the main street is huge if car restrictions are put in place” (KI 2, 2010). The economic benefits identified by Key Informants indicate the potential for modal shift promotion in Dunedin.
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The Key Informant interviews also highlight that businesses have an economic benefit through having more active employees. One Key Informant identifies, “Your brain is heightened through cycling to work as you’re physically active on the way to work, more prepared to work” (KI 3, 2010). This was continued where another Key Informant highlights, “Physically active people are more productive and less likely to take time off for illness” (KI 4, 2010). The economic benefits have been perceived to contribute to Dunedin society on an individual and societal level and affirm the importance of a modal shift occurring in Dunedin.

5.3.4 Social
The social benefits identified by Key Informants were quite limited, which may be due to a lack of awareness of overseas examples of successful modal shifts in promoting socially cohesive areas, and also due to the social benefits being less pronounced. One Key Informant did provide insight into the social benefits, “It is more community oriented to have people walking and cycling oppose to in their cars” (KI 13, 2010). It is the personal communication and interaction being referred to by Key Informant 13 that can create a friendly and welcoming environment when modal shift promotion is undertaken successfully.

The health, economic and social benefits of modal shift promotion has been illustrated as perceived by Key Informants in interviews. The results suggest an array of benefits that are important to understand when developing a planning framework to assist modal shift promotion in Dunedin.

5.4 Conclusion of Results Chapter
The two results sections have presented the views and opinions on the characteristics important for assisting modal shift promotion in Dunedin, the barriers to modal shift promotion occurring and the benefits of modal shift promotion. A number of important themes have emerged within this results chapter and these will be developed further in the following discussion chapter. Three research questions have been addressed within this Result’s Chapter, and a discussion on the results will now occur.
6. Chapter Six Discussion

6.1 Introduction

This discussion chapter is about the findings of the research identified in the two previous results sections in response to the four research questions. Incorporating the international literature, explored in Chapter Two, will also take place. This chapter will be broken down into three sections; characteristics of modal shift promotion and barriers to modal shift promotion in Dunedin, benefits of modal shift promotion in Dunedin and conceptualising a planning framework for assisting modal shift promotion in Dunedin. The first two sections will involve discussing the findings of the research and providing interactions and analytical discussion with the international literature reviewed in Chapter Two. The third section will contain the interpretation of the two previous discussion sections and their relationship with international literature to enable the conceptualisation of a planning framework for assisting modal shift promotion in Dunedin. The third section will also provide insight into the recommendations that are being made from this research and will be illustrated in the following conclusions chapter.

6.2 Characteristics and Barriers of Modal Shift Promotion

The results identified in the previous chapter indicate six themes that are important to be considered within characteristics and barriers to modal shift promotion in Dunedin. The various roles and significance of these characteristics and barriers identified by Key Informants will be discussed. This section of the discussion chapter addresses the first and second research questions. Firstly, how can a planning framework for modal shift promotion be developed for Dunedin? Secondly, what are the potential barriers to a modal shift promotion in Dunedin? It is the understanding of the six characteristics and barriers that Key
Informants have identified, coupled with the knowledge gained through the literature review that will enable the answering of the first and second research questions.

6.2.1 Cycle Infrastructure
The inclusion of cycle infrastructure was identified in the literature review as being a prominent and essential component of modal shift promotion. The literature review detailed the specific cycle infrastructure that is important to assist modal shift promotion, including, extensive separate cycle facilities, intersection modifications, green wave movements, traffic calming and bike parking facilities (Litman, 2003; Banister, 2005; Pucher and Buehler, 2007). The findings from Key Informant interviews suggest the cycle infrastructure present in Dunedin is on a completely different scale to that implemented in successful cycle cities and countries in Europe. While the current levels of cycle infrastructure present in Dunedin were referred to as inadequate by most Key Informants, the identification of the role of cycle infrastructure was prominent. The types of cycle infrastructure being referred to by these Key Informants did not go into the detail that the literature review and case studies did, but recognition of separate cycle facilities, intersection modifications, traffic calming and bike parking occurred throughout many of the interviews.

Key Informant 8 identified that the cycle infrastructure is at times given too much attention as a characteristic for assisting modal shifts. This was not identified within the literature review or directly by other Key Informants, but considering the Key Informant has a vast background in cycle promotion through his role in the New Zealand Transport Authority, this is still important to consider. The results also highlighted the importance of ‘doing it right’ the first time. Key Informants 4 and 7 identified that infrastructure that is implemented has to be appropriate for the context. This notion of ‘doing it right’ the first time was apparent in the case studies where the cities of Amsterdam and Odense both made reference to implementing cycle infrastructure appropriately the first time (Pucher and Buehler, 2007; 2008). Key Informant 7 identified that the development of a commuter link with Mosgiel, utilising the railway tunnel, would provide a 20 minute cycle link between the central business district and Mosgiel. Cycle infrastructure of this scale is important to incorporate in Dunedin to assist modal shift promotion.
Pucher and Buehler (2003) identified that cycle infrastructure can extend to providing a website for cycling information. The ability to determine one’s route, gradient, time and the location of cycle facilities, are attainable to incorporate into cities electronic resources (Pucher and Buehler, 2003). Key Informants did not identify this kind of cycle infrastructure, but it is important to recognise the importance of resources of this nature.

It can be interpreted that the role of infrastructure as a characteristic assisting modal shift promotion is important, but further exploration of the relevance to Dunedin is required. The literature review helped in the continuation of the philosophy that if the cycle infrastructure is built, and is appropriately designed, then it will work as a characteristic assisting modal shift promotion.

Conversely, the results from Key Informant interviews also identified that when cycle infrastructure is not done right the first time then it acts as a barrier to modal shift promotion. Key Informants identified that cycle infrastructure has the ability to greatly influence, whether a cyclist cycles in the first place, the choice of route for a cyclist, when they cycle and the pleasantness of their cycling experience. Key Informants 4 and 7 felt strongly that the current cycling infrastructure in Dunedin is working against modal shift promotion. Both mentioned poorly placed cycle lanes and inappropriate traffic calming as inhibiting cycle promotion in Dunedin. These findings were consistent with the literature review where inappropriate cycle infrastructure, like poor spatial design, is identified as an impediment to modal shift promotion (Pucher et al., 1999). Key Informants have identified that cycle infrastructure is a prominent barrier to modal shift promotion in Dunedin and will continue to be inhibitive unless the implementation of successful cycle infrastructure is incorporated in the Dunedin Cycling Strategy.

### 6.2.2 Political Environment

The political environment, encompassing both central and local levels, was illustrated by all Key Informants as being an imperative characteristic in assisting modal shift promotion in Dunedin. This finding aligns itself with research relating to successful cycling cities, identified in Chapter Two, where the political environment was a major influencer in assisting
modal shift promotion (Banister, 2002; Litman, 2003; Cox, 2010). The significance of distinguishing between the roles of central and local political environments will be discussed.

**Central Political Environment**

The results from Key Informant interviews indicate that the current central political environment is not acting as a characteristic assisting modal shift promotion in Dunedin. Key Informants all attributed the role of a central political environment to assist modal shift promotion as essential. Key Informant 16 identified that where modal shifts have occurred in the past internationally there has been strong political leadership present. This was also identified by Key Informants 4 and 11 who outlined the significance of a central political level in assisting modal shift promotion.

The central political environment was also identified as a barrier at present in New Zealand and inhibiting modal shift promotion in Dunedin. Key Informant 5 identified that with the change in the central government 18 months ago the focus has directed away from being progressive and aligned to modal shifts, to now being economically driven. This was furthered by Key Informant 8 who feels the focus of the current government is very short term. Key Informant 16 identifies the central political environment as the single most important barrier to modal shift promotion. The findings from Key Informant interviews indicate the current central political environment is acting as a barrier to modal shift promotion. The findings from Key Informant interviews were consistent with the literature where the recognition that central political environments can be strong barriers to modal shift promotion was identified (Banister 2002; 2005; Cox, 2010). The fact that Key Informant 8 and 16 both have extensive backgrounds in cycle planning and promotion along with being exposed to successful modal shifts overseas highlights the significance of the barrier of the central political environment that they both alluded to.
Local Political Environment

The findings from this research illustrated that the local political environment can play a major role as a characteristic assisting modal shift promotion in Dunedin. Key Informants 7 and 14 identified the requirement of a favourable local political environment, one that Pucher and Buehler (2007) identify in the literature, as present amongst successful European cycling cities, to enable modal shift promotion to occur. Key Informant 7 illustrates the role for the local political environment when contributing, “The local and regional council are key to it. The councils need to be fully involved. The council and New Zealand Transport Agency need to be actively involved. A coordinated and integrated approach is fundamental” (KI 7, 2010). Key Informant 14 identified that the Dunedin City Council could promote a modal shift through generating awareness, but for that to happen it had to be a political decision. Key Informant 5 affirmed that the local political environment is important for modal shift promotion and that they are always ready to listen. Yet, the results from Key Informant interviews have indicated that the barriers associated with the local political environment are quite extensive.

