A Step Towards Sustainable Transportation Behaviour:
Understanding automobile ownership and mode choice through qualitative research

by

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Author's Declaration

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

I understand that my thesis may be made electronically available to the public.

Abstract

It is now widely recognized that society's over-reliance on the automobile contributes to environmental problems, especially in urban areas. Nevertheless, efforts to bring about modal shifts through transportation demand management strategies typically have had limited success. As a result, transportation research is increasingly focused on understanding the decision-making process of travel behaviour changes including mode choice and automobile ownership. The purpose of this study is to explore how individuals arrive at a decision to live either car-free or car-lite.

Using a grounded-theory approach, this thesis explores the factors involved in a car-free/car-lite decision and the manner in which those factors work together to create the decision making process(es). Semi-structured interviews were conducted with 20 driving members of a car-sharing organization, each of whom made a decision to go car-lite (car-sharing is their additional vehicle) or car-free (car-sharing is their primary vehicle).

Five main interconnected themes emerged from the analysis: finances, personal values and attitudes, personal history, perceived accessibility and situational life events. In particular, the participants' experiences reinforce the importance of situation life events in the decision-making process, a factor not commonly identified in behaviour change theory. Additionally, the participants' narratives illustrate that intention is created from an individual's inclination and ability to make a travel behaviour change. However, translation from intention into action appears to be conditionally dependent on contextual and/or situational changes, most often in the form of situational life events, that provide a push into or out of the decision-making process. Findings underscore the importance of life events as catalysts for bringing travel behaviour in line with an individual's sense of what is important and what is possible.

This research illustrates the relevance of qualitative work in advancing transportation research – particularly in understanding human travel decisions. While the current transportation-planning paradigm is appropriate for making short-term forecasts, we must recognize that non-linear, non-utilitarian, long-term, often qualitative factors, such as those identified in this research, are not exogenous to travel decision making. Results also provide a basis for reflecting on the appropriateness of various metrics for evaluating the effectiveness of transportation demand management initiatives.

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1   INTRODUCTION

1.1 Research Problem

The widespread adoption of an auto-centric living style has produced significant concerns about the health of our cities and the planet. Over the last century, the increasing dominance of the automobile has primarily been the result of transportation planning strategies aimed to meet expected traffic volumes by supplying increased road infrastructure (Hanson & Giuliano, 2004). For many urban areas, traffic congestion and associated air pollution are the top municipal concerns.

With mounting evidence that the North American transportation system is not sustainable, there is now growing interest in policy interventions and planning strategies that offer alternatives to road expansion (Newman & Kenworthy, 1999). These alternatives, collectively known in North American as transportation demand management (TDM) (also referred to as mobility management and integrative transportation strategies) are strategies for altering travel behavior in ways that improve the efficient use of current infrastructure or shift travel away from automobiles. TDM strategies encompass a breadth of options including high occupancy vehicle lanes, parking management, public transit and car-sharing. Across the USA and more recently in Canadian urban centers, TDM strategies are increasingly being adopted as part of urban transportation plans.

The potential effectiveness of TDM strategies in mitigating traffic congestion as well as improving air quality has been met with skepticism because of the debatable successes TDM strategies have had. Initially touted as the panacea for transportation problems, some research illustrates successes stories while others a lack of impact; however a majority of case studies remain unassessed. At present there is a gap between expected and realized outcomes of various

TDM initiatives, with a majority of case studies not living up to expected results. In particular, modal shift is often disappointingly low with average expected modal shift between three and five percent (Ogilvie *et al.*, 2004; Cao & Mokhtarian, 2005). This may be due to the evaluation methods used and reliance on indictors that are incomplete. With an inconsistent track record, concern continues among municipal decision-makers and practitioners regarding TDM strategies' effectiveness at promoting modal shifts and also about their palatability to the general public.

At its core, TDM strategies seek to prompt a travel behaviour change to a more sustainable car-free or car-lite lifestyle and "only by understanding the full nature of people's travel decisions and how they interact can sensible policies be formulated" (Arnott & Small, 1994, 455). Research has focused on deciphering the factors that affected a change in travel behaviour including cost, convenience, attitudes and demographics. However, while research provides a solid foundation of these factors, it does not illustrate how these factors compete, complement and/or enhance each other in a decision-making process. One gap that remains unexplored is the need to further understand the decision-making process itself.

This study explores the experiences of a small sample of citizens who have made a modal shift decision by joining a car-sharing organization (a less commonly implemented TDM strategy) and going either car-free (car-sharing is their primary vehicle) or car-lite (car-sharing is their additional vehicle). Particular attention was given to how the factors affected the decision-making process as well as how the factors work together within the decision-making process.

1.2 Purpose and Objectives of Study

The purpose of this study is to explore from the perspective of individuals making a car-free/car-lite decision how they arrived at this decision the factors involved and how these factors

work together to create the decision making process(es). This exploratory research used face-to-face interviews with driving members of car-sharing organizations who have made a lifestyle choice to go car-free (individuals who do not own or lease their own vehicles and use car-sharing vehicles as their primary vehicles) or car-lite (those who own or lease at least one vehicle but use car-sharing vehicles as their additional vehicles). These interviews elucidate the experiences and perceptions of these individuals in changing their travel behaviour.

Using a grounded theory approach, the primary objective of this research is to contribute to substantive theory that:

1. identifies the perceptions and relative importance of factors affecting a modal shift decision and explores the presence (or lack thereof) of a trigger point for the decision being made;

2. explores the decision-making process individuals adopt when considering (or rejecting) a travel behaviour change.

1.3 Conceptual and Theoretical Framework

The conceptual framework adopted during this study is outlined inFigure 1.1. The decision to make a travel behaviour change is complex and based on a number of well-researched factors associated with life stage, land use, transportation systems, personal attitudes and values, cost, etc., but there is little known about the factor involved in a car-free or car-lite decision. The study's two objectives collectively address knowledge gaps present in this framework. In keeping with a grounded theory approach a theoretical framework evolved through the analysis process.

Figure 1.1: Conceptual framework for this thesis
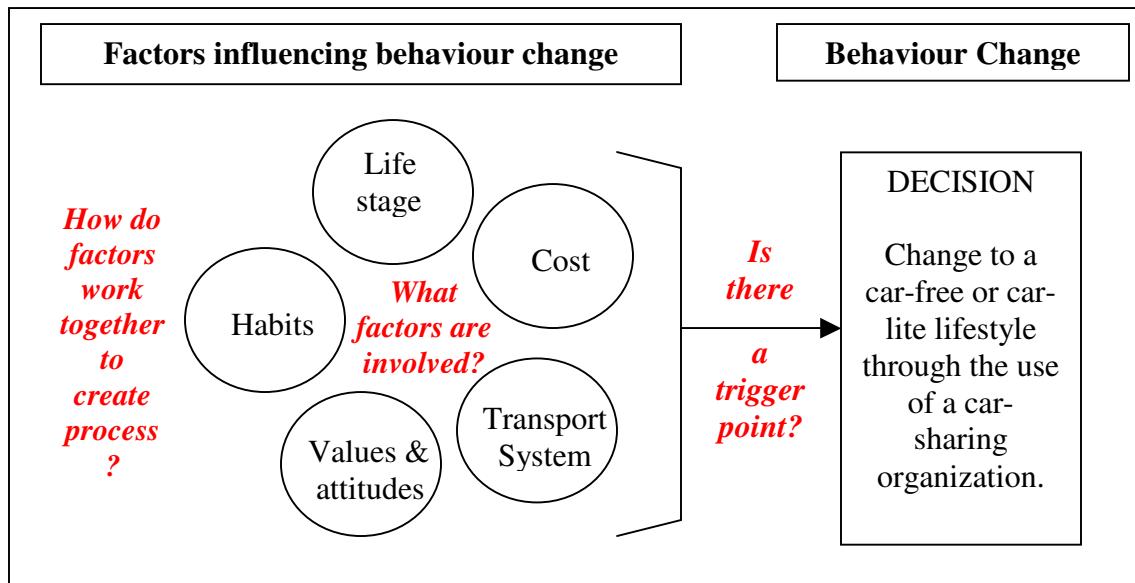
1.4 Overview of Thesis

Including this introductory chapter outlining the context, purpose and rationale for undertaking a study of the interactive effects of TDM strategies, this thesis is comprised of 6 chapters. The subsequent chapters explore this research, beginning with a literature review (chapter 2), followed by details of the research design and methods (chapter 3). Findings of the research are described in chapters 4, and the emerging themes are interpreted and discussed in chapters 5. The last chapter is dedicated to the conclusion (chapter 6) including dissemination, application and future research questions.

2   LITERATURE REVIEW

2.1 Sustainability and the North American Transportation System

There is growing evidence that the current North American transportation system cannot be sustained. The auto-centric living style has produced significant concerns about the health of our cities and the planet. Sustainable development has been the foundation for envisioning alternative transportation futures. Popularized in 1987 with the Brundtland Report definition, sustainable development is "development that meets the needs of the present without compromising the ability of future generations to meet their own needs," balancing social, economic and environmental concerns while increasing the standard of living and quality of life (World Commission on Environment and Development, 1987, 43). Sustainable development pertains to all human action, including transportation and related concerns such as traffic congestions, air quality, mobility, and climate change.

Sustainable transportation, when embedded in the broader concept of sustainable development, describes a situation where transportation infrastructure and patterns deliver reliable and equitable accessibility of goods and people with minimal environmental impact. Sustainable transportation ideology diverges from past practices that employed an economic welfare approach to transport analysis. Instead of attributing monetary values to the expenses and returns within a cost-benefit analysis, a more integrated approach includes, in addition to traditional monetary values, non-monetary social and environmental values that reflect the epistemology of sustainability (Jones & Lucas, 2000; Deakin, 2002). This sustainable vision "requires that policy making . . . be viewed in a holistic sense: that planning for transport, land-use and the environment no longer be undertaken in isolation" (Geerlings & Stead, 2003, 187). Researchers who espouse changing the current transportation system into a more sustainable one

often identify the use of full-cost accounting as imperative for success (Jones & Lucas, 2000; Schipper, 2002).

2.1.1 Trends in Canadian Transportation

Over the past 50 years, personal and commercial mobility has increased dramatically and has become increasingly auto-focused. Not only are Canadians traveling and shipping more, but also the means to make those increased trips and kilometres have been fulfilled by on-road transportation modes. Truck freight in Canada has seen a dramatic and steady rise, increasing 9.38% between 1990 and 2004 (Natural Resources Canada, 2006a). Likewise, Canadians are traveling more kilometres per year (Natural Resources Canada, 2006b), and of all trips made by adults in Canada on a typical day in 1998, 75% were made by automobile, up from 70% in 1986 (Clark, 2000). These trends in personal movement have been fostered in part by urban sprawl and the low-density design of suburban areas. Commuters are traveling longer distances to get to work, and the number of short-distanced trips has also increased (Statistics Canada, 2006c). Indeed, urban residents in Canada, when compared with those in other developed countries around the world, have higher than average energy use per vehicle-kilometre (The Centre for Sustainable Transportation, 2002).