The barriers of the local political environment that were mentioned by Key Informants extend from the central political barriers identified above. Key Informants 2, 6, 11 and 13 identify the local political environment as a barrier to modal shift promotion in Dunedin. These four Key Informants felt that the promotion of cycling in Dunedin was being restricted through an inability, at the local political level, to appreciate the opportunity apparent within cycling. This is evident where Key Informant 5 identified that a modal shift would not work in Dunedin because Dunedin does not like change. The identification of the local political barrier that Key Informants 2, 6, 11 and 13 identify is an important result from this research. The literature identified that the local political environment can be evident as a barrier to modal shift promotion (Banister, 2002; Cox, 2010). It is important to identify that the local political environment has changed recently (since interviewing), where the voting in of a new mayor and newly elected councillors, along with some returning councillors, could change the local political environment evident in Dunedin.

The political findings on Dunedin suggest that the current central and local political environments are restricting modal shift promotion from occurring. It is these two levels of
political environments that the literature and Key Informants identify as being fundamental to modal shift promotion occurring. The understanding that an integrated, systemic approach within these two levels was highlighted by Key Informants 11 and 16, and emphasises the role of both central and local political levels in modal shift promotion.

6.2.3 Education
The results from Key Informant interviews indicated that education is an important characteristic for assisting modal shift promotion in Dunedin. Key Informants referred to education differently when asked about the role it plays in modal shift promotion. The wide interpretation of education, from driver awareness to educating preschool children emphasised the consideration required to appropriately deliver on the education most readily being sought. Key Informant 6 illustrated the importance of active transport education being apparent at a kindergarten age. The ability to educate parents to experience a new lease of life is important to enable a modal shift.

Key Informant 11 identified the need for motorist education on the capabilities of cyclists. A point further aligned with Key Informants 5, 8 and 10 who all stressed the need to educate motorists on driving amongst cyclists and also cyclist capabilities. The literature highlighted that education is important for assisting modal shift promotion, particularly involved in motorist education, school education and also educating the general public (Pucher and Buehler, 2007). The findings on education as a characteristic assisting modal shift promotion seem consistent with that identified in the literature and case studies.

Education was identified by most Key Informants as a barrier to modal shift promotion in Dunedin currently. This is largely evident through the current driving behaviour of motorists, where Key Informants believe a lack of awareness exists in terms of driving amongst cyclists. Key Informants 1, 3, 8 and 10 all identified that current driver behaviour is a barrier that needs to be addressed. Key Informant 10 identified that drivers in Dunedin are not educated on how to drive amongst cyclists, including assessing their capabilities in terms of speed and space.

Key Informant 16 also felt, that with only a limited number of people in Dunedin having witnessed cycle success in other countries, there is a lack of recognition of the capabilities that
cycling can produce in Dunedin. The literature identified that education is an important component of modal shift promotion, but did not specify many barriers to education. While the barriers to education were not outlined in the literature, the Key Informants have identified a lack of education as a barrier in Dunedin; these include cyclists, promoters of cycling, city representatives and law enforcers. This diverse range of people identifying a lack of education, particularly motorist education, as a barrier to modal shift promotion in Dunedin justifies its validity.

6.2.4 Culture
The results from Key Informant interviews indicate that culture is an important component of modal shift promotion in Dunedin. Five Key Informants identified the significance of developing a cycle culture, as being imperative for modal shift promotion in Dunedin. Key Informant 7 highlighted that to have a culture that is receptive to change is important for Dunedin. Key Informant 15 identified that developing a cycle culture involves generating a critical mass of cyclists. All five Key Informants stressed the importance of a cycle culture being present, a point that the literature review and case studies also identified as fundamental for modal shift promotion. Pucher and Buehler (2007) identify that the Netherlands have excelled in the development of a cycle culture and it has directly helped further cycle success.

The results from Key Informant interviews indicate that a car dependent culture is present in Dunedin which inhibits modal shift promotion. Nine of the sixteen Key Informants specifically exemplified the car dependent culture. Key Informant 2 highlighted that New Zealanders are attached to their cars, its part of their identity. Key Informant 15 also identified that the car dependent culture is perpetuated within the District Plan which extensively caters for car parking provisions in Dunedin. Key Informants identified that the implementation of a parking strategy restricting cars generated uproar from local businesses and the public. Key Informant 6 identified that businesses believed their viability would be compromised with the implementation of the proposed strategy. Key Informant 9 stressed that people took a long time to understand why the prices of parking were being increased. The reactions that Key Informants identified illustrates the car dependent culture that is prevalent in Dunedin. Key Informant 16 succinctly summed up the majority of the views on culture when stating, “It’s
just a reflection of the underlying culture; we believe we need mobility and the only way we get this is through driving around” (KI 16, 2010).

Key Informants also indicated that the media play a role in continuing the car dependency in Dunedin. Key Informant 11 emphasised that the media portray cycling negatively and therefore endorse car dependency and restrict opportunities for cycle culture development. Key Informant 8 also identified the media being inhibitive to the development of a cycle culture.

The literature review did not encounter barriers to culture present, predominantly through a focus on literature based on successful cycle cities that possess an appropriate cycle culture. Pucher and Buehler (2008) recognised the success of Berlin, Germany, in achieving a cycle culture that exists alongside a car dependent culture. The results from the research indicate that the development of a cycle culture is highly important for modal shift promotion to occur in Dunedin, but the current predominance of a car dependent culture will make cycle culture development very hard to achieve.

6.2.5 Funding
The results from Key Informant interviews illustrated that funding is an important characteristic for assisting modal shift promotion in Dunedin. Key Informant 8 identified that when it comes down to funding, cycling is currently missing out. Key Informant 16 emphasised that funding is occurring from a central level but it is minimal. Key Informant 16 furthered that when the comparison of funding between cycling and public transport occurs, public transport is identified as getting more than 10 times as much funding, yet they have a similar modal share within New Zealand. Key Informant 16 furthered the point by illustrating that cycling infrastructure is significantly cheaper and would result in more “bangs for one’s buck”. The literature explored did not go into any real detail on funding, but what did come out of the literature was the importance of central funding being present. Banister (2005) identifies that central funding is where the big government dollars are and could, therefore, have the biggest effect on assisting modal shift promotion. Key Informant 16 illustrated that it would be nice for cycling to have the big government dollars, but was pessimistic about this
option because of central government policy not aligned to funding active transport. Key Informant 15 highlighted that funding is driving what is happening, so without funding it is hard to achieve modal shift promotion. The views of Key Informant 15 affirm the significance of funding as a characteristic of modal shift promotion.

Funding was identified by Key Informants as a barrier to modal shift promotion in Dunedin. Key Informant 11 emphasised that with the current focus of the central government very little funding is available for cycling. This barrier was also identified by Key Informant 9 who indicated that the ability to fund projects through the New Zealand Transport Agency, which has to be consistent with government policy, is very limited. It can be determined through Key Informant interviews that the current central government is inhibiting modal shift promotion in Dunedin through not providing significant funding to cycling. Key Informant 15 identified that funding from a local level could occur if political direction and will power were present. The results indicate that funding is currently inhibiting modal shift promotion through playing a seemingly non existent role. The current government focus identified in Key Informant interviews indicates that government spending will continue to be distributed towards economic efficiency and congestion reduction, as oppose to incorporating other more sustainable modal transport options.

6.2.6 University
Key Informants identified that the university is an important characteristic for assisting modal shift promotion in Dunedin. Key Informant 1 emphasised that cycling use to be predominant around the university campus. A view shared with Key Informant 2 who also identified a cycling presence being evident in North Dunedin in the past. The development of a Master Plan for the University of Otago provided an opportunity to incorporate cycling into the future direction. Key Informant 2 identified that cycling is mentioned in the Master Plan, but at a pretty limited level. The identification that the university has the ability to assist a modal shift in Dunedin is evident where Key Informant 6 and 13 both identified the university as having the ability to strongly assist modal shift promotion in Dunedin, through the influence the university has in Dunedin. The potential role the university could play as a promoter of modal shift promotion is evident through the densely populated North Dunedin area, along with the
flat topography, the lower socio-economic status and green minded population. The literature also identified universities as being prominent places for cycling where Cambridge and Oxford in the United Kingdom have both incorporated successful modal shifts (Banister, 2005; Cambridge Cycle Plan, 2008), along with Copenhagen, Odense and Muenster in the case studies having a strong university presence (Pucher and Buehler, 2008).

Key Informants identified that the university is currently a barrier to modal shift promotion in Dunedin. Key Informant 2 identified that the university took a no cycling on campus policy due to an incident that occurred on campus back in the past. Key Informant 7 also identified with this policy where, through restricting cycling on campus, it is restricting the opportunity of a modal shift promotion from occurring. Key Informant 3 identified that through the university failing to substantially provide for cycling in its Master Plan it seems imminent to continue to restrict cycling around and through campus. This will, therefore, maintain the university as a barrier to modal shift promotion in Dunedin, when, as identified above, the university could be a potentially key characteristic within a successful modal shift in Dunedin.

There was no literature incorporated into this research that identified a university being a barrier to cycling, which potentially highlights the uniqueness of the situation where the University of Otago are not promoting cycling, an active and sustainable mode of personal transport.

The results from Key Informant interviews highlight the University of Otago as an important, potential characteristic for modal shift promotion in Dunedin. Conversely, the University of Otago has also been identified as a significant barrier to modal shift promotion. It seems for modal shift promotion to become prominent around campus, serious changes are required in the current mindset of the university toward cycling.

The three characteristics identified by Key Informants that did not also possess barriers, were marketing, funding and enforcement. A discussion on these three characteristics and their roles in assisting modal shift promotion in Dunedin will now occur.
6.2.7 Marketing
Results from Key Informant interviews highlighted that marketing is an important characteristic in assisting modal shift promotion in Dunedin. Key Informants 3 and 15 both illustrated the importance of marketing in assisting modal shift promotion in Dunedin. The ability to change the perception of cycling for the better, where the public view it as a realistic mode of personal transportation around Dunedin, is what Key Informants 3 and 15 alluded to. Key Informant 1 felt that bikewise, a national run cycle promotion programme is a strong step in the right direction for marketing. The opportunity for Dunedin in developing its own marketing niche within cycling could assist the likelihood of a modal shift occurring.

The role of marketing extends to the other side where by making the private car seem less appealing modal shift promotion could be indirectly promoted. Key Informant 7 identified that taking the car off its pedestal would assist cycling in Dunedin. Low and Gleeson (2003) identified in the literature that target marketing campaigns at a national or local level that targets short car trips and the cost they have on society, particularly through health costs, but also economic and social costs, could assist in breaking down the car dependent culture. Key Informant 10 identified with the laziness of the Dunedin population, with the vast majority driving such short distances. A wider education on the benefits of modal shift promotion could assist in the development of cycling in Dunedin. Results from Key Informants and the literature indicate marketing as playing an important role within a potential modal shift in Dunedin.

6.2.8 Integration
Integration as a characteristic for modal shift promotion arose when discussing the central and local political environments but will be discussed further now. Key Informant interviews identified that integration is a very significant characteristic for assisting modal shift promotion in Dunedin. Over half of the Key Informants emphasised the significance of integration within a planning framework for modal shift promotion in Dunedin. Key Informant 4 identified that it is not just about promoting cycling, but the integration of transport modes to ensure cohesive transport exists in Dunedin that is not car dependent. The
opinion was shared with Key Informant 3 who illustrated the significance of multiple modes to get people out of their cars.

Key Informants 4 and 8 also highlighted the importance of integration between government departments and agencies as a characteristic assisting modal shift promotion in Dunedin. Key Informant 4 recognised the importance of bringing in different sectors with the benefits of a modal shift being extensive across different areas of society. This integration was also stressed by Key Informant 8, where a current lack of integration is inhibiting cycling growth.

The recognition that improved integration at both a central and local level will ensure better cohesiveness and directions for cycle planning and modal shift promotion has been illustrated by Key Informants. Key Informant 16 reiterated this when identifying that a systems approach that incorporates all important characteristics is fundamental for assisting modal shift promotion in Dunedin. It is the multifaceted approach that Key Informants highlighted, with the continual affirmation that with integration come wider public buy-in and resources. The integration being referred to by Key Informants aligns itself with comparable findings in the literature (Banister, 2005; Pucher and Buehler, 2007; 2008; Cox, 2010). The results indicate that integration is an important characteristic for modal shift promotion, but the lack of integration currently in Dunedin is a barrier to modal shift promotion.

6.2.9 Enforcement

The results from Key Informant interviews highlight that enforcement is an important characteristic for assisting modal shift promotion. Key Informants 2, 4 and 13 identified that, with a realignment of the onus of responsibility, the conditions for pedestrians and cyclists in Dunedin could drastically improve. Key Informant 4 emphasised that following the direction of successful cycling countries in Europe and prioritising pedestrians and cyclists, where the motorist is completely responsible in an accident, even if the pedestrian or cyclist is at fault, would contribute immensely to modal shift promotion in Dunedin and New Zealand. Key Informant 2 also identified that car speed is a factor that needs to be addressed to ensure modal shift promotion could occur. Key Informant 2 recognised the potential around the University of Otago in bringing the speed limit down to 30 km/hr, which would in turn assist
in the promotion of other modes. The results of Key Informant interviews confirm the findings from the literature where the shifting of the onus of responsibility assists directly in modal shift promotion (Pucher and Buehler, 2008).

The research also identified three barriers that have not been elaborated on yet, topography, weather and safety. A discussion on these three barriers will enable further interpretation of the roles they play as barriers to modal shift promotion in Dunedin.

6.2.10 Topography
Key Informants highlighted that topography plays a role as a barrier to modal shift promotion in Dunedin. This is largely evident through the hilly nature of Dunedin, coupled with the desirability to reside on hills. Key Informants 3 and 12 both referred to bike racks on buses as being able to combat the potential barrier of topography in Dunedin. Electric bikes identified by Key Informants 4 and 7 provide assistance to combating the barrier of hills, yet these are not as readily affordable to the general public, but may be more affordable in the future. Pucher et al. (1999) illustrated that topographical barriers are important to consider when assessing modal shift promotion [many successful cycling cities in Europe are predominantly flat]. Key Informants identify that the barrier of hills in Dunedin is a real barrier, yet can be overcome through appropriate route design, incorporation with other modes, and improvement of cycles.

6.2.11 Weather
Key Informant interviews highlighted that the weather is a barrier to modal shift promotion in Dunedin. It is important to recognise that this was only alluded to by a small number of Key Informants but is still important to discuss. Key Informant 3 identified that the climate in Dunedin can vary considerably during a day and consequently puts pressure on providing options to stay dry or warm if the weather changes. Key Informant 15 also agreed that the weather plays a role as a barrier to modal shift promotion, a view shared with Key Informant 14. The literature review indicated that weather does not play a significant role as a barrier to modal shift promotion (Pucher et al., 1999) evident through cycle success occurring in areas
that experience significantly harsher winters than Dunedin. The findings from Key Informant interviews align themselves with the findings in the literature that, by in large, the weather is not a prominent barrier in modal shift promotion, provided some integration is present between modes. But with the current integration lacking in Dunedin the weather could be a valid barrier at present.

6.2.12 Safety
The results from Key Informant interviews identified safety as a barrier to modal shift promotion in Dunedin. Key Informant 1 identified this safety barrier where parents are driving their children to school, therefore, taking children that could walk or cycle off the roads and making it harder to achieve a critical mass of cyclists identified as important by Key Informant 15 and in the literature (Pucher and Buehler, 2007). The identification of a flow on effect where parents start taking their children to school by car because they fear for their safety, which in turn makes the conditions less safe for other cyclists and forces more into other modes, was identified by Key Informant 13. The ability to develop a critical mass that Key Informant 15 identified is important to assist modal shift promotion in Dunedin, but currently lack of safety, and the perception of lack of safety, are working as a barrier, as identified by Key Informants.

The concern over safety on the roads is furthered where Key Informant 10 identified that the penalties associated with unsafe driving are insignificant. Key Informant 10 referred to an example where a cyclist was killed in Dunedin and the penalty was 200 hours community service and license loss for nine months. The literature identified that safety is an important barrier to address to assist modal shift promotion. Pucher and Buehler (2007) highlighted that the ability to develop a critical mass of cyclists will greatly aid the promotion of cycling in cities. It was also identified by Key Informant 10 that appropriate penalties should be enforced when contravening road rules. This was established in the literature where Pucher and Buehler (2008) identified Muenster in Germany as being successful in enforcing road rules. The ability to transfer the onus onto the motorist seems to be an important part of installing a safer environment for active transport.
Key Informant 10 identified that the development of a cycle simulation that allows drivers to be educated on cyclist’s capabilities should be an important addition to driver license education. The increase in safety that could be achieved through motorists having a greater awareness of cyclists would assist a modal shift in Dunedin.

The results from Key Informants are primarily aligned with the literature and, therefore, highlight the necessity of the presence of a safe cycling environment to encourage a modal shift promotion in Dunedin.

It is important to mention that whilst Key Informants did not specifically refer to spatial planning policies as an important characteristic or barrier to modal shift promotion in Dunedin, the literature has suggested spatial planning policy is pertinent to consider. The literature identified that spatial planning policy assists cycle growth in cities (Banister, 2002; 2005; Litman, 2008; Pucher and Buehler, 2008). The importance of Dunedin recognising this, and incorporating into their plans, a spatial policy that assists modal shift promotion is significant.

6.2.13 Conclusion of Characteristics and Barriers Section
This first discussion section on characteristics and barriers involved in modal shift promotion in Dunedin has enabled the identification of six main areas predominant from Key Informant interviews and the literature review for Dunedin. The first research question has been addressed, where the characteristics required for assisting a modal shift in Dunedin and the components of a planning framework to achieve this have been identified. The second research question has also been addressed where the barriers that are present to a modal shift promotion have been identified. The direction of this discussion will now consider the third research question.
6.3 Benefits of Modal Shift Promotion

The results section on benefits of modal shift promotion sought to answer the third research question, ‘What are the benefits of a modal shift towards cycling in Dunedin?’ This discussion section will answer the third research question by identifying the benefits of a modal shift promotion occurring as identified by Key Informants, and comparing these with benefits established in the literature.

Key Informant interviews were used to identify some of the health, economic and social benefits that can be experienced through a modal shift. These three areas will be discussed to allow for interpretations of the results to occur.