2.1.2 Measuring the Sustainability of a Transportation System

In response to growing concerns, agencies and individual researchers have identified numerous indicators to monitor the sustainability of transportation networks. Using social, economic and environmental indicators, this body of literature identifies the state and current impacts of a transportation system, and proposes strategies that would improve the sustainability of our transport system and, in turn, our cities.

The indicators used to measure a transportation network's sustainability can be grouped by economical, social and environmental foci (Jones & Lucas, 2000; Finke & Schreffler, 2004; Kennedy *et al.*, 2005; Litman & Burwell, 2006) (See Table 2.1: Sustainable Transportation Indicators). Despite a lengthy list of sustainability indicators, a majority of research and practice utilizes only economic-transportation and environmental indicators, often neglecting to employ broader, equity-based indictors (Jones & Lucas, 2000; Deakin, 2002; Schipper, 2002). These equity-based indicators are often found only in research focusing on the breadth of sustainable transportation, e.g., see Jones and Lucas (2000) and Kennedy *et al.* (2005). This variance in the indicators selected to evaluate transportation networks is highlighted because it significantly influences the evaluation results and thus challenges current standard practise to measure sustainability in its entirety.

2.1.3 Creating a Sustainable Transportation System

2.1.3.1 From supply- to demand-management planning

The rapid increase in motorization following the end of the Second World War, combined with low-density, supply-management, land-use planning has fostered the development of automobile-dependent cities, particularly in North America (Tolley & Turton, 1995; Newman & Kenworthy, 1996; Sheller & Urry, 2000; Kennedy, 2002; Button & Hensher, 2005). The focus of planners was on providing residential communities that were separate from commercial land. In doing so, transportation planners needed to maintain and enhance mobility between different zoning areas through the use of extensive road networks, thus neglecting to improve accessibility (Walton & Shaw, 2003; Hanson & Giuliano, 2004). The focus was on

Table 2.1: Sustainable Transportation Indicators

Objectives	Indicators	Direction
ECONOMIC		
Accessibility – commuting	Average commute travel time	Less is better
Accessibility – land use mix	Number of job opportunities and commercial services within 30 minute travel distance of residents	More is better
Accessibility – smart growth	Implementation of policy and planning practices that lead to more accessible, clustered, mixed, multimodal development	More is better
Transport diversity	Mode split: portion of travel made by walking, cycling, rideshare, public transit and telework	More is better
Affordability	Portion of household expenditures devoted to transport by 20% lowest-income households	Less is better
Facility costs	Per capita expenditures on roads, traffic services and parking facilities	More is better
Freight efficiency	Speed and affordability of freight and commercial transport	More is better
Planning	Degree to which transport institutions reflect least-cost planning and investment practices	More is better
SOCIAL		
Safety	Per capita crash disabilities and fatalities	Less is better
Health and fitness	Percentage of population that regularly walks and cycles	More is better
Community liveability	Degree to which transport activities increase community liveability (local environmental quality)	More is better
Equity – fairness	Degree to which prices reflect full costs unless a subsidy is specifically justified	More is better
Equity – non-drivers	Quality of accessibility and transport services for non-drivers	More is better
Equity - disabilities	Quality of transport facilities and services for people with disabilities (e.g., wheelchair users, people with visual impairments)	More is better
Non-motorised transport planning	Degree to which impacts on non-motorised transport are considered in transportation modelling and planning	More is better
Citizen involvement	Public involvement in transport planning process	More is better

ENVIRONMENT

Climate change emissions	Per capita fossil fuel consumption, and emissions of CO2 and other climate change emissions	Less is better
Other air pollution	Per capita emissions of 'conventional' air pollutants (CO, VOC, NOx, particulates, etc.)	Less is better
Noise pollution	Portion of population exposed to high levels of traffic noise	Less is better
Water Pollution	Per capita vehicle fluid losses	Less is better
Land use impacts	Per capita land devoted to transportation facilities	Less is better
Habitat protection	Preservation of wildlife habitat (wetlands, forests, etc.)	More is better
Resource efficiency	Non-renewable resource consumption in the production and use of vehicles and transport facilities	Less is better

(Litman & Burwell, 2006, 337-338)

transportation supply management, i.e., about estimating and projecting mobility demand, and then supplying the appropriate infrastructure to meet it. Future road needs were estimated using the Urban Transportation Model System, the backbone of transportation planning which quantifies current trip generation, trip distribution, modal split and traffic assignment to predict future travel patterns for entire transportation systems (Tolley & Turton, 1995; Johnston, 2004).

More recently there are concerns over the limit to which governments, particularly in urban areas, can continue to increase road capacity. One concern is that many cities have limited land, especially in high-volume traffic corridors (Wachs, 1991; Newman & Kenworthy, 1999; Hanson & Giuliano, 2004). Also, the economic affordability of building and maintaining massive road infrastructure is being questioned. The business case or cost-benefit analysis no longer exclusively favours subsidizing and/or expanding road infrastructure because doing so generates external costs (e.g., increased expenses to the health care system) (Willard, 2002). Likewise, other sustainability indicators (See Table 2.1: Sustainable Transportation Indicators on page 8) illustrate the unsustainable nature of continued road expansion and the impact of current

transportation patterns (Newman & Kenworthy, 1999). Transportation planning has had to reassess its position from road expander to transportation manager.

2.1.3.2 Sustainable Transportation Initiatives: Managing today's transportation networks

The envisioning of a more sustainable North American transportation system has focused on innovative initiatives, but also some traditional ones. Classified by the impacted component of the transportation system, vehicle technological advances, road network improvements and demand management, they encompass initiatives that seek to maximize existing infrastructure, change travel behaviour and lead to an improved quality of life in urban areas (Deakin, 2002). In Canada, an example of technological advances is the transition from diesel to propane and natural gas transit buses, and more recently to bio-fuels. However, existing infrastructure supports primarily the exclusive use of gasoline/diesel fuel (Kennedy *et al.*, 2005). Future technological advances in intelligent transportation systems, including smart vehicles, have been touted as the possible congestion panacea. While networks are the foundation of a transportation system, improvements in this area have typically been focused on the least contentious initiatives including conventional traffic flow improvements. Finally, demand management initiatives, which often result in modal shifts, include pricing incentives and disincentives, and land-use development strategies; and they have been receiving increasing attention since the 1970s oil crisis (Deakin, 2002).

Across developed urban centres, demand-management strategies are increasingly being adopted as part of urban transportation plans. A particularly active research area has been the debate over the extent to which density, including neo-transitional development, affects travel patterns and modes (Friedman *et al.*, 1997; Kennedy *et al.*, 2005).

2.2 Transportation Demand Management: Policy changing travel behaviour

Transportation policy research, much of which is normative, looks at

> "The collection of data (its transformation into information), the formation of policy objectives by government (at all its different levels), the establishment of institutional structure to carry through these goals, the creation of the resourcing for these institutions, the carrying through of actions and the policing and monitoring of outcomes" (Button & Hensher, 2005, 1).

Transportation policy foci have evolved over time from the development of nations, such as with Canada's transnational highway, to the design of new urban centers supplying all citizens with mobility through a multi-modal transportation system, to current policy that also includes the re-evaluation and management of existing transportation systems and their impacts. Up until the mid-1960s, the primary goal of transportation planning was to expand road infrastructure but, with increased concern over oil shortage, the use of Transportation System Management emerged during the 1970s aimed at maximizing the efficiency of existing infrastructure through low, capital-cost initiatives (Ferguson, 1990; Wachs, 1991; Salomon & Mokhtarian, 1997). In the early 1980s, increased awareness of the shortcomings of Transportation System Management were identified and the importance of altering human behaviour became important. Transportation Demand Management emerged from that criticism, refocusing transportation planning away from supply-side measures and toward measures affecting demand (Salomon & Mokhtarian, 1997).

2.2.1 Defining Transportation Demand Management

Strategies to manage the increasing demand are being adopted more frequently as components of transportation planning in order to alleviate transportation/congestion problems and assist in creating and maintaining sustainable communities (May *et al.*, 2000). The most

commonly used umbrella term for the wide range of interventions intended to modify urban travel behaviour is transportation demand management (TDM). Terms that are sometimes used as synonyms include mobility management and integrated transportation planning. TDM, broadly defined, is a set of strategies for altering travel behaviour in ways that either improves the efficient use of current infrastructure or shifts travel away from automobiles, thus achieving "specific objectives such as reduced traffic congestion, road and parking cost savings, increased safety, improved mobility for non-drivers, energy conservation and pollution emission reductions" (VTPI, 2006).

There are numerous TDM strategies representing the complexity of the urban environment and transportation issues (VTPI, 2006). Many strategies are mode-specific, such as programs that support carpooling/sharing and investments that encourage public transit bicycling. Others focus on reducing the number or altering the timing of work trips through, for example, flexhours, the compressed workweek, and telework. A third group of strategies seeks to systemically change the urban character through land-use policies and urban design (new urbanism).

No two TDM programmes are the same; implementation is done at various levels and involves a unique combination of strategies that are intended to meet the needs of the implementer (Bianco, 2000). While strategies may be implemented individually, TDM programs now often involve a combination of measures that may reflect circumstances or challenges that are unique to a place/system (Bianco, 2000) and are intended to increase the possibility of synergistic effects (May & Roberts, 1995; Thorpe *et al.*, 2000; Shiftan & Suhrbier, 2002). The components of a program are flexible so as to meet specific requirements, program outcomes as well as research has established that a "one-size-fits-all" approach does not work (Bianco, 2000).

Additionally, TDM strategies can be implemented on a variety of scales (e.g., at a worksite or region), and have short- or long-term results (VTPI, 2006). Strategies can aim at short-term mitigation of existing transportation problems, such as creating high occupancy vehicle lanes, or avoid future problems by involvement at a more strategic level of policy such as blending mixed land-use planning into a region's transportation master plan (Meyer, 1999).

2.2.2 Categorizing TDM Strategies

Given the relative newness of TDM initiatives and the broad range of related activities, it is perhaps not surprising that different organizations and authors have categorized TDM strategies in distinctly different ways. Victoria Transportation Policy Institute's *Online TDM Encyclopaedia*, a widely recognized practitioner's one-stop TDM source, categorizes TDM strategies by the mechanism used to implement a strategy: "Policy and institutional reforms, transportation demand management programs and program support, improved transport choice, incentives to use alternative modes and reduce driving, and, land use management" (VTPI, 2006). As a second example, Meyer's 1999 article lists three ways of categorizing TDM strategies. First, strategies are categorized by the mechanism used to bring about change, for example, offer an alternative mode, provide incentive/disincentive, and enable the accomplishment of a task without a trip (Meyer, 1999). The second categorization considers the spatial scale that the strategy targets: initiatives that are site-specific (teleworking policy) versus programmes/policies that are area-wide (growth management strategy). Third, TDM strategies are categorized by trip destination: work, shopping, or tourist trips (Meyer, 1999). Pollution Probe's S-M-A-R-T Movement manual also provides a categorization, this time by the type of commute: group commuting, schedule change, or active commuting (Pollution Probe, 2001).