6.3.1 Health

The health benefits that were identified in Key Informant interviews included benefits on an individual and societal level. To distinguish between these two levels is important when assessing their interactions. The individual health benefits that can be obtained through modal shift promotion are vast, and while no Key Informants went into great detail about the benefits to an individual, all did refer to there being health benefits from a modal shift. Key Informant 7 identified the New Zealand Transport Authority as identifying a $2.80 saving per kilometre in the health sector, when referring to those least active, becoming active. Key Informant 6 identified mental benefits and that significant health benefits are associated with exercise. Key Informant 4 also identified the health benefits when identifying the reduction in medical diseases, particularly when those that are sedentary are being enticed into active transportation and cycling. Key Informant 10 furthered this by identifying that the current health burden, by the inactive portion of the population, would be reduced through incorporating a modal shift that included the most sedentary people.

Key Informant interviews also indicated the significance of physical activity by New Zealanders as the population becomes more sedentary. Key Informant 3 illustrates that the public are becoming more concerned about obesity and this provides an opportunity to market cycling and educate the public on the benefits that exist. Key Informant 4 also alluded to the
importance of reducing injury costs, which are associated with health, where the slowing down of motorised traffic will assist the reduction in health costs, primarily through crash injuries, to occur. This finding highlights what was identified in the literature on the health benefits at a societal level when the speed of travel is reduced (Pucher and Buehler, 2007; 2008). The literature review also identified that health benefits exist through modal shifts occurring. Litman (2003; 2010) also identified the benefits that can be experienced at an individual and a societal level through modal shift promotion. Key Informant 6 identified that health benefits can be detailed to the public through pamphlets. Key Informant 6 referred to the Dunedin City Council ‘Walk to Work’ pamphlet that educates people on distances and time along with the benefits of walking to work, including health, economic and social benefits (Appendix C).

The health benefits of a modal shift occurrence have been identified as extensive between Key Informants and the literature. The health benefits that occur at both an individual and societal level reinforces the significance of a modal shift being developed in Dunedin.

6.3.2 Economic
The economic benefits identified by Key Informants provide an understanding of the various types of benefits that are present through a modal shift occurring. The economic benefits occur, like the health benefits, at an individual and societal level. The individual economic benefits associated with modal shift promotion, as identified by Key Informants include greater expendable income, lower transportation costs, and lower maintenance costs. Key Informant 6 identified that the economic benefit to the individual is extensive if cycling is utilised as their main transport mode. This view was shared by Key Informant 1 who identified the cost of public transport and taking a car could contribute more to undertaking active transportation in the future.

The individual economic benefits extend to a societal level where the growth in expendable income on an individual level will likely directly influence the local economy through more expenditure, as identified by Key Informants. Key Informant 14 identified that a more socially cohesive street is economically beneficial for businesses. This was articulated in the literature.
review by Banister (2005), thus affirming the recognition that such economic benefits are apparent within modal shift promotion. Key informant 3 also identified the economic benefits at a societal level extend to people having more time to shop, with not being restricted by paid parking. Key informant 2 expands on the economic opportunity within the main street, where they identified, if car restrictions were incorporated, the economic potential for businesses would be immense. This view was disagreed with by key informant 5 who felt the perceived economic benefits that George Street could gain from car restrictions were not obviously going to outweigh the negatives. However, given that the key informants who identified with the economic benefits possess a more extensive background in modal shift promotion and active transport it would be valid to place more emphasis on their views.

Key informants 3 and 4 identified the economic benefits through the increased productivity of their employees that are physically active. Key informant 4 identified that physically active people are more productive and less likely to take time off through illness. This view is shared with key informant 3 who identified that one’s brain is heightened through regular exercise, particularly with commuting, and allows one to be more prepared for work. The identification that with a healthy employee come increased productivity, which is correlated with economic benefits, is an important finding from key informants. This finding is evident in the literature where Cycling in the Netherlands (2009) identified economic benefits for businesses with active employees.

It can be interpreted that the vast majority of key informants identified with the economic opportunity for Dunedin with a modal shift promotion and car restrictions within the central business district. One key informant, a current councillor, did however make it clear that the benefits are not obvious. The literature review supports the view of the majority of key informants where Litman (2010) quantified the economic benefits of modal shift promotion. This is supported elsewhere in the literature review where Banister (2005) and Pucher and Buehler (2007) both identified with the economic benefits of a modal shift.
6.3.3 Social
The social benefits of modal shift promotion identified by Key Informants were not as extensive as one had initially hoped. Key Informants alluded to a couple of social aspects that benefit from modal shift promotion, but it seems the understanding of how modal shift promotion could affect social dynamics is largely unknown or not understood in the New Zealand context. Key Informant 13 identified that with people walking and cycling, cities become more community oriented through the increase in interactions that occur. Key Informant 3 also identified that with a modal shift comes increased social security which increases social experiences. Both these views were confirmed within the literature where Litman (2003) and Cox (2010) identified social benefits from modal shifts occurring. Pucher and Dijkstra (2003) identified a less divided society can occur with cycling being accessible to all income levels, and therefore considered a socially equitable mode of transport. Banister (2002) also outlined some social benefits of modal shift promotion, including the reduction of depression and anxiety which can inhibit social situations, and through being physically active it is proven to reduce these medical conditions. The majority of social benefits identified within the literature review were not identified by Key Informants, which is somewhat expected due to cycle success not being apparent in Dunedin and New Zealand, therefore, people are not exposed first hand to the social benefits.

6.3.4 Conclusion of Benefits Section
This discussion section has addressed the third research question where the benefits of modal shift promotion, as identified by Key Informants have been compared to those findings articulated in the literature review. It is evident from this discussion that the benefits of modal shift promotion are vast and require consideration when promoting a modal shift in Dunedin. The levels of understanding currently present on benefits of modal shift promotion are questionable, and require further education and marketing to ensure the wider public have the information necessary to make sound judgements, as to how modal shift promotion can benefit them and the wider society in general, both in Dunedin and New Zealand.
6.4 Planning Framework for Modal Shift Promotion in Dunedin

This section answers the fourth research question, namely, what process is required for a planning framework to successfully assist a modal shift in Dunedin? This section brings together the two previous discussion sections and formulates a conceptual planning framework for assisting modal shift promotion in Dunedin. The integrative nature of this section will be illustrated by conceptual representations and will identify areas for recommendations and conclusions.

Figure 8 demonstrates the integration that is required to develop a planning framework to assist modal shift promotion in Dunedin. The three components of this figure, characteristics, barriers and benefits were extensively illustrated in the literature review, results and discussion sections of this research to enable an interpretation of their roles in a planning framework for assisting modal shift promotion.

Figure 8: Interpretation of the relationship between the three research aspects of this thesis.
Figure 8 identifies that the three research questions overlap and, where the overlapping of the three components occurs, forms the main interest of this research. The importance of determining the characteristics, barriers and benefits of modal shift promotion, have assisted in the development of the planning framework to assist modal shift promotion in Dunedin.

It is from the interpretation of Figure 8, that the move towards the development of the planning framework can occur. Table 19 illustrates the multifaceted approach required for modal shift promotion in Dunedin and starts to detail the process.

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<th>Characteristics</th>
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<th>Stage Two</th>
<th>Stage Three</th>
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Table 19: Identification of the stages involved in the development of a planning framework for modal shift promotion in Dunedin, based on the literature, results and discussion sections.

Table 19 incorporates three stages and recognises the diverse requirements that a planning framework must encompass to enable modal shift promotion to occur in Dunedin. To allow for a full understanding of the planning framework the process will be broken down into three stages and allow for an interpretation of the components for promoting modal shift in Dunedin within each stage.
Figure 9 illustrates the planning framework for assisting modal shift promotion in Dunedin and an explanation of the key components continues below. The development of the planning framework has occurred through the understanding of the important characteristics for modal shift promotion along with the current deficiencies in Dunedin to modal shift promotion currently. The incorporation of a gap analysis, identified in the methodology, has allowed for the identification in Key Informant interviews of the current areas requiring improvement to ensure modal shift promotion to cycling can occur. The proposed planning framework and explanation that follows highlights the key areas that have been identified by Key Informants, literature and case studies as important for assisting modal shift promotion in Dunedin.
Figure 9: Planning Framework for Assisting Modal Shift Promotion in Dunedin

Stage One
- Active Transport Forum
- Cycle Culture
- Electronic Mapping
- Political Environment
- Public Buy-in

Stage Two
- Marketing
- Education
- Enforcement
- Commuting Travel Plans
- Infrastructure Plan

Stage Three
- Car Restrictions
- Monitoring
- Long Term Vision

Successful Modal Shift in Dunedin
6.4.1 Stage One: Initiation

The initiation of a planning framework for assisting modal shift promotion in Dunedin requires multiple components being connected and undertaken simultaneously. The results from Key Informant interviews and the literature review have enabled the development of a three staged planning framework for modal shift promotion in Dunedin. The first stage, ‘Initiation’, requires a focus on the political and administrative levels to enable the grounding of such a shift to occur. The five components within the planning framework for Stage One are: active transport forum, cycle culture, electronic route mapping, political buy-in and public buy-in. The five components must be incorporated at the start of the modal shift process in Dunedin and each is discussed in turn below.

Figure 10 illustrates the roles, processes and responsibilities for Stage One of the planning framework.