Finally, Ferguson's article categorizes strategies by which of the four stages of transportation decision-making the strategy affects (1990).

Within increased attention being given to the importance of "bundles" of TDM being implemented either simultaneously or in sequence, the categorization of TDM strategies becomes more important. How should policy makers and practitioners conceptualize the myriad of potential "carrots and sticks" that together make up the field of TDM? Within academia and practise no standard TDM categorization exists, indeed each paper, report and manual features its own. However, despite this gap, there is limited development toward a standard through the use of citation or critique of existing categorizations. It is suggested that the categorization scheme that is most relevant to the issue of complementarity/synergy among TDM strategies should be based on the following criteria: it should mesh well with urban transportation planning/modeling systems, it should consider the various types of behavioural changes, and it should focus on the actors who are critical to the successful implementation of each strategy.

The proposed conceptual framework consists of a matrix. The columns of the matrix reflect the four-stage urban transportation modeling system, which is the primary methodology used in transportation planning and engineering. The modeling system analyzes transportation patterns based on the four main travel decisions: do I need to make a trip?; where am I going?; how am I going to get there?; and, what route am I going to take? Ferguson, in his 1990 article, categorizes TDM strategies in this way, arguing that it strengthens the ability of TDM to be integrated and articulated in the dominant transportation language thus enhancing collaboration and understanding between different transportation practitioners.

A categorization should also be relevant to all of the various actor groups, both inside and outside the transportation field. This can be done using a conceptual matrix. One axis identifies

the division of strategies by the Urban Transportation Modeling System, while the second axis categorizes by actors responsible for implementing TDM strategies additionally illuminating the scale and/or location of implementation (See Table 2.2: Categorization of TDM Strategies). While individuals may be users of transportation demand management programs, they are not included as an actor group in the matrix because rarely are they the implementers of such strategies. The amalgamation of categorizations enables greater understanding of TDM measures from a transportation decision-making perspective as well as an implementation and management perspective; additionally, this categorization facilitates TDM strategy selection by asking – Where and what travel pattern change is desired?

2.2.3 Barriers to Implementation

In many instances, TDM research is evolving separately from practice; while on paper it is widely accepted as an integral component of transportation planning, the implementation of it is often tentative and limited in scope (Stewart & Pringle, 1997). The barriers to implementation faced by TDM practitioners and transportation planners have been identified and documented in academic and professional sources. Common themes in discussions of barriers to implementation include: insufficient funding, resources, and personnel; institutional constraints including lack of integrated approach or resistance to change; planning practices favouring continued infrastructure expansion, lack of community or business involvement; and political, public and corporate attitudes to changing the current transportation system especially from those currently benefiting from inefficiencies (Kennedy *et al.*, 2005; ACT Canada, 2006; Victoria Transport Policy Institute, 2006). These themes are reiterated in the breakout group notes taken at the various location of the 2006 ACT Canada's Building Capacity for TDM in Canada Cross-Canada Workshop Series' (ACT Canada, 2006). Stewart and Pringle state that the support for

Table 2.2: Categorization of TDM strategies

Who is in the drivers seat?	Trip Generation Do I need to make a trip?	Where am I going? (Spatial)	Trip Distribution When am I going? (Temporal)	Modal Split How am I going to get there?	Route Assignment What path do I take?
Municipal Government	Fuel tax	Zoning Parking management Fuel tax/road pricing		Zoning – density Parking management Alternative mode facilities (e.g., bike racks) Trail route development Fuel tax Road pricing	Traffic calming Improved security Mixed use development
Provincial government				Carpool lots	HOV lanes Traffic information
Transit Providers		Ride planning program		Increased transit service Park & ride	
Employers	Telework	Worksite location Onsite facilities (gym, daycare)	Flexwork Compressed work week	Guaranteed ride home Designated carpool spots Transit subsidies Parking management Onsite amenities for biking and walking Ride matching program	Improved security

Table 2.2 continued: Categorization of TDM strategies

Who is in the drivers seat?	Trip Generation	Trip Distribution		Modal Split	Route Assignment
	Do I need to make a trip?	Where am I going? (Spatial)	When am I going? (Temporal)	How am I going to get there?	What path do I take?
Schools (Elementary, High School, College, University)	Correspondence	Satellite Campus		Walking school bus program U-Pass	
TMAs - NGOs				Ride matching program Car-sharing	
Stores/banks/ amenities	E-commerce			Bike/Pedestrian friendly site design	
Private service providers				Car-sharing	

TDM initiatives is often "overshadowed by political sensitivity to pushing changes in travel behaviour and lifestyle" (1997, 1203). The many barriers and the magnitude of the challenge are succinctly summarized by Kennedy who states that "change is hard" and for transportation patterns to change there is a need for significant social change (Kennedy *et al.*, 2005, 395).

In Canada, the tradition of using TDM to address transportation problems is still in its infancy. The year 2003 saw the formation of the a Canadian chapter of the Association of Commuter Transportation, and 2007 will be the first year a TDM practitioner conference will be held. As a result, there are few articles about the general state of Canadian transportation systems, as well as few case studies available; and those that exist are far less developed than US or European countparts. While lessons can be learned form their experiences, Canadian travel patterns and predominant city design as well as legislation regarding transportation and the environment, are somewhat different. At one extreme, European dense-city design has lent itself to supporting a more diverse modal split with an average 25 percent of total travel made by transit and 21 percent by walking and cycling (Newman & Kenworthy, 1996)); meanwhile the USA and Australia are closer in comparison to Canada, but they remain the most auto-dominated and have lower densities in their urban areas (Newman & Kenworthy, 1996). Additionally, in comparison to Canada, both Europe and the USA have more extensive legislation requiring the implementation of transportation demand management practices. The result has been a focus within the academy on the American context. Many advances in transportation planning, including modeling practices and new travel demand management strategies, were germinated by American policies such as the 1950s Highway Act, 1970s Clean Air Act and 1990s Intermodal Surface Transportation Efficiency Act (ISTEA) (Andrey, 1995; Black, 2002; Katz & Putentes, 2005).

2.2.4 Effectiveness of TDM strategies

Within the TDM field there are the success stories; the City of Portland's Lloyd district witnessed a 24% reduction in single occupancy vehicle (SOV) trips over an eight year period, and Canada's York University a 10% modal shift away from SOV trips over an eight year period (Victoria Transport Policy Institute, 2006). But in Canada, as made clear in the Report on Canadian Transportation Programs, many TDM examples or case studies remain unevaluated, and are examples of successful adoption and implementation rather than case studies of results (Stewart & Pringle, 1997; Environment Canada, 2005). As of 2005, the mostly commonly implemented TDM strategy in Canadian workplaces was on-site bicycle parking (Environment Canada, 2005). In the U.S., when TDM was first being widely adopted in the 1990, the most commonly implemented strategy was carpool ride-matching services (Ferguson, 1990). Of those initiatives that have been evaluated, similar to other behaviour change situations, there is a gap between expected and realized outcomes, and a majority of TDM case studies is not living up to expected results with modal shift often disappointingly low (i.e. 1-5% is typical and is currently considered realistic) (Meyer, 1999; Shiftan & Suhrbier, 2002; Ogilvie *et al.*, 2004).

2.3 Travel Behaviour: Quantifying, predicting and understanding

The application and measurement of TDM requires transportation researchers to identify the "how, when, where, what and why" of transportation patterns and choices. A dominant approach is analyzing human travel behaviour. "Travel occurs in relation to the spatial separation of activities and according to the needs and constraints imposed on travelers by their time, schedules, socio-demographic characteristics and network characteristics" (Rosen *et al.*, 2004, 162). Transportation planning analysis relies on quantifying, predicting and understanding

human travel behaviour. While quantifying and predicting are core to transportation research, enabling the application and use of more sustainable transportation networks requires a better understanding of travel behaviour more specifically understanding why the changes in travel behaviour occur and how we can motivate them.

2.3.1 Quantifying Travel Behaviour

Quantitative methods are the predominant approach used to describe, explain and predict travel patterns and their impacts (Gunnar Roe, 2000). Each measurement method is associated with particular sample sizes, data, models and scales, resulting in transportation predictions with varying degrees of accuracy and scope. The quantitative approach facilitates easy comparison and statistical aggregation, and often enables generalizations to be made (Neuman, 2003). For example, the results from the Transportation Tomorrow Survey, conducted throughout the Greater Toronto Area, collects survey results from thousands of local residents and gathers information that provides the modal split, average trip distance, origin-destination, etc. for each traffic zone or planning area (University of Toronto, 2006).

The questions asked in quantitative transportation research focuses on deciphering existing transportation patterns and maximizing mobility and efficiency in a transportation network. Quantitative methods provide an effective and essential paradigm for addressing supply management challenges (Gunnar Roe, 2000). They utilize the variety of data sets available, such as those for passenger travel including the Transportation Tomorrow Survey and Statistics Canada's *Journey to Work*. One of quantitative methods' strengths is the ability to collect data in a structured design where variables and responses are isolated before the study (Creswell, 1994; Neuman, 2003). As a result, each of the data sets available has limited but standardized data

enabling the ability to generalize patterns. Quantitative research is ideal at asking what patterns exist and answering why they exist within a set of parameters.

2.3.2 Predicting Travel Behaviour: Modeling transportation patterns

Transportation planning in the 1950s experienced a paradigm shift away from an ad hoc 'build as needed' approach, after which an enormous amount of attention and resources were devoted to data collection and analysis in order to predict and plan for future transportation needs. A standardized method for predicting future transportation patterns based on current transportation patterns, i.e. the Urban Transportation Modeling System, was created during the 1950s and formalized in the 1960s (Tolley & Turton, 1995; Johnston, 2004). It combines the four steps of travel modeling (trip generation, trip distribution, modal split and trip assignment), steps that also reflect the four stages in travel decision-making. Based on the outcomes, transportation planners anticipate demand and respond by supplying expanded transportation infrastructure. This type of planning response was challenged during the 1970s oil crisis and subsequent rise in environmental concern. Questions were raised about the ability of planners to maintain the level of service through supply management and the desire of the community to sustain auto reliance. These concerns resulted in the impetus within academic and government to consider and create alternate transportation planning strategies such as TDM strategies (Ferguson, 1990).

Despite the 1970s oil crisis, sustainability concepts were not incorporated into traditional transportation modeling systems, the backbone of transportation planning, until more recent experimental attempts. However, since the 1990s, a new, more complex type of transportation modeling has evolved called integrated transportation modeling systems. These complex models consider land-use and transportation pattern simultaneously, and provide an opportunity for sustainability indicators (discussed in section 2.1.2) to be accounted for (May & Roberts, 1995;

Anderson *et al.*, 1996; Zachariadis, 2005). The resulting predictions of transportation patterns are based on a broader range of indicators and can enable proactive sustainability-focused planning; but, due in part to the quantity of data required for these models, they have yet to be used in transportation planning departments.

2.3.3 Understanding Travel Behaviour: Qualitative research

While a majority of transportation research employs a quantitative and predictive approach, there are some areas that could benefit from using a qualitative approach. In particular, a qualitative approach is more appropriate for asking why travel behaviours and patterns exist for non-linear rapid change. These are cases were variables cannot be held constant and we do not know what to measure (Gunnar Roe, 2000; Finke & Schreffler, 2004; Cao & Mokhtarian, 2005).

A qualitative research paradigm espouses a holistic, inductive and value-laden approach emphasizing the how or why of a human process by capturing development, description and discovery in an open-ended forum typically from a small number of participants. Appropriate applications of a qualitative approach includes research that monitors process, gauges the quality of an experience, explores new research areas where correct measures are unknown, or generates new insight (Patton, 1990). Many of these scenarios are common to sustainable transportation research, and the adoption of a qualitative paradigm would be especially useful in analyzing the effects of programs that have already been implemented (i.e., monitoring process or evaluating individualized programs), understanding how to improve new/existing programs (i.e., assessing quality of participants experience) or brainstorming new ways of planning a transportation system (i.e., providing new insight). In transportation research, qualitative approaches are often associated with social psychological studies that probe changes in human behaviour, values, and attitudes.

Qualitative research is sometimes criticized as being less rigorous and unsuitable for generalizations. In response to this criticism many transportation researchers over use or improperly use quantitative methods for studies that would benefit from a qualitative approach, such as human behaviour and perceptions (Gunnar Roe, 2000; Cao & Mokhtarian, 2005). Thorpe *et al.*'s (2000) paper is an example of this, analysing public attitude to transportation demand management measures through a large sample close-ended survey. By approaching their study in this way, proponents of qualitative methods in transportation research would question the researchers' ability to rate attitudes and the values of such rates in improving our understanding of the public's thinking about transportation futures (Patton, 1990; Creswell, 1994). Broad standards for measuring performance of sustainable transportation initiatives (including TDM strategies) rely heavily on quantitative measures, related to modal shift, reductions in vehicle trips or vehicle miles traveled; however, practitioners "felt that this narrow perspective on TDM effectiveness masks some of the qualitative and longer-term impact of TDM projects and programs" (Finke & Schreffler, 2004, 136). Subsequent large-scale quantitative research can emerge from research that properly uses qualitative methods to better understand certain components of transportation research, including motivators, triggers and barriers to behaviour change.

2.4 Changing Travel Behaviour

At the core, the goal of TDM strategies is to change travel behaviour (Handy *et al.*, 2005). However, to state that behaviour change is complex is an understatement. Research into behaviour-change theory has evolved in recent years, primarily in the discipline of psychology. In fact, when applied to travel behaviour, this type of inquiry remains relatively separate from the general transportation planning research.

2.4.1 Factors Affecting Travel Behaviour Change

Current North American culture is steeped in a lifestyle that values 'freedom of mobility' and thus presents many factors (or perceived barriers) that are involved in a decision to change travel behaviour. There is growing understanding of the factors involved in behaviour choices and decisions. Among many others, these include: social norms, cost of travel, design of a neighbourhood, accessibility, knowledge, personal values, perceptions of convenience, prestige, heavy carrying load or children and weather (Salomon & Mokhtarian, 1997; Nilsson & Küller, 2000; Derek Halden Consultancy, 2003; Cao & Mokhtarian, 2005; Ryley, 2006; Victoria Transport Policy Institute, 2006).

Even though it is possible to identify the factors contributing to a travel decision, it is difficult to attribute the ensuing behaviour change directly or indirectly to a TDM strategy(ies). Many site-specific worksite trip reduction programs begin by surveying employees to identify the perceived barriers but, as with other behaviour change programs, researcher and practitioners "have had difficulty assessing how policy intervention . . . would be transmitted to affect commuter' [travel] choices" (Bianco, 2000, 47). By asking employees to rank their top three reasons for changing their travel behaviour, Bianco's paper identified the number one reason was "unconnected to any TDM program" but rather the author concludes "they [employees] changed for reasons related to their lifestyle" (Bianco, 2000, 51). The questions remains how can practitioners identify travel behaviour changes attributed to a TDM program.

Despite a disconnect between TDM intentions and realized behaviour change, sometimes information and programs can lead to a change in beliefs and attitudes that support lifestyle choices (Fishbein & Ajzen, 1975; Rose & Ampt, 2001). Using a ranking system, as done in Bianco's research (2000), employees may be unable to directly attribute changes in broader lifestyle choices to those in beliefs and attitudes resulting from contact with a TDM

program/strategy. The inability to attribute behaviour changes to the presence of a TDM program poses a problem in evaluating behaviour change. To overcome this shortcoming, suggested revision to evaluation criteria include continuums of behaviour change that accounts for interim changes in such areas as insights or attitudes that initiatives have fostered (Jones *et al.*, 2003; Finke & Schreffler, 2004).

2.4.2 Theories of Behaviour Change

Most research on travel decisions is based on mathematical or statistical models, is designed to estimate the influence of specific variables or interventions on travel outcomes, and is based on utility theory with a premise that all decisions (at times unconscious) are based on a cost-benefit analysis and a desire to improve or maximize an individual's total utility. However, as pointed out by Guiver (2007, 234), while these models are used to predict future behaviour based on consistent relationships that are observed today, they "… do not purport to reflect the processes of individual decision-making". From a theoretical perspective, there are a variety of conceptualizations of the behaviour change decision-making process. Evolving within different disciplines, such as economics, environmental studies and psychology, they each highlight a particular slant to behaviour change and their application has stretched far beyond their originating discipline. This section highlights a few commonly referenced conceptualizations.

Research into individual behaviour change is mostly rooted in the field of social psychology and to measurements of people's preferences and priorities. A widely referenced conceptualizing of behaviour change, and one that has been applied to various transportation problems, is Ajzen's Theory of Planned Behaviour (Ajzen & Driver, 1992). It purports that behaviour is a linear and cognitive process guided by an individual's attitudes, subjective norms and perceived ability to perform the behaviour, which together create an intention to behave, which in turn can lead to

realized behaviour in accordance with a person's beliefs (Bamberg & Ajzen, 2003)(See Figure 2.1: Theory of Planned Behaviour Framework). A second theory that has particular applicability to pro-environmental behaviour is Schwartz's Model of Normative Decision-Making (Schwartz & Howard, 1981). Pro-environmental behaviour is a small field looking at the decision-making process for environmentally based decisions. Making a car-free/car- lite decision can be interpreted as a pro-environmental behaviour (Klockner & Matthies, 2004; Collins & Chambers, 2005). The Model of Normative Decision-Making argues that behaviours can be triggered by both an awareness that an individual's actions can have positive consequences for others and a feeling of moral obligation to act in accordance with personal and social norms (Klockner & Matthies, 2004; Collins & Chambers, 2005)(See Figure 2.2: Model of Normative Decision-Making). Other researchers argue that travel behaviour is less planned than the above two conceptualizations and more habitual in nature thus requiring new situations in order to change behaviour (Aarts *et al.*, 1997; Verplanken & Wood, 2006). The critique is that past behaviour cannot predictor future behavioural intent because habits provide an orientation in which

Figure 2.1: Theory of Planned Behaviour Framework

(Source: Azjen & Driver, 1992)

Figure 2.2: Model of Normative Decision-Making

Situational Cues	**Attention Stage**	**Motivation Stage**	**Evaluation Stage**	**Denial**
	• Awareness of Need • Awareness of Consequences • Perceived behavioural control	• Personal Norms • Social Norms • Nonmoral Aspects (e.g. economical)	• Feeling of Guilt/ Satisfaction • Shame/Pride • Further neg./pos. consequences of behaviour (e.g. monetary costs)	• Denial of Need • Denial of Ability • Denial of Control

Behaviour

(Source: Klockner & Matthies, 2004, 320)

individuals attend less to new information and changing their course of action, and can therefore interfere with the behaviour changes process (Bamberg *et al.*, 2003; Klockner & Matthies, 2004; Verplanken & Wood, 2006) (See

Figure 2.3: Integration of Habits into Decision-Making Model). Finally, another stream of social psychology has fostered the use of life course analysis as a means of understanding behaviour change (Giele & Elder, 1998). In life course analysis, the focus is on how past events, circumstances and social processes initiate decision making and, in particular, how transitions processes unfold. (Clausen, 1998).

Despite the similarities and divergences between these schools of thought, the majority of research identifies that (a) very little travel behaviour change is chosen for solely altruistic reasons (Klockner & Matthies, 2004; Anable, 2005) and (b) the factors that affect modal change

do not act independently, as suggested by traditional mode choice models (Gunnar Roe, 2000; Cao & Mokhtarian, 2005). Rather, changes in mode choice reflect a complex combination of

Figure 2.3: Integration of Habits into Decision-Making Model

	Attention Stage	Motivation Stage	Evaluation Stage	Denial
Situational Cues	• Awareness of Need • Awareness of Consequences • Perceived behavioural control	• Personal Norms • Social Norms • Nonmoral Aspects (e.g. economical)	• Feeling of Guilt/ Satisfaction • Shame/Pride • Further neg./pos. consequences of behaviour (e.g. monetary costs)	• Denial of Need • Denial of Ability • Denial of Control

Habits

Behaviour

(Source: Klockner & Matthies, 2004, 320)

attitudes, norms, external constrains and habit (Salomon & Mokhtarian, 1997; Nilsson & Küller, 2000; Klockner & Matthies, 2004; Anable, 2005; Cao & Mokhtarian, 2005; Ryley, 2006).

While an extensive list of factors affecting mode choice has been identified, there remains a lack of understanding as to how to assess their combined impacts on changes in mode choice. This limits our ability to predict the effects of TDM strategies on both short-term and long-term travel behaviour. If, in fact, advocates of behaviour change theories in social psychology are correct, then it is imperative that we unmask the complexity of behaviour change beyond immediate changes in transportation patterns (Bianco, 2000; Finke & Schreffler, 2004;

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Cao & Mokhtarian, 2005; Handy *et al.*, 2005). At present, our primary means of evaluating TDM measures is through outcomes (e.g., modal shift, vehicle kilometres traveled). However, in keeping with travel behaviour research, it is the inclusion of softer evaluation methods that would allow practitioners to probe changes in attitudes and norms, which are the first step to long-term behaviour change (Bianco, 2000; Jones *et al.*, 2003; Finke & Schreffler, 2004).