Active Transport Forum

The development of an Active Transport Forum in Dunedin has come across within the results and discussion of this research as an important part of modal shift promotion. The Active Transport Forum needs to incorporate a diverse background of knowledge on active transportation, with representatives from the Dunedin City Council, Otago Regional Council, New Zealand Transport Authority, local advocacy groups and University of Otago, chaired by an independent representative. The development of a forum that meets regularly, potentially monthly, throughout the year will allow for the positive progression of active transport in Dunedin. The results from this research have identified that integration across levels of government, both central and local, is pertinent to modal shift promotion. Therefore, by developing an Active Transport Forum a strong step towards addressing the current barrier of integration would be made. It would be important that the Active Transport Forum acted on directing the processes being integrated at a Dunedin level. This could include active transport objectives, funding priorities, community consultation along with other areas. The Dunedin City Council is recommended to facilitate the establishment of this Active Transport Forum.
Figure 10: Stage One of Planning Framework Initiation

**Active Transport Forum**
- **Roles:** Dunedin City Council
- **Process:** Integration of key stakeholders
- **Responsibility:** Fundamental component of modal shift promotion in Dunedin

**Cycle Culture**
- **Roles:** Dunedin City Council
- **Process:** Shift in mindset
- **Responsibility:** Moving away from car dependency toward cycling in Dunedin

**Electronic Mapping**
- **Roles:** Dunedin City Council
- **Process:** Enhance resources
- **Responsibility:** Educate and generate awareness of cycling in Dunedin

**Political Environment**
- **Roles:** Cycling champion, Mayor of Dunedin and Councillors
- **Process:** Gathering political and public support
- **Responsibility:** Provide political impetus for a change in culture in Dunedin

**Public Buy-in**
- **Roles:** Prominent Dunedin People
- **Process:** Facilitating public buy-in to cycle culture
- **Responsibility:** Incorporating a change at the public level to get more prominent support for cycling in Dunedin

**Stage One Initiation**
Chapter Six Discussion

Development of Cycle Culture

The results from Key Informant interviews and the literature review indicated the importance of a cycle culture being developed to assist modal shift promotion. The challenge for Dunedin is to overcome the current car dependency through working towards developing a cycle culture. The results of this research have identified that culture can be changed through strategic marketing. The importance of the Dunedin City Council, along with New Zealand Transport Authority and other local agencies, to develop a marketing campaign that shifts the current image of cycling, to how cycling could be in Dunedin. The ability to market cycling as being an appropriate mode of personal transport for all ages and backgrounds would significantly assist modal shift promotion. The recognition to foster the development of a cycle culture through marketing, some marketing could be aimed at highlighting the real cost and consequences of the private car in Dunedin and, therefore, indirectly promoting cycling. The realisation that the development of such a marketing campaign could be integrated with the Active Transport Forum, and potentially utilise the University of Otago and the creativity of students in its design.

Electronic Mapping

The literature identified the importance of having up to date cycle route mapping that is user-friendly and enables one to calculate route times. The value of establishing a link on the Dunedin City Council website that demonstrates cycle routes throughout Dunedin and the approximate times and gradients, along with facilities at destinations, will assist in the promotion of a modal shift. It is important that the route information is accurate and enables people to identify with commuting options to their work. A Key Informant also identified that the Dunedin City Council has developed a ‘Walk to Work’ pamphlet (Appendix C) which provides good information on the benefits received to the individual. A similar form of ‘Cycle to Work’ pamphlet would assist cycle promotion in Dunedin. The recognition that the use and accessibility of the internet is relatively wide spread further reinforces the need to establish electronic mapping and resources in Dunedin.
**Political Environment**

The political environment was identified by Key Informants and the literature as being an important characteristic in assisting modal shift promotion. Dunedin currently possesses a political environment that restricts modal shift promotion, and therefore, provides the opportunity for the development of a new direction that works toward modal shift promotion. The incorporation of a ‘cycling champion’ within the Dunedin City Council who is employed to develop and promote cycling within Dunedin is important. It would be up to this person to gain support from respected people in the Dunedin community that would assist in the development of a cycle culture and increase political and public buy-in. The ability of the Dunedin City Council to completely understand the benefits of active transport in their city is required to enable the direction of current transport to be altered away from the current car dominant society that is present. It is also important that the ‘cycling champion’ develops funding initiatives, as the central government funding into cycling in Dunedin would be limited with the current government. Funding initiatives could include fund raising for cycle projects or the implementation of taxes on the private car, through increased parking or fuel costs, are ideas. It is important to realise that funding is fundamental for assisting modal shift promotion so the ‘cycling champion’ would have to be competent at addressing this.

**Public Buy-in**

The results from this research have indicated that public support is important when challenging the norms of societal function. The public need to identify with the issues of car dependency and the associated health, economic and social costs. The public need to understand the benefits of cycling. The ability to gain public buy-in would be assisted through the support of prominent Dunedin people who are highly regarded in the community. Successful sports representatives, business leaders and Dunedin icons could all be incorporated into the marketing of cycling in Dunedin. This could significantly improve public buy-in on the importance of cycling in Dunedin. Public buy-in could be extended further through encouraging submissions on active transportation to the Active Transport Forum that would assist the development of Long Term Community Council Plans. The
inclusion of prominent consultation would aid in the relationship of the Active Transport Forum and the Dunedin public.

The five components of the first stage involved in initiating a planning framework for assisting modal shift promotion in Dunedin is vital for cycle success in Dunedin. Understanding that all five components discussed above must be integrated and initiated collectively is vital, as the implementation of only one or two of the components may not allow the momentum required to ensure success in modal shift promotion.

6.4.2 Stage Two: Continuation
Stage Two of the planning framework for assisting modal shift promotion in Dunedin includes aspects that will continue the momentum generated from Stage One. The significance of gathering impetus, where the groundwork is established in the first stage, allowing cycling to grow in this stage and subsequent stages, is important for Dunedin. This planning framework will identify five components for assisting modal shift promotion in the ‘Continuation Stage’, namely; marketing, education, enforcement, commuting travel plans and a cycle infrastructure development plan.

Figure 11 identifies the roles, processes and responsibilities within Stage Two of the planning framework.
**Marketing**

**Roles:** Active Transport Forum

**Process:** Improving the image of cycling in Dunedin

**Responsibility:** To provide impetus to modal shift promotion in Dunedin

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**Education**

**Roles:** New Zealand Police

**Process:** Exposure of cycle simulation

**Responsibility:** Creating awareness in Dunedin drivers

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**Enforcement**

**Roles:** New Zealand Police

**Process:** Speed reductions and change in onus of responsibility

**Responsibility:** Culture change

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**Commuter Travel Plans**

**Roles:** Dunedin City Council and Cycling Champion

**Process:** Developing safe and efficient routes for commuting to school and work

**Responsibility:** Culture change

---

**Cycle Infrastructure Plan**

**Roles:** Active Transport Forum and Dunedin City Council

**Process:** Providing direction for future cycle infrastructure

**Responsibility:** Assisting modal shift through appropriate cycle infrastructure

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**Figure 11: Stage Two of Planning Framework Continuation**
Chapter Six Discussion

**Marketing**

The results of this research have identified that marketing plays an important role in modal shift promotion. The results find that marketing can be used to create awareness, encourage cycle use, assist cycle culture, and gain public and political support. The need for an exciting advertising campaign that will generate interest for a modal shift in Dunedin is required to ensure cycle success occurs. The ability to recognise that the public listen to marketing campaigns, evident through speed reductions during Queens Birthday weekend this year and smoking campaigns over the last few years, highlight the significance of making sure they are very appropriately designed. Marketing will help promote a cycle culture in Dunedin and will work toward modal shift promotion. The funding for such a marketing program needs to come from local government initially as central government are not prioritising such modal shifts at present. Funding could also be sponsored through businesses that will benefit from a modal shift occurring, for example cycle shops. The integration with the University of Otago could assist in the development of marketing campaigns at a reduced cost and in turn gathering student buy-in to cycle promotion.

**Education**

The results from Key Informant interviews and the literature have identified that education is essential in allowing modal shift promotion to occur in Dunedin. The education needs to target the barriers that are currently present in Dunedin; these include driver awareness, modal options and safety, and coupled with the benefits that cycling brings into a city. The responsibility for education being incorporated falls onto the ‘cycle champion’ and the Dunedin City Council. If the wider Dunedin public understand the benefits of cycling and see that cycling is being provided for, the momentum for modal shift promotion will continue to grow. The education being alluded to could also take place through incorporating a recently designed simulation that represents cyclist capabilities and experiences in Dunedin. The New Zealand Police funded simulation could become a part of a driver’s education or testing for licenses.
Enforcement

The results from this research have illustrated the importance of having support from the New Zealand Police in ensuring that motorists adhere to the road rules, along with cyclists. The significance of developing a culture change to see the onus of responsibility fall onto the motorist will assist in modal shift promotion, and will result in more cautious motorists and, therefore, safer environments for pedestrians, cyclists and all other transport users. The change in the onus of responsibility onto the motorist would see drivers behave more appropriately and cautiously around other road users, therefore, assisting in modal shift promotion. Key Informants also identified that speed reductions around the central city and other key areas will assist the safety of other road users. The speed around the University of Otago campus could be reduced to 30km/hr, even on the one-way streets to ensure priority and safety is given to other road users.