2.4.3 Car-free/ Car-lite: Living an alternative lifestyle

In order to impact auto-dependency, TDM strategies need to stimulate the full spectrum of travel behaviour change, that includes shifting commute times of single occupancy vehicle trips, adopting a car-free lifestyle and everything in between. Specific research into car-free or car-lite lifestyles is restricted to specific initiatives including car-free city design or days, and car-sharing (Topp & Pharoah, 1994; Prettenthaler & Steininger, 1999). In part, the lack of research can be attributed to the small minority of the population these individuals represent. The proportion of individuals that does not own a vehicle is declining. Between 1997 and 2005, the number of households in Canada that did not own or lease one or more vehicle(s) declined from 14.6% to 10.9% (Statistics Canada, 2006b). Of these, it is unknown how many are financial and physically able to choose to own/lease an automobile. Similarly, the percent of individuals using their vehicles for daily trips has increased. Of all trips made in Canada, single occupancy vehicle trips have increased their modal split share by 5% between 1987 and 1997 (Clark, 2000). Still, individuals who choose an atypical lifestyle by using other transport modes may provide understanding of the complex, socially non-conforming decision of going car-free or car-lite in an auto-dominated society.

2.5 Decision-Making Process: Factors working together

The various behaviour change theories account for the factors involved in the decision-making processes and, in some, the order in which factors influence a decision, but each neglects to elaborate on influences between factors. So, is each factor an independent variable? Is the process of decision-making as linear as the theories depict? How do these factors work together to create a decision-making process? These questions are important to providing a greater understanding of behaviour change.

2.5.1 Defining 'Working Together'

The terms to describe the relationship between factors are numerous and at times are used interchangeably. To bring clarification to this research, the terms, combination, interaction and synergy are defined for this paper as follows. Combination is the presence of more than one factor. Interaction occurs when a combination of factors produce an effect different than that we would expect given the apparent lack of power of each factor on its own (Neuman, 2003). It is most commonly thought of in the context of a regression model, where $(X_1 X_2)$ is the interactive term.

$$Y = a(X_1) + b(X_2) + c(X_1 X_2) + error$$

It is also appropriate, however, to think of interaction in terms of conditions. If the effect of (X_1) is conditioned by the values of (X_2), then (X_1) has a certain effect when the value of (X_2) is zero, and another effect when it is not zero. For an interactive effect to be present, the outcome must be greater (synergy) or lesser (antagonism) than the sum of their individual effects, where $(X_1 X_2)$ is positive or negative respectively (May *et al.*, 2006). Despite the importance of interactive effects in other research fields, such as medicine, it has only recently been formally

applied to transportation policy initiatives or evaluations. In the case of TDM and behaviour, a synergistic interaction is desired.

2.5.2 Harnessing Synergistic Effects to Foster Travel Behaviour Change

Although TDM is often described as a 'suite of options', there is little research on understanding and harnessing the synergistic effects between factors (including TDM strategies) involved in a travel behaviour change decision (Geerlings & Stead, 2003; Shepherd *et al.*, 2006). TDM research has focused on individual strategies and their outcomes (Handy & Mokhtarian, 1995; Friedman *et al.*, 1997; Black *et al.*, 2001; Helling & Mokhtarian, 2001), but such strategies are often less than successful when implemented alone: "frustration resulting from the failed transportation plan, caused by the limited scope [implementation of individual initiatives], has often resulted in an abandonment of TDM as having any potential within future urban plans" (Robinson, 1997, 14). There are several papers that allude to the benefits of combining TDM strategies in motivating an increased number of travel behaviour changes (Modarres, 1993; Lim, 1997; Newman & Kenworthy, 1999; Thorpe *et al.*, 2000; Handy, 2002; Bonsall, 2005) and still others that call for greater research on the optimal combinations (Frank, 2000). "The debate over whether density [or any other individual TDM strategy] is a useful tool to reduce auto dependence needs to be shifted toward the identification of which combination of factors, including density, are most effective at reducing congestion and vehicle emissions while promoting walking, biking, and transit use" (Frank, 2000, 12). There are a few researchers that have begun to address this gap from a strategy implementation and a behaviour change perspective (Thorpe *et al.*, 2000; Shiftan & Suhrbier, 2002; Collins & Chambers, 2005; May *et al.*, 2006). There is a need for transportation researchers and planners to have greater

understanding about how factors interact within a travel decision-making process and the larger

implications for TDM policy development.

3 METHODS

This chapter describes the approach and rationale used in this study to understand how the factors affecting mode choice work together. The first section describes qualitative approaches as the methodological foundations for the study. Section two describes the sampling technique used to select both a sampling frame and characteristics of the sample. Section three discusses specific data collection and analysis techniques used in the research, focusing specifically on grounded theory. A discussion of the limitations of the study concludes the chapter.

3.1 Methodological Approach

To expand our understanding of the complex processes involved in adopting a lifestyle that is less automobile intensive, a qualitative and inductive approach was adopted (Patton, 1990). This approach was chosen because it is most appropriately applied to exploratory, individual, processes-oriented research (Patton, 1990). The study was designed to enable an in-depth experiential understanding of the decision-making processes of individuals with respect to mode choices and to elucidate how factors work together. Through the extensive use of quantitative research methods, particularly demand models, transportation research is well versed at identifying existing patterns and behaviours; however, research questions as to why these transportation patterns and behaviours occur is more appropriately suited to a, less often applied, qualitative approach (Gunnar Roe, 2000; Cao & Mokhtarian, 2005). A qualitative approach exposes an individual's internal changes or decision making that lead to changes that are visible and measurable (Patton, 1990). Indeed, this research could have been conducted in a quantitative approach through the use of a survey, for example research by Thorpe *et al.* and Bianco (2000;

2000), but in doing so the outcome would have merely been able to identify and rank the factors affecting mode choice. To begin to understand the process of how the factors work together requires a more open inductive dialogue with the participants.

The vast majority of transportation research uses a deductive approach; pulling from other social science disciplines, this research opted for an inductive approach. This research is exploratory in nature; the goal is to further refine our understanding of travel behaviour change and how factors work together to create a decision-making process. An inductive approach offered through grounded theory allows a researcher to uncover the overarching themes expressed in vastly different personal experiences without putting limitations on the data. Employing an exploratory and explanatory case study approach, where no control was placed over the behavioural events, is particularly appropriate for this research (Yin, 2003). The use of a 'case' rather than a 'sample' enables the holistic and meaningful characteristics of real life events, which are complex in nature and have no single set of outcomes, to be retained (Yin, 2003). It is hoped that this study can be seen as an investigation of mode choice within a unique case study of car-sharing members, which in turn may help to determine criteria for a future, more comprehensive, study in other transportation behaviour change.

3.2 Sample Characteristics and Interviewees

To address the objectives as outlined in Section 1.1, the study required participants who had made a conscious modal shift and utilized at least one TDM strategy. For this study TDM strategies that fulfilled the definition given in section 2.3.1 were considered providing that they were integral to a person's mode choice, for example discount bus passes, ride-matching programs, car-sharing, and parking management practices. To conduct meaningful semi-structured interviews, purposive sampling was used to isolate a sampling frame and select

participants (Neuman, 2003, 213). The researcher's judgment was used to select participants within a specific population for in-depth investigation (Neuman, 2003, 213).

Within the general population, individuals of relevance to such a study are hard to identify or track. After exploring several possible recruitment strategies, including employees at workplaces with trip reduction programs and university campuses, a decision was made to focus on members of a car-sharing organization. The two former options were not selected due to perceived difficultly in isolating potential participants and/or isolating a common TDM strategy used by all sample participants. Alternatively, in Southern Ontario there are several car-sharing organizations located in mid-sized cities (Region of Waterloo, Guelph and London), each with an accessible and moderately sized membership.

Car-sharing members have chosen a car-free/car-lite lifestyle. With less-than-average car use per year, they are frequent users of alternative modes and TDM initiatives (Prettenthaler & Steininger, 1999; Katzev, 2003). On average, half of all car-sharing members own at least one vehicle. Based on car-sharing research to date, car-sharing members in North America are typically: 25-45 years old, upper middle class, possess upper level education, have smaller household size, and are somewhat more likely to be male (Prettenthaler & Steininger, 1999; Shaheen *et al.*, 2005). In addition, car-sharing members are thought to have stronger than average attitudes toward environmental and social concerns and often lean towards identifying themselves as innovators, economizers and non-car status consumers (Shaheen *et al.*, 2005).

Participants were recruited from a car-sharing organization in a mid-sized Ontario city by using the organization's newsletter and email list-serve (See APPENDIX 1: Recruitment Materials – flyer, email and script). Potential participants were screened to ensure they fit the participant criteria as follows:

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- Driving member of a car-sharing organization
- Sale of own vehicle without replacing it or deciding not to purchase a vehicle (either sole or secondary vehicle) including those who had never own a vehicle
- Financial resources to keep or buy the said vehicle(s) at the time of their decision
- Resident of the research area, a Southern Ontario mid-sized city
- Interest in participating in this study

To explore the decision to go car-free or car-lite, it was important that a choice was involved; thus participants' financial situation could not dictate their mode. Potential participants were asked "Was the decision to go car-free or car-lite a solely financial decision; in other words, at the time of this decision, could you have afforded to keep or buy said vehicle?" (See APPENDIX I: Recruitment Materials - Script).

The car-sharing organization chosen for study is based in Kitchener-Waterloo and has both individual and couple memberships – each couple membership is considered only one member with two or more drivers. Of the 138 driving members, 92 allow email contact and of those 23 members responded to my first email campaign, yielding a response rate of 25% of email accessible members. Of the 23, 17 memberships expressed interest, qualified and were interviewed. Two of these interviews had both drivers of a single membership present, and the two drivers of a third membership requested separate interviews. A total of 20 individuals representing 17 memberships were interviewed in 18 interviews.

The participants represented a diverse group of members (See Table 3.1: Participant and member characteristics). The participants were 8 females and 12 males (n=20), and, with the exceptional of three (retired [n=2], full-time undergraduate student who also works [n=1]), all were of working age and working. While eight of the participants are adults living alone, the

other participants provide a wide range of household arrangements including single parents (n=1), two adults without children (n=3), two adults with children (n=4) and households with 3 or more adults (n=1).

Table 3.1: Participant and member characteristics

		Participants		Car-sharing organization membership
Gender	Female	8	40%	
	Male	12	60%	
Household	One adult living alone	8	47%	
	One adult and one or more children	1	6%	
	Two adults and no children	3	18%	
	Two adults and one or more children	4	23%	
	Three or more adults	1	6%	
	Still care for children	5	29%	35%
	Do not care for children	12	71%	65%
	Single	9	53%	53%
	Couple	8	47%	47%
Vehicle ownership	Car-free	14	82%	84%
	Car-lite	3	18%	16%
	Reduced number of vehicles owned	8	47%	40%
	Didn't have car in Ontario prior	9	53%	60%
Residential location at decision time	Downtown – within 3km	11	61%	
	Suburban – further than 3km	7	39%	

Of importance, participants of this study (n= 17 memberships) are representative of the membership as a whole, when compared with the organization's member statistics (See Table 3.1: Participant and member characteristics). Those still caring for children (30%) and not caring for children (71%) are similar to the overall membership of 35% and 65% respectively. Likewise those participants identifying themselves as part of a couple (47%) or single (53%) are the same as overall membership characteristics. For this research, participants' status as car-free or car-lite is of utmost importance. Car-free participants are defined as those who do not own or lease their own vehicles and use car-sharing vehicles as their primary vehicles. Alternatively, car-lite

participants are defined as those who own or lease at least one vehicle but use car-sharing vehicles as their additional vehicles. Participants included both car-free and car-lite memberships, 82% and 18% respectively, which is very similar to the overall car-sharing organization (84% and 16% respectively). Additionally, 47% reduced the number of vehicles they owned when they joined as opposed to 53% who did not own a vehicle in Ontario prior to joining; the equivalent numbers of the entire membership are 40% and 60%, respectively.