Commuting Travel Plans

The results from this research have highlighted commuting travel plans as a tool for assisting modal shift promotion in Dunedin. This is where workplaces and schools are helped to develop safe and pleasant walking and cycling trips. The requirement for the Dunedin City Council cycling champion to work actively with businesses and schools to achieve these commuting travel plans will further encourage the development of a cycle culture and assist modal shift promotion. There is a realisation that schools’ commuting travel plans will differ slightly to workplace ones as the role of discussing routes and encouraging safe riding may be more appropriate. The recognition that businesses and schools make up a significant number of private car trips that occur daily, and the need to replace these trips with active transport trips will assist the public awareness of the benefits, at an individual and societal level, in Dunedin.
Cycle Infrastructure Development Plan

The results from Key Informant interviews and the literature exemplified the requirement for appropriate cycle infrastructure to exist. The establishment of a cycle infrastructure development plan that is incorporated within the Active Transport Forum will allow for cycle infrastructure in Dunedin to be improved. The results highlight that cycle infrastructure plays a prominent role in modal shift promotion and subsequently needs to be appropriate and integrated to ensure the development of a cycle culture and modal shift promotion can be achieved in Dunedin. The recognition that projects, like the two tunnels commuter link to Mosgiel is important for assisting modal shift promotion in Dunedin. The integration of a cycle infrastructure development plan within the active transport forum, suggested in Stage One, will ensure the appropriate input assists modal shift promotion to occur.

6.4.3 Stage Three: Monitoring
The first two stages of the planning framework identified the Initiation and Continuation stages for modal shift promotion in Dunedin. This third stage, Monitoring, looks at the continual development of a modal shift in Dunedin. It includes three areas, car restrictive measures, monitoring and the development of a long term vision for Dunedin.

Figure 12 identifies the roles, processes and responsibilities of the third stage of the planning framework.
Figure 12: Stage Three of Planning Framework

**Car Restrictions**

**Roles:** Active Transport Forum and Dunedin City Council

**Process:** Increase parking costs and creating active transport precincts

**Responsibility:** Reduce car dependence

**Monitoring**

**Roles:** Active Transport Forum and cycle champion

**Process:** Evaluation and re-evaluation of cycle plans

**Responsibility:** Provide excellent facilities for cycling in Dunedin

**Long Term Vision**

**Roles:** Active Transport Forum

**Process:** Detailing direction for cycling in Dunedin

**Responsibility:** Ensuring cycling is a prominent mode of personal transport in Dunedin

Stage Three
Monitoring
Chapter Six Discussion

Car Restrictive Measures

The results from this research have identified that car restrictive measures are important for indirectly promoting modal shifts. The difficulty in providing car restrictive measures in car dependent societies has been highlighted by Key Informants and literature. The increase in oil and subsequent effects on petrol will further highlight the benefits of active transport. The move toward assisting active transport within plans over the private car will help promote a modal shift in Dunedin. The results have highlighted examples of car restrictions, such as incorporating a pedestrian-only main street, providing less parking for cars, as well as making car users pay for the real cost on society, assisting modal shift promotion in Dunedin. The implementation of car restrictive measures would need to be implemented at a local level, with the Active Transport Forum and Dunedin City Council working together to address the car dependency. The unpopularity of car restrictive measures in a car dependent society are obvious, yet for modal shift promotion to occur the development of a cycle culture, and importantly, the move away from a car dependent culture has to begin.

Monitoring of Characteristics

The different Initiation and Continuation components within the proposed planning framework for modal shift promotion in Dunedin identified above require monitoring to ensure successful outcomes are being experienced. Key Informants and the literature identified with the significance of continually evaluating and re-evaluating to ensure that modal shift promotion occurs appropriately. The onus of monitoring falls onto the Dunedin City Council and the Active Transport Forum. The ‘cycle champion’ could also be used to develop monitoring mechanisms to determine the cycle levels, and areas for further cycle infrastructure development.
**Development of Long Term Vision**

The results from this research have illustrated the importance of incorporating a long term vision for modal shift promotion that allows momentum to gather. Long term visions are important for assessing progress and allowing an understanding of the progression that is required to obtain modal shift promotion in Dunedin. A 30 year vision for cycle growth in Dunedin would allow for the continual development and progress towards the goal of a prominent cycle culture in Dunedin, a vision that would greatly assist the health, economic and social vibrancy of the city in the future. The incorporation of spatial planning within the Dunedin City Council City Development Plan is important to ensure the long term visions of cycling are achieved. The literature reiterated that spatial planning is an important component for creating compact and sustainable cities and Dunedin needs to incorporate such a policy into their City Development Plan for the future success of the city.

### 6.4.4 Conclusion of Planning Framework

The proposed planning framework for assisting modal shift promotion in Dunedin has been outlined. The incorporation of the components identified will go along way to redressing the culture of car dependency present in Dunedin and ensure active transportation, particularly cycling, has a prominent place in Dunedin.
7. Chapter Seven Conclusions and Recommendations

7.1 Introduction

The identification of car dependency in Dunedin and a strong interest in active transportation has guided this research on promoting cycling in Dunedin. A planning framework for assisting modal shift promotion in Dunedin has been developed to address the research problem. The question of how a planning framework can be developed to assist modal shift promotion in Dunedin arose, with a focus on personal travel patterns including commuting, leisure and daily activities. Consequently, the main objectives of the research were to identify key components for a planning framework to assist modal shift promotion, along with the identification of barriers and benefits to such a modal shift occurring in Dunedin.

In this chapter the research questions and their associated objectives along with the developed planning framework and the main findings of the research are revisited and a number of conclusions are drawn. The implications of the research for modal shift promotion and the limitations of these conclusions are also discussed. The research concludes with eleven recommendations for modal shift promotion in Dunedin, based on the planning framework identified from findings of this research, and outlines future direction for research.

7.2 Conclusions

The review of literature on modal shift promotion and the outlining of six case studies allowed for the identification of characteristics involved in successful modal shift promotions. The understanding of important characteristics for assisting modal shift promotion enabled a comparison to the Dunedin context and to help formulate a planning framework. The conclusions being identified in this section have come through the understanding of the
literature, case studies, results and the relationship between them as outlined in the discussion. The development of the planning framework outlined in the previous chapter highlights the direction required for Dunedin to experience modal shift promotion.

The first conclusion relates to the importance of assisting modal shift promotion in Dunedin. The current dependence on the car that is evident in Dunedin needs to be overcome to allow the development of a cycle culture. The prominence of the car in Dunedin is restricting the experiences of other road users, including the pleasantness and safety of cycling. The first conclusion is that to assist modal shift promotion in Dunedin the current car dependence needs to be addressed. The planning framework has identified car restrictive measures that will work alongside marketing and education that will target people’s behaviour to reduce the car dependency currently present in Dunedin.

The second conclusion stems from the interpretation of characteristics important for assisting modal shift promotion. The literature and results both exemplified the importance of having a political environment that is conducive to modal shift promotion. The current central political environment has been identified as a significant barrier to a modal shift. Coupling the central political barrier with the previous local political constraints, Dunedin could be interpreted as being in a difficult place to achieve a modal shift. The identification that the local political environment in Dunedin has changed since Key Informant interviews, [with a new mayor and other newly elected councillors] provides an opportunity for changing local political views on modal shift promotion. The ability for a ‘cycling champion’ to educate and foster the development of a favourable political environment is important for assisting modal shift promotion. The second conclusion is that, for a modal shift promotion to occur in Dunedin a realignment of the political environment is required. This must be driven by local government as the current central political environment has not made modal shifts a priority.

The third conclusion is formed through the identification within literature, case studies and the research results of the importance for integration being prominent. Stage One of the planning framework includes the Active Transport Forum which could improve the current integration, or seemingly lack thereof, in Dunedin. The collective integration of the Dunedin City Council, Otago Regional Council, New Zealand Transport Agency, University of Otago and cycle advocate groups could provide the direction and impetus required for a modal shift to occur.
Chapter Seven Conclusions and Recommendations

The recognition that integration occurs across numerous levels is demonstrated within the proposed planning framework where a public consultation process is incorporated into the Active Transport Forum to further the integration occurring. The third conclusion of this research is for modal shift promotion to be evident in Dunedin, the integration of key stakeholders is fundamental.

A fourth conclusion that is significant to this research involves the understanding of the importance of a modal shift in Dunedin. The literature and results from this research have stressed the health and economic implications of a modal shift occurring. The liveability of Dunedin could be significantly improved with health, economic and social benefits being experienced by individuals and the Dunedin community. The fourth conclusion is in order for Dunedin to develop as a city, the incorporation of a modal shift is an important component of this development.

A fifth conclusion stems from the significance of spatial planning policy from the literature. The literature identified that modal shift promotion is more likely to occur when strict spatial policies are in place. The relevance of spatial policy for Dunedin is evident through the current lack of a spatial planning policy that ensures compact and mixed use future growth within Dunedin. The fifth conclusion is in order for Dunedin to experience a modal shift the direction of current spatial policy must change. This will ensure Dunedin becomes more compact and mixed use, and, therefore, more cycle-friendly.