Using the participants' hand-drawn travel maps, residential location within the city at the time of the decision was determined (See APPENDIX II – Example of participant drawn travel map). The 17 participant household locations represented both those living within three kilometres of the downtown and the car-sharing vehicles (n=11), and those living in a suburban setting exceeding three kilometres from the downtown core and car-sharing vehicles (n=7). Two of the households made their decisions while residing in a suburban setting but have since moved to a downtown location where they currently reside. Indeed, each participant was asked if his/her household travel map had changed since adopting a car-free or car-lite lifestyle; in total, ten participants said it had, three said maybe but were not sure, four said no it had not, and one did not answer this question. In particular, six out of the eight[1] participants residing in a suburban location at the time of the decision stated that their travel maps looked different from a map that might have been drawn prior to their car-free/car-lite decision. In general, common changes in their travel maps identified less frequent trips outside the region, centralization of shopping destinations as well as changes resulting from home or work relocation.

The participants of this study had a diverse usage rate and varied trip destinations for their car-sharing vehicle trips. Several participants (n=7) used the car-sharing vehicles on an

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[1] The two drivers of one household membership requested separate interviews. They are counted as one household in a suburban neighbourhood but the participants has two different answers about changes to their travel maps.

unscheduled and variable basis, at times frequently and at others infrequently depending on need. These participants used the vehicles for work or vacation in concentrated blocks of time, and/or for social engagements or errands that required a vehicle sporadically. For the other participants, their approximate usage of the car-sharing vehicles ranged from once or twice a year (n=1), monthly (n=5), bi-weekly (n=1) and weekly (n=3). The car-sharing vehicles were used solely for city-based trips (n=7), solely out of city trips (n=2) and for a variety of destination both in and out of the city (n=5). The three remaining participants did not specify the destinations of their car-sharing vehicle trips during the course of the interview and in their travel map drawing.

The above participant statistics were based on the members' own responses during the interview and on their travel map drawings (See APPENDIX II – Example of participant drawn travel map). While most responses were easily categorized with respect to vehicle ownership and household characteristics, three participants were not. At the beginning of one interview, one participant identified him/herself as car-free but revealed during the course of the interview that he/she owned a motorcycle which was driven approximately 4 or so months of the year when weather conditions permitted. For the above numbers, they were designated as car-free. The second is a member who has shared custody of one teenager, but his/her home is not the teenager's primary residence. This member was designated as not caring for children and as adult living alone. Finally, a third participant elaborated on two distinct car-free decisions: initially, he/she made a car-free decision while living in a downtown setting, then a vehicle purchase prompted a move from the downtown core, and finally he/she made a decision to return to a car-free lifestyle while still living in a suburban setting. There were two car-free decisions represented in the transcript, and therefore this member was considered to have made one car-free decision while residing downtown and another while residing in a suburban community.

3.3 Study Location Characteristics

The study is situated in Kitchener-Waterloo, one of the fastest growing and most dispersed regions in Canada (Filion *et al.*, 1999; Bunting *et al.*, 2002). As of 2006, the cities of Kitchener and Waterloo had just over 300,000 residents with approximately 200,000 residents in Kitchener and just under 100,000 residents in Waterloo. Their population increases over the past ten years have been double the population increase for the Canadian population at large (Statistics Canada, 2006a). Kitchener-Waterloo's gross population density is 1,508 people per square kilometre, but this metropolitan area does not have a steep density gradient from the two adjoining central city areas outward (Filion *et al.*, 1999; Region of Waterloo, 2006; Statistics Canada, 2006a). The locations of jobs are dispersed with a large number of manufacturing plants, three post-secondary education institutions and several high-tech firms situated primarily out of the downtown cores, and insurance and public sector jobs located in or near the downtown core areas (Filion *et al.*, 1999).

Waterloo Region, within which the cities of Kitchener and Waterloo are located, is highly automobile dependent with approximately 90% of the households owning one or more vehicles (University of Toronto, 2006). In total, 66.5% of the population are licensed drivers while only 2.5% have transit passes (University of Toronto, 2006). Of all trips taken in Region of Waterloo for the journey to work, 88% involve an automobile, 5% public transit, 6% pedestrian and 2% other (Statistics Canada, 2001).

Many sustainable transportation strategies and programs have been implemented or improved in the past ten years. Some noteworthy changes have been:

- 1997: Creation and subsequent paving of the Iron Horse Trail, which is a 5.5 kilometre pedestrian and cycling corridor that connects the two downtown cores

- 1998: Creation of the local car-sharing organization and its expansion from one to ten vehicles clustered along the main transportation corridor on King Street

- 1999: Approval of a Regional Transportation Master Plan with demand management strategies as an integral component

- 2000: Amalgamation of three municipal transit providers into one regional transit provider, Grand River Transit

- Nov. 2004: Approval of a cycling master plan to expand, connect and improve the bicycle network, including 250 kilometres of trails added by the end of 2005

- Sept. 2005: Creation of a bus rapid transit route called *iXpress*, running the length of the Region and providing a frequent bus service through key employment and downtown core areas

- Jul. 2005: Adoption of a pedestrian charter

- 2006: Implementation of the bus n' bike program that installed bicycle racks on the front of every public transit vehicle

(City of Waterloo, 2007; Grand River CarShare, 2007; Region of Waterloo, 2007)

While many of these changes are regional initiatives, the majority of improvements and new services are concentrated or more developed along a central transportation corridor that links the two downtown cores as well as key education and employment hubs. This concentration creates an accessibility gradient in relation to this corridor for those using non-automobile modes which by comparison is not pronounced for automobile users.

3.4 Interview Structure

The approximately hour-long semi-structured interview, designed to be open and non-directed in nature, was used to interpret the experiences and processes of mode choice and discover the meanings related to the factors involved (Patton, 1990). To provide context and refresh memories, the interview began with questions that revisited the decision in question. The interview then proceeded to the individuals mapping out their current transportation patterns (See APPENDIX II – Example of participant drawn travel map). Current experiences are often the

most accurate (Patton, 1990), and it was hoped that thinking about current travel patterns would enable participants to better contrast and remember previous patterns or transportation characteristics/services that had influenced their decision. The interview proceeded to talk about components of their travel space, engaging participants to think about the relative importance and combined effects of various factors of their decision. The final portion of the interview was dedicated to the actual decision of joining the car-sharing organization and a series of final questions about feelings, the future and their opinion. Sample interview questions and order are listed in Appendix III.

3.5 Data Collection and Analysis

In-depth semi-structured interviews were the primary data collection. Topics and questions were outlined but the delivery of probe questions as well as the wording and order of questions, tended to vary somewhat. Sample interview questions and order are listed in Appendix III. All the interviews were conducted face-to-face, and were audio-taped to accurately capture the experiences of the interviewees. The interviews took place during the month of November and December 2006, each lasting between 45 minutes to 1 hour and 15 minutes. They were conducted at the participants' desired location: a meeting room on-campus, at their place of work or in the participant's home. The interviews were semi-structured to provide flexibility to explore and guide the experience.

Using an inductive qualitative approach, the interview transcripts were coded using *NVivo* software. In keeping with grounded theory, coding began with open coding to create initial themes commonly found in the participants' experiences of the decision-making process. Subsequently, axial coding identified overriding themes, creating separate categories for the factors and the decision making process itself. A third pass refined and identified the emergence

of overriding themes, and illuminated relationships and patterns (Strauss & Corbin, 1998). These were then linked back to the developing argument of the thesis and themes and ideas encountered in the literature. Finally, selective coding was employed to choose specific examples and quotations that best illustrated the major themes. Throughout, constant comparison between and within themes and participants was used to saturate and refine themes, and analytical notes were used to enhance the credibility and support the development of themes and theory (Creswell, 1994; Neuman, 2003).

To ensure consistency and rigor, a codebook was used to define, describe and provide parameter for each of the themes. The codebook was updated as themes evolved. To determine the presence of a theme, it was important that multiple interviewees discussed it one or more times through out the interview. The themes were then arranged according to the timeline in which they affect the interviewees' decision as well as in conjunction with prominent literature in the behaviour change theory.

4   FINDINGS

4.1 Factors Involved in a Car-free/Car-lite Decision

Five main interconnected themes on the factors involved in mode choice/automobile ownership emerged from the coding analysis of 245 pages of single-spaced interview transcripts. They are: finances; personal values and attitudes; personal history; perceptions of accessibility; and, situational life events. Each theme is discussed in detail, including illustrative quotations. In keeping with grounded theory, these illustrative quotations are those identified during selective coding as specific examples and quotations that best illustrate the major themes.

4.1.1 A Question of Cost - Does it make financial sense?

"… was it really worth that much of your income and your life to a car? It really isn't worth it." [P16[2]]

For many, the question of mode choice begins and ends with, is a car-free or car-lite decision an economically viable option. For all participants this was part of the decision; a theme that emerges strongly from their narratives. It begins with an understanding of the cost and time involved in owning and operating a vehicle.

> "… getting rid of it, my truck, felt like a huge weight off my shoulders, because it's such a pain to maintain and to pay for and look after." [P9]

Beyond just the mere expense and time, this type of reflection provides a basis for evaluating the worth of owning a vehicle, a rudimentary cost-benefit analysis. Participants highlighted the importance of making a fiscally responsible decision. For many it was evaluating the frequency of use and necessity of using a vehicle for those trips.

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[2] To ensure the anonymity of the participants each participant [P] is referred to by their number (e.g. P14). For those interviews with more than one participant an additional number is given (e.g. P14-1).

> "Well financially to invest in another car when we weren't using a
> car very much we just thought well there are probably better ways
> we could be spending our money" [P8]

A notable finding pertains to auto ownership; of the eight memberships that reduced the number of vehicles owned, six waited until their car broke down before making a decision. The fiscal responsibility of these individuals is a paramount value that stems from their philosophical outlook of responsible consumption.

> "... owning a car for, as a single person seems like a lot of resource
> devoted ... for stuff that it's not really needed for." [P2]

These individuals do not subscribe to the cultural idea that social status is associated with the type of vehicle one drives, and therefore they do not up-grade their vehicles frequently. Rather, the narrative illustrated that the participants valued responsible spending, being conscious of needs and wants. In particular, car-free participants often citied other financial priorities that took precedence over owning/leasing a vehicle. As a direct result of their car-free decision, participants were able to afford to purchase or renovate their home (Participants 4, 7, and 16), contribute to student loan pay back (Participants 3 and 11), and save for retirement (Participant 11) much sooner than they might otherwise have done. In addition, for one family the decision to join the car-sharing organization enabled one parent to stay at home and for all participants in generally more disposable income.

> "I had 'x' number of dollars in the bank and I could have
> continued putting that into the house that I had ... it was a real
> fixer-upper ... or put that into a car. And I new that one appreciates
> and if I had use for it every day I could have justified it probably
> very easily." [P4]

But the decision to go car-free or car-lite does not end with it making financial sense. Indeed, if economic rationality prevailed, society would be much less auto-dependent.

> "I think if it was just about saving money there are plenty of
> people who still wouldn't do it." [P17]

There are clearly many considerations involved in mode choice.

4.1.2 Living Within My Values - Personal values and attitudes

"It reflects our values and I feel good that we can integrate our values with our daily life." [P17]

Throughout the analyses, in keeping with behaviour change theory, a predominant factor affecting mode choice is personal attitudes or values. Within social psychology values are defined as "… standards of desirability that are more nearly independent of specific situation" (Schwartz, 1977, 232), meanwhile attitudes are " … a psychological tendency that is expressed by evaluating a particular entity with some degree of favor or disfavor" (Ajzen & Krebs, 1994, 251). For example, an individual can value spending their money in a responsible way and possess the attitude that owning a vehicle that is not used often is a poor way to spend their money. It was apparent that all participants had a set of personal values and attitudes that guided their decisions. In fact, in all instances these personal beliefs were responsible for the decision even being considered.

"But there was also, a philosophical decision. That we wanted to reduce our dependence on vehicles." [P18-2]

The overarching values by which an individual wishes to lead his/her life appeared to be fundamental for the choice of car-free/car-lite being considered for these participants.

For many participants, that underlying 'philosophical decision' pertained to concerns about the negative impacts of the automobile on the environment and their community. A car-free or car-lite decision was their contribution to addressing an overarching issue.

"So my not wanting to pollute the environment with car emissions more and not wanting to have more cars in the dump, you know after they rust and they age. And tires in the dump and batteries and all those things influence my decisions." [P11]

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A few participants did not specifically identify the environment as a driving factor but did identify the need to reduce consumption and responsibly use resources. In this vein, some articulated that the ratio of one vehicle to one person was a poor use of resources, and individuals could not justify that amount of consumption to facilitate this lifestyle.

Others identified car-free or car-lite decision as something that enabled them to achieve a specific quality of life component they desired. More specifically, some participants identified the need for a healthy and active lifestyle, noting that car dependency deprived them of this lifestyle.

> "The primary one was probably lifestyle. I actually, I never walked, never biked when I had a car and I felt like crap when I was at the end of that year. I felt slow. I felt kind of heavy." [P2]

Still others focused on simplifying the way they live, illustrating this point by noting that being car-free/car-lite does not allow you to pack one's schedule so tightly.

> "I think it just fit in with ... how I felt about simplifying your life"
> [P1].

4.1.3 All That I Have Learned - Personal history

> *"It's a personal decision. It's just based on experience, it's based on research."*
> *[P5]*

As noted in some behaviour change theories, individuals' pasts—including their experiences, knowledge, habits and family values–can be an indicator of future behaviour. These experiences often are the foundation upon which personal values and perceptions of accessibility are built. Indeed, all interviewees linked their decision-making process to influential past experiences. The above four themes, growing up, experiencing other cities, knowledge, and travel habits, were the most commonly talked about experiences that impacted their decision to go car-free or car-lite.

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For many, the initial experiences from youth instilled many of their personal values from friends and family.

> "Well for me I think it's my up bringing too—just being raised.
> My mom ... instilled in us to try to be aware how lifestyles impact
> others people." [P8]

In particular, early attitudes about the environment, social justice, religion and fiscal responsibility contributed to their car-free decisions. Additionally, where an individual grew up had an impact, whether it was growing up in a city:

> "I grew up in <major Canadian city> so it's a very bad idea to own
> a car if you live in <major Canadian city>. It's impossible to park
> and drive. We don't, we just don't use car that much. So for me it's
> just natural." [P6]

Or in the country:

> "I grew up in the country where I think sometimes you're much
> more aware of the impact that you're having on the environment
> around you." [P18-1]

The impact of past experiences does not stop once an individual leaves home but extends to all experiences. Commonly, those experiences are of other cities or countries with different travel options that provide examples of how people live car-free.

> "Living in a city that had a lot of resources taught me initially how
> to get around ... It was an entry way. And then when I moved here,
> and it was less easy, at least I had the experience and I could piece
> it together." [P11]

These past experiences and everyday knowledge acquired over the years informed their ability to determine their accessibility equation.

> "It's more than life-stage, it's simply an experience level." [P16]

Knowing that services existed and understanding how to use them provided the possibility to get around.

Similarly, an individual's past travel habits sometimes reinforced their decision to go car-free/car-lite. Many participants, who previously owned vehicles, were not frequent drivers. Among the participants there was also an awareness that once travel habits were established they were much harder to break.

> "If we had two cars sitting in the driveway you can bet that the both of us would probably be driving to work every day ... So this sort of doesn't allow you that opportunity so you just do it." [P18-1]

Participants' desire to live in a ways that were consistent with their personal values pushed them to adopt and maintain certain travel habits.

4.1.4 Getting Around with Ease - Perceptions of accessibility

"I can do that, but I'm not out to make myself a martyr" [P13]

Participants' values were the foundation for considering being car-free or car-lite as an option, but there was an overwhelming understanding that individuals assess whether living in these ways would affect and reduce accessibility beyond their comfort level.

> "I can still have these values but it doesn't mean that I'm this perfect person who does all these simple-living, environmentally appropriate things." [P11]

In transportation planning, accessibility is both "the impedence factor, reflecting the time or cost of reaching a destination, and an attractiveness factor, reflecting the qualities of the potential destinations" (Handy, 2002, 4). During the interviews, participants were asked to draw out a travel map for a typical day, including major destination points and routes taken, to help refresh and visualize their travel patterns (See Appendix II – example travel map). This exercise established the objective accessibility of various destination points in relation to the participants' homes. However, most of the dialogue focused on subjective accessibility by pitting the relative

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ease of getting to where they needed/wanted to go versus what level of perceived hassle they would be willing to live with. As one participant stated:

> "I knew that any place we went to <regional area> we could get to if we wanted to get to." [P14]

But as another car-lite participant indicated, the question was at what expense:

> "So I have an infant and a 4 year old and I have to go shopping, taking them both by trailer to the car location. And then having to carry the kids and the groceries home ... My life was stressful enough. I didn't need that kind of hassle." [P17]

People evaluate ease of getting to the locations they need to or want to go – thus affecting their ability to even consider a car-free or car-lite decision.

Participants identified locations of home, work, and the car-sharing cars in relation to the city core/amenities, the presence and level of transportation services, and the relative inconveniences of scheduling family responsibilities as the factors involved in assessing accessibility. For some, the equation of these factors resulted in their ability to be car-free:

> "We decided to live in <city> so that we could be close to shopping and <Partner's> job. We will probably continue to do so because it's a nice area, the school's good, everything's close by."
> [P7]

However, accessibility is not a constant, and later during the interview the same participant illustrated a scenario where the equation may not end in a car-free decision:

> "Maybe we'll revisit it again when the kids are a little older and they get more involved in things that are far away ... that kind of thing where the bus service is really terrible up there and you can only bike." [P7]

Most often during the interview, the state of being car-free/car-lite was not described as easy, and the decision came after an assessment of the inherent difficulties and whether they were in conflict with the level of lifestyle they valued. The majority of participants live within close

proximity to the downtown core, and during the interviews respondents often citied their location

choice and the resulting accessibility as enabling their car-free or car-lite decision.

> "I live close enough to work, you just position yourself so you
> don't have to travel a long distance" [P3]

In addition, both car-free and car-lite participants identified a car-sharing organization as an

import factor in maintaining their car-free or car-lite status. In short, a car-free or car-lite

decision requires an ongoing assessment of accessibility – where one needs/wants to go and how

easy it is to get there using various modes.

4.1.5 The Decision Point - Situational life events

> *"I think it was the inertia carries you along and the status quo maintains itself.*
> *So, if there hadn't been a precipitating factor like that [car breaking down] no I*
> *don't think we would have changed deliberately" [P18-2]*

The experiences of the participants reveal that the four themes discussed above inform

their willingness to live in a particular way and are necessary for a car-free/car-lite decision to

even be considered, but a behaviour shift in each of the participants also required a push.

> "I got laid off from my last job so that was the trigger" [P9]

> "If the car hadn't broken down ... gave me the push" [P1]

> "… the second car our son had. And when he left, is when we
> decided" [P13]

> "<Partner> got rid of his car in '96 when he moved to <US city>."
> [P7]

> "… when I first heard about it [car-sharing organization] I didn't
> think that I needed to make use of it at that point ... when I had a
> girlfriend when I decided it made sense to do that." [P10]

> "the big turning point, when my daughter left. Then I definitely
> didn't have an excuse to have a car standing in drive way" [P15]

These trigger points are times or events that mark a change in direction from the one that was

being taken (Giele & Elder, 1998). These situational life events, including losing a job, children

moving out of the home, retiring, moving locations, and, for several, a car breaking down, provided an opportunity to reassess their travel needs, whether it be to increase or decease their accessibility to a vehicle, and allowed them an opportunity to "just try it". This finding translates into a working definition for situational life events that is consistent with Verhoven *et al.* (2005) definition of key events.

The sentiment of 'just try it' was often used as a means of describing the final decision-making.

> "Well just try it <P1>. What is the worst thing? You'll go buy a car
> if you hate it. So I did, I finally did." [P1]

These situational life events allowed the participants to make a leap of faith in trying a different mode. In addition, individuals felt that they are not locked into their mode choice but rather they have the freedom to change their decision at any point.

As one would expect, life events often occur in unpredictable ways at unpredictable times. The time between first consideration and actual joining of the car-sharing organization ranged from a month to almost nine years, with the average being two years. Despite the involvement of many factors leading up to joining the car-sharing organization, this decision was very rarely made within a static environment. Woven into the narratives about the decision-making process there was a theme of changing life events. With the exception of Participant 16 (who did have his/her car break down), each individual talked about changes in one or more than one significant area of their life over the course of the decision-making process. For example, participants had home location moves, either within a city (Participants 1, 2, 3, 4, 6, 8 and 12) or to a new city (Participants 5, 7 and 11), and changes in childcare responsibility such as children entering into a more independent age (Participants 1, 4, 17 and 18), children moving out of the home (Participants 1, 4, 13, 14, and 15) and recent new additions (Participants 7 and 12).

Finally, there also occurred changes in work status and/or location (Participants 2, 9, 10, 12, 13, 14, 17 and 18) and partnerships/marriages (Participants 3, 4 and 10).

Each life event provided yet another occasion to reassess one's travel needs.