The final conclusion considers the wider implications of this research for New Zealand. The prominence of car dependency outlined for Dunedin has also been identified in New Zealand. The planning framework developed to assist modal shift promotion is context specific to Dunedin. However, the components of the three stages could potentially have similar effects in a different New Zealand context if they were tailored to that context. The identification of the current central political direction in New Zealand as being inhibitive of modal shift promotion reinforces the importance of a modal shift being promoted. The final conclusion is that in order for New Zealand to progress as a country, the current central political direction for personal transport must change. This will ensure that future considerations and a long term vision are integrated into New Zealand’s personal transport direction.
7.3 The Implications for Modal Shift Promotion

The current research makes a number of contributions to the current knowledge on modal shift promotion. Firstly the comprehensive literature review and case studies undertaken allowed for the development of a conceptualisation of the characteristics important for assisting modal shift promotion within theory and practice. This conceptualisation will assist the understanding between theory and practice within modal shift promotion.

The research also consolidates several ideas in the literature on modal shift promotion. Firstly, the importance of an appropriate political environment being present should not be overlooked by cities promoting a modal shift. Secondly, the barriers to modal shift promotion require context specific understanding as many are not transferable between locations. Thirdly, important characteristics for assisting modal shift promotion vary depending on the context of the locality, but overlapping themes are evidently apparent within these characteristics. Fourthly, the integrative component of modal shift promotion must not be underestimated. Fifthly, modal shift success is attributed to the ability to incorporate a multifaceted approach that illustrates the complexity associated with modal shift promotion.

The development of a planning framework for assisting modal shift promotion in Dunedin contributes to the knowledge on modal shift promotion. The planning framework details a three stage process to assist modal shift promotion and many of the components would be transferable to other contexts, provided they are adapted accordingly. The implementation of the planning framework into the Dunedin context with the result of a modal shift would further the significance of this framework, but this will only occur if key stakeholders buy into the developed planning framework.

This research also contributes to a better understanding of personal active transport in Dunedin. The findings could assist future policy directions on cycling in Dunedin. The planning framework identified that incorporating a ‘cycling champion’ is important for Dunedin to move toward a modal shift. The Long Term Community Council Plan, the District Plan, the Dunedin Cycling Strategy and the City Development Plan all provide opportunities to incorporate elements of this research.
Chapter Seven Conclusions and Recommendations

7.4 Limitations of the Research

The conclusions drawn from this research must be understood within an appreciation of their limitations. Firstly the specific Dunedin focus of the research generates caution if utilising the planning framework for a different New Zealand context. It is important to identify that the majority of Key Informants spoken to in relation to the research were located in Dunedin. This was due to the nature of the research focusing on Dunedin. The findings of the research do still correlate to a New Zealand level, but care is advised to be taken to prevent inappropriate generalisations.

The research design was limited to a literature review, Key Informant interviews and a gap analysis. The incorporation of a more comprehensive cycle assessment could have allowed stronger conclusions to be drawn between the literature and the results. The sixteen Key Informant interviews provided a range of roles and responsibilities on modal shift promotion. The gap analysis incorporated into this research could have benefited from a more extensive cycle assessment that identified the aspects working well and the current deficiencies in Dunedin for cycling.

Another limitation that was present in the research involved the focus on successful European cycle cities within the literature. The understanding that a wider focused literature review that considered both successful and unsuccessful modal shift examples, along with assessing different localities, could have strengthened the findings of the research and the subsequent proposed planning framework. This could have been through a comparison of the characteristics that are proven to work and those that do not work in assisting modal shifts.

Despite these limitations, the research has been successful in developing a planning framework for assisting modal shift promotion in Dunedin. Whether the implementation of the planning framework will achieve modal shift promotion in Dunedin will remain to be seen. The research does indicate that the potential for a modal shift is present through the integrative approach detailed in the planning framework. The research has implications for Dunedin and also wider ramifications for New Zealand. The following section presents recommendations for assisting modal shift promotion in Dunedin and New Zealand.
7.5 Recommendations

The following recommendations are based on the findings of the literature review, context analysis and primary research presented in Chapter Five and discussed in Chapter Six. The recommendations are based on the planning framework developed to assist modal shift promotion in Dunedin. To assist the practicality of the recommendations they are tailored for the Dunedin City Council and transport planners in Dunedin and the New Zealand Transport Agency and how they might assist modal shift promotion in Dunedin.

1. That the Dunedin City Council consider the incorporation of the developed planning framework into its cycling strategy.

The incorporation of the developed planning framework illustrated in Chapter Six could allow for the assistance of a modal shift in Dunedin. The Dunedin Cycling Strategy is currently being redrafted and it is recommended the planning framework is considered and incorporated appropriately into the Dunedin Cycling Strategy.

2. That the Dunedin City Council initiate an Active Transport Forum for Dunedin.

The Dunedin City Council could initiate an Active Transport Forum by integrating with other key stakeholders. The Dunedin City Council, Otago Regional Council, The Local New Zealand Transport Agency, University of Otago and local advocacy groups could all have representatives (preferably multiple) that form an Active Transport Forum, chaired by an independent representative. The initiation of an Active Transport Forum could significantly assist the opportunity of active transport in Dunedin. The University of Otago could be a prominent part of an Active Transport Forum and this is important to occur.
3. *That the Dunedin City Council consider the development of a cycle culture in Dunedin.*

The initiation of a cycle culture in Dunedin is recommended to allow for the development of cycling as a mode of personal transport. The development of a cycle culture can include marketing that improves the image of cycling in Dunedin. The incorporation of respected people in Dunedin into a marketing campaign for cycling could strongly assist the development of a cycle culture. The recognition that education of motorists is another important component and the utilisation of the cycle simulation programme developed by the New Zealand Police could assist this education. The Active Transport Forum could also play a part in the marketing and education direction undertaken in Dunedin. The Active Transport Forum could assist the education of the health, economic and social benefits of a cycle culture being developed in Dunedin.

4. *That the Dunedin City Council incorporate electronic resources to assist modal shift promotion.*

The initiation of an electronic cycle resource within the Dunedin City Council website could allow the public to calculate cycle routes, times, gradients and identify with cycle facilities that are present in Dunedin. The inclusion of a recreation and commuter map could assist the differentiation between these two types of cycling. The incorporation of electronic monitoring around key areas in Dunedin, for example the central business district and the University of Otago, could assist measuring cycling in the city and help determine areas for improvement. Electronic resources are a popular feature of successful cycling cities overseas and by incorporating a similar resource in Dunedin it could generate further education and awareness and assist cycle culture development.
5. *That the Dunedin City Council, in conjunction with the University of Otago, consider implementing a 30km/hr speed restriction in the Tertiary Precinct to assist pedestrian and cyclist safety.*

The implementation of speed reductions around the University of Otago could assist the development of a cycle culture and assist modal shift promotion. The results of this research have identified that reducing speed is an important part of promoting a modal shift. The implementation of a 30km/hr speed limit around the campus zone could be trialled, and if successful extended to other areas in Dunedin, including South Dunedin and the wider central business district.

6. *That the Dunedin City Council work with the Dunedin Police to establish stricter adherence to traffic laws to ensure greater pedestrian and cyclist safety.*

The importance of having laws reinforced in the developing stages of a cycle culture is essential. The strict enforcement of motorist behaviour could assist the development of a cycle culture through motorists identifying that the onus of responsibility falls on them. This could create an environment that is conducive to a modal shift.

7. *That the Dunedin City Council develop a Cycle Infrastructure Development Plan.*

The Dunedin City Council could develop a cycle infrastructure development plan that seeks to improve the cycle infrastructure in Dunedin. It would be recommended to establish the plan within the Active Transport Forum to ensure that cycle infrastructure projects carried out in Dunedin are appropriately planned and implemented. The recognition that projects, like the commuter tunnel to Mosgiel, are important for developing cycle culture and assisting modal shift promotion in Dunedin.
8. That the Dunedin City Council implement a long term vision for active transport in Dunedin.

The long term vision could be incorporated within the Active Transport Forum and provide a realistic vision for the future of Dunedin active transport. A 30 year vision for active transport could allow for pedestrian and cyclist needs to be achieved in Dunedin and allow for the continual development and progression towards the goal of a prominent cycle culture in Dunedin. This vision could greatly assist the health, economic and social vibrancy of the city in the future.

9. That the Dunedin City Council begin the slow implementation of car restrictions.

The implementation of car restrictions in Dunedin could significantly assist the development of a cycle culture along with reducing the level of car dependence. The increase in the cost of paid parking in the central business district, along with a reduction in the number of parks available, through taking out the parking provisions requirement in the District Plan, will assist in cycle culture development. Investigating increasing the price of petrol in Dunedin could also be considered an option to assist the implementation of car restrictions.

10. That the Dunedin City Council considers integrating cycle promotion through spatial planning policy in the City Development Plan.

The Dunedin City Council could integrate a strict spatial planning policy within its District Plan. The establishment of spatial planning policy, that ensures Dunedin incorporates compact and mixed use development, could assist in the future viability of the city and modal shift promotion through the need for shorter trips.
11. That the New Zealand Transport Agency provide more comprehensive national level guidance on assisting modal shifts towards cycling for New Zealand cities.

The New Zealand Transport Agency could provide more detailed information on assisting modal shift promotion in New Zealand cities with the opportunity to incorporate more active transportation. The recommendation stems from the identification that the current resources available to local level governments on modal shift promotion are limited. The incorporation of guidance, along with a more comprehensive and explanatory system from the New Zealand Transport Agency, could assist the promotion of active transport modes in all New Zealand cities, and foster the development of a cycle culture in New Zealand.

7.6 Future Research

Several directions for further research emerged as the research developed. Firstly, the research findings are based on a context specific case study for Dunedin and therefore a comparative study with the development of a planning framework for another city in New Zealand may provide different findings, or a relevant comparison. Secondly, the development of a planning framework would benefit from a greater understanding of the factors that influence cycle culture, and allow for local councils and planners to incorporate such factors into their cities. Thirdly, research on means of integrating modal shift characteristics into the practical application in cities would assist the implementation of cycling in New Zealand cities. Finally there is an important gap between the behavioural barrier of car dependency and an understanding of people’s willingness to change. Appropriate planning design and implementation would enable active transportation to be promoted in New Zealand cities.
7.7 Concluding Comments

How can a planning framework for assisting modal shift promotion be undertaken for Dunedin? The findings of this research highlight the components that are fundamental to a planning framework assisting modal shift promotion in Dunedin. The integration and collaboration of characteristics, benefits and barriers to this planning framework demonstrate the implications for Dunedin and modal shift promotion. The current car dependence that is evident in New Zealand is inhibiting the promotion of active transport modes, yet there is recognition that if the appropriate planning frameworks are adhered to then active transportation has an increasing role to play. The influential components identified throughout this research emphasise the power that is currently possessed by the central and local political environments. The move toward public integration and wider education on issues related to active transport could help direct New Zealand toward a more active and fulfilling future.
8. References


Key Informant Information Sheet and Consent Form
Cycling toward Europe: Opportunities for assisting cycling in Dunedin through a proposed planning framework

INFORMATION SHEET FOR PARTICIPANTS

Thank you for showing an interest in this project. Please read this information sheet carefully before deciding whether or not to participate. If you decide to participate we thank you. If you decide not to take part there will be no disadvantage to you of any kind and we thank you for considering our request.

What is the Aim of the Project?

This project is being undertaken as part of the requirements for a Masters in Planning. The aim of this thesis is to develop a planning framework for the Dunedin City Council to assist modal shift promotion towards cycling in Dunedin.

What Type of Participants are being sought?

Participants with an expertise, a vested interest or role in the active transportation sector are being sought to participate in this research.

What will Participants be Asked to Do?

Should you agree to take part in this project, you will be asked to answer questions to the best of your ability on active transport, cycling, modal shifts and applicability to New Zealand during an approximate 30 minute interview.

Please be aware that you may decide not to take part in the project without any disadvantage to yourself of any kind.

Can Participants Change their Mind and Withdraw from the Project?

You may withdraw from participation in the project at any time and without any disadvantage to yourself of any kind.

What Data or Information will be Collected and What Use will be Made of it?

Data will be collected in the form of an audio-taped interview that will allow answers to questions to be fully developed (Note below).

The use of the data and those who will have access to it will include the researchers, typists, transcribers and staff making photocopies.
The results of the project may be published and will be available in the University of Otago Library (Dunedin, New Zealand) but every attempt will be made to preserve your anonymity.

You are most welcome to request a copy of the project should you wish.

The data collected will be securely stored in such a way that only those mentioned below will be able to gain access to it. At the end of the project any personal information will be destroyed immediately except that, as required by the University’s research policy, any raw data on which the results of the project depend will be retained in secure storage for five years, after which it will be destroyed.

Reasonable precautions will be taken to protect and destroy data gathered by email. However, the security of electronically transmitted information cannot be guaranteed. Caution is advised in the electronic transmission of sensitive material.

**What if Participants have any Questions?**

If you have any questions about our project, either now or in the future, please feel free to contact either –

Sam Le Heron or Rosalind Day
Department of Geography Department of Geography
University of Otago University of Otago
03 479 4216 03 479 8780

Note: To be included if an open-questioning technique is involved-

This project involves an open-questioning technique where the precise nature of the questions which will be asked have not been determined in advance, but will depend on the way in which the interview develops. Consequently, although the University of Otago Human Ethics Committee is aware of the general areas to be explored in the interview, the Committee has not been able to review the precise questions to be used.

In the event that the line of questioning does develop in such a way that you feel hesitant or uncomfortable you are reminded of your right to decline to answer any particular question(s) and also that you may withdraw from the project at any stage without any disadvantage to yourself of any kind.
Cycling toward Europe: Opportunities for assisting cycling in Dunedin through a proposed planning framework

CONSENT FORM FOR PARTICIPANTS

I have read the Information Sheet concerning this project and understand what it is about. All my questions have been answered to my satisfaction. I understand that I am free to request further information at any stage:

I know that:-

1. My participation in the project is entirely voluntary;
2. I am free to withdraw from the project at any time without any disadvantage;
3. The data (audio tapes) will be destroyed at the conclusion of the project but any raw data on which the results of the project depend will be retained in secure storage for five years, after which it will be destroyed;
4. “this project involves an open-questioning technique where the precise nature of the questions which will be asked have not been determined in advance, but will depend on the way in which the interview develops and that in the event that the line of questioning develops in such a way that I feel hesitant or uncomfortable I may decline to answer any particular question(s) and/or withdraw from the project without any disadvantage of any kind”;
5. The results of the project may be published and available in the University of Otago Library (Dunedin, New Zealand) but every attempt will be made to preserve my anonymity.

I agree to take part in this project.

…………………………………………..
………………………
(Signature of participant) (Date)
Guideline for Key Informant Interviews
Key Informant Preparation Information:

The three research questions associated with this study are outlined below along with questions that will likely be asked during interviews.

1. How can a modal shift toward cycling be promoted in New Zealand?
   a. Do you believe there is an opportunity for an increase in the number of people cycling in New Zealand?
   b. Does the current institutional framework in New Zealand provide for the promotion of a modal shift? Reasons?
   c. What changes in institutional frameworks are required if the promotion of a modal shift is to occur?
   d. Who are the key agents/agencies involved and how do they support / establish conditions favourable to a modal shift?

2. What are the opportunities and potential barriers for promoting a modal shift in New Zealand?
   a. What are some of the benefits associated with a modal shift?
      i. Social / economic / physical / environmental
   b. Do you feel that New Zealand / Dunedin are experiencing these benefits currently?
   c. What are some of the potential barriers to the promotion of a modal shift in New Zealand / Dunedin?
      i. Social / economic / physical / political / environmental
   d. How could these barriers be addressed appropriately to promote a modal shift?

3. How could a modal shift be promoted in Dunedin?
   a. What are the important characteristics for promoting a modal shift?
   b. Who would need to be involved to achieve a modal shift?
   c. How important is the role local government plays in this promotion?
   d. Do you feel that Dunedin has the potential to experience a modal shift?
      i. How can this be achieved?

What do you associate as being one of the big underlying characteristics for the promotion of a modal shift in Dunedin?

Do you feel that Dunedin is forward thinking in its transport provisions?

Would the population of Dunedin respond to a change in transport mode if directly and indirectly guided?
- Do you feel South Dunedin / North Dunedin link with CBD could be better designed for cyclists?
  
  o Considering the short nature of most trips from ND and SD into the CBD does the DCC identify and want to act on this sustainable potential?
- Does the DCC work actively with the university to achieve integrated responses?
Walk to Work Pamphlet
Did you know?

- There are approximately 200 walking tracks within the Dunedin City boundary. These great walks are suitable for people of all levels of fitness.
- Dunedin has six spaces in the city that have been created specifically as dog exercise parks. If you are walking in the weekend why not take your family pet to a dog exercise area.
- A Walking School Bus is a group of children walking to school escorted by an adult volunteer Walking Bus ‘driver’. The Walking Bus walks along a fixed route that has been checked by the Police for safety, and picks children up at assigned stops along the way. For more information on Walking Schools Buses in Otago or other active transport initiatives, contact Sport Otago on 0800 ACTIVE (0800 228 483).
- Dunedin has guided inner-city walking tours. The Otago Settlers’ Museum runs a series of guided inner-city walks that allow people to experience the character, history and beauty of Dunedin in a leisurely two hour stroll. For more information contact the Dunedin Visitor Centre (i-site) in the Octagon.
- There are over 900km of footpaths in Dunedin with 38 sets of traffic lights and 51.5km of stairs to help you get from A to B.

Why walk to work?

- Walking is cheaper and healthier
- It provides an opportunity to appreciate Dunedin’s beautiful surroundings.
- It’s versatile – you can leave when you want to.
- Weather – it’s nice to be out in the sun, invigorating in frosts and staunch in wet weather.
- There are heaps of health benefits to walking:
  - Increased energy levels
  - Improved sleep quality
  - Lower stress levels and blood pressure
  - Help ‘clock up’ your 30 minutes of daily exercise
  - Park and walk from free parking areas outside Central Business District.

Take the bus some of the way

Too far to walk to work from home? Why not take a bus halfway and walk the rest using this walking map? Too many steep hills? Walk to work and catch a bus home. For more detailed information on bus routes you can go to the Otago Regional Council website: www.orc.govt.nz or phone (03) 474 0287.

Further information and feedback

For more information or to offer feedback on this map please contact the Dunedin City Council on 477 4000.

Central City Walk to Work

www.dunedin.govt.nz