> "Something happens in your life and you get married … get a job, ok what's that going to do to our transportation issue … we've just reached this baby level ... You almost get this unsettled part at each new stage where you have to figure out how things work and one of those options that always comes up is do we need a car at this new stage" [P12-1]

The examples given above were those that affected this specific decision. However, participants most notably those who did not own a vehicle prior to joining the car-sharing organization, could envision their car-free/car-lite decision being reversed by a future situation life event.

4.2 The Process of Decision Making

The first phase of analysis suggests that five main factors are involved in the decision to go car-free or car-lite, raising questions about how the various pieces fit together within the decision-making process. The second phase of analysis deals with this issue of combined effects. Initially, I attempted to approach this phase of the analysis using a more structured approach focusing on the identification of interactive effects—a concept that is rooted in quantitative analysis and is normally expressed as either the product of two factors or as conditional probabilities. However, with some re-analysis of the transcripts, I returned to a grounded theory approach so as not to constrain my interpretation of the participants' experiences and expressed perceptions of how the factors link within the decision-making process. While I cannot qualify the extent to which my second approach at stage-two analysis is informed by the preliminary findings of the first approach, the results of the two approaches had significant differences. I focus here only on the results emerging from the second analysis—that using the grounded theory approach.

My first step in returning to analysis was to re-read the discussion of the findings of section 4.1, and at this point I realized that links between the themes had emerged from the data already. The participants' experiences highlight the first four themes of finances, personal values and attitudes, personal history and accessibility as factors that determine interest in a travel behaviour change and create a sense that is it possible. However, many studies of TDM strategies to date illustrate that personal preferences, priority and ability do not always translate into behaviour change. Rather, it is situational events that provide a contextual change, translating intention into action. Indeed, this is the only link in the decision-making process where conditional dependencies arise and examples from the original analysis resurface. This section discusses in detail each link from the participants' perceptions of the decision-making process as a whole, including illustrative quotations.

4.2.1 Linking the Decision-Making Process

Throughout the transcripts, sections of dialogue combined factors, revealing how these factors worked together in the decision-making process. Using a grounded theory approach, three main links between the themes emerged from the coding analysis. They are: who I am; what is possible; and when I can.

4.2.1.1 Who I am – What about this travel behaviour change interests me?

"… it [car-sharing] fit the profile of what I thought should be being done." [P14]

The first link in the travel decision-making process is how the decision speaks to the preferences of an individual. The decision to consider a car-free or car-lite lifestyle is accessed based on a set of values and attitudes.

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> "I really really wanted to try it. I just really wanted to try it. I just knew that. … I think it just fit in with how I felt about environmental issues, about how I felt about simplifying your life, you know all that kind of stuff. I just thought the [car-sharing organization] would fit into it." [P1]

The transcripts reveal a range of values and attitudes being held by the participants; these relate to the environment, accessibility, time efficiency and money matters. Regardless of differences, what all participants held in common was a sense that their decision should be based on principles, rather than need or convenience alone. The transportation decision being considered must speak to an individual's values and attitudes about such things as the environment:

> "We always felt like environmentally we didn't want to do that. That was really important for us not to own two cars." [P17]

And/or alternative modes of transportation:

> "I take the bus not because I'm poor it's because is there and the bus is going to run whether I run it or not and my car isn't going to run if I don't take it." [P6]

And/or the way they spend their money:

> "…before I spend anything over $10 I have to satisfy myself that it's worth it. That the value is there." [P4]

It is important to add that sometimes an individual's values and attitudes appear to be contradictory. For example, preferring to live a lifestyle that is sensitive to environmental values or spending money in a responsible way may not be consistent with attitudes toward using public transit. The decision-making process is guided by those values and attitudes that are paramount.

> "I guess I have a different threshold for convenience … they're other things that I have said that I think are important, are more important than a seven minute wait for a bus to me." [P10]

> "I feel good about it from a kind of environmental perspective and I feel bad about it when I'm being inconvenienced walking out in the rain and I'm wet." [P7]

As Participant 10 and 7 stated, despite a car-free/car-lite decision being in conflict with certain preferences such as convenience, other preferences are more important to the decision-making process. Participant 10, as well as other participants, identified the presence of an overriding value to their decision:

> "… another big reason is environmental impact of driving a car for sure. I mean I am of the opinion that taking care of the environment is the most important thing, most important thing, period." [P10]

> "… overriding principle of being a secular humanist" [P11]

> "I have a more European mentality where I just say that's just nuts when you have one car per person. Because that's not efficient at all … it's just human nature to be driven by economic reasons" [P5]

While the values and attitudes determine whether a decision is considered, they themselves are informed by personal history. The values and attitudes held by the participants evolve over time, shaped in part by past experiences and decisions.

> "…decisions have re-enforced the fact that we want to be car-free and can be car-free, and the fact that we're car-free re-enforces the types of decisions that we make…" [P12-1]

The personal values and attitudes of the study participants reflect who they are and why the decision is being considered.

4.2.1.2 What is possible - Can I, given my life circumstances, follow through with this travel behaviour change?

> *"… if I get rid of the car, there's got to be an option" [P16]*

Once interest in making a car-free or car-lite decision is established, participants then assessed their perceived ability to follow through. Foremost, personal characteristics and contextual variables were assessed based on an individual's preferences as either enabling or hindering their perceived ability.

> "… we considered [going car-free] a few times over the last 10 years, before we had our kids, when my son was small and then when my daughter was small. And it just was never feasible for what one reason or another." [P17]

Indeed, as Participant 13 stated so succinctly and others suggested similarly, they are not willing to be 'martyrs' for the decision. The participants were and are not willing to let a car-free or car-lite decision extensively impede their lifestyle. Therefore, during the decision-making process each participant carefully considers whether they could follow through with the said travel behaviour change.

More specifically, socio-demographics and accessibility factors determine whether a car-free or car-lite decision is feasible. Consideration was given to personal characteristics including household make up, terms of employment, and financial priorities. For Participant 13, negotiating a car-free lifestyle was unattainable, but a car-light one was possible:

> "No, No for the fact that, with real estate, <Partner> needed a larger car and the fact the clause built into my employment insisted. I mean there was no way you could." [P13]

Similar consideration was given to contextual variables including proximity of major destinations from the home, types and quality of alternative mode services available and the ability to access a vehicle occasionally through a car-sharing organization.

> "I'd say my own situation living downtown really helps because I'm able to walk to almost everything we need … my experience has been that where you live in the city is going to make that decision [car-free] harder or easier." [P8]

This step of the decision is guided by the values and attitudes held by the participants. Their values and attitudes are the standards against which they judge their ability to act. For many participants, the primary focus was on the impact the decision would have on their lifestyle, given their personal circumstances and whether the level of impact was acceptable.

> "I think that the strongest motivator is really cost verse lifestyle.
> Like how much does it cost me to have that little bit of lifestyle
> and do I need it?" [P5]

The decision-process is comprised of determining what an individual would like ('Who I am')

and then assessing it against what they need ('What is possible').

4.2.1.3 When I can – Why is this the 'best' time to consider making this travel behaviour change?

> *"I waited until I had enough need for it [car-sharing organization]." [P3]*

Many factors discussed in the interviews reflect the personal, contextual and situational

characteristics involved in determining an individual's inclination and ability to make a travel

behaviour change. However, with the exception of one participant, rarely do inclination and

ability to be car-free/car-lite directly translate into a behaviour change. In particular, as

illustrated in the previous two sections, the contextual variables and the personal preferences,

priorities and characteristics are the foundation for interest in and assessment of a travel

behaviour change, but none of these were the final push to change an intention into action.

> "... human nature is just that you need an external motivator to
> make responsible decisions just by saying it's a good thing to do
> and do it because it's a good thing to do, usually doesn't work."
> [P5]

Indeed, the decision-making process took much longer than expected, given inclination

and ability. In particular, many who had strong environmental values (P 6, 8, 11 & 15) did not

give up their car without a final push from another factor.

> "I always felt in a sense I felt a bit guilty for having a car and I've
> talked to my daughter and she was always saying you know, 'Once
> I leave, it's alright for you not to have it anymore.' I didn't need it
> for myself and I wasn't – it probably was being alone that was the
> tipping point." [P15]

When asked why they did not use their vehicle, often they cited environmental consciousness, but when asked why they gave up their car, they cited moving to a new province where the insurance was more expensive, their car breaking down and their child moving away to university. So, were environmental values and the other factors listed above important to the decision being considered? Definitely they were, but they were not pivotal in initiating the change.

Instead, the decision to become and remain car-free or car-lite is conditionally dependent on an event that provides a contextual or situational change. These changes relate to a variety of factors such as changing family/partnerships (P 1, 3, 4, 7, 10, 12, 13, 14, 15, 17, and 18), particularly children, career transition (P 2, 9, 12, 13, 14, and 17), house relocations (P 4, 5, 6, 7, & 11) and the car breaking down (Participant 1, 3, 4, 8, 9, 16 and 18).

> "P: I waited until I had enough need for it.
>
> I[3]: and what was enough need?
>
> P: Girlfriend … I thought about it, I just didn't have enough need." [P3]

The opportune moments are the push into or out of the decision-making process and provide an opportunity to reassess travel options. Among the participants' experiences, there are several prominent contextual or situational changes.

The change in presence and age of children in a household was a pivotal step in the decision-making process for nine participants who had children - five of whom still had children living at home. Their car-free/car-lite decisions were conditionally dependent on transitions in family structure (children being born, growing to a more independent age and moving out) that often improved their ability to follow through. For example, the car-lite decisions of participants

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[3] To maintain the integrity of participant dialogue some selected quotes include interviewer prompts or questions that intersects the participant's quote. The speaker is indicated using the initial I (Interview) and P (participant).

4, 13, 14, and 15 were in part prompted by and coincided with at least one child moving out of the home.

> "When the one child left permanently ... was feasible to take a look at going down to one car." [P13]

For the average North American car owner, a vehicle breakdown is often followed by a decision to purchase a new vehicle, but this situational life event did not have the same outcome for the participants of this study. Indeed, the situational change of a vehicle breakdown (Participant 1, 3, 4, 8, 9, 16, and 18) was an opportunity to re-evaluate one's mobility options and was instrumental to the decision being made at that specific time. As one participant stated:

> "… our second car was really old, just 'keep it on the road for short trips' kind of car. So when it died a horrible death, we decided we weren't going to replace it ... We're in a fortunately situation in that we live centrally – so we're in downtown <city>. And we both live, most of the time, within walking distance from our work." [P18-1]

In addition to changes in perceived ability, situational events provide opportunities for new decisions to be examined in light of evolving personal preferences or priorities. In particular, many participants (4, 5, 6, 7, 8, 11, and 16) considered the cost of owning a vehicle as an inappropriate use of their money, given the frequency of its use. This position was strengthened when a situational life event, such as moving to a province where insurance was much higher, moving to a new country, or a car breakdown, occurred and a review of mobility options ensued.

> "Financially to invest in another car [after just sending one to the junk yard] when we weren't using a car very much, we just thought well there are probably better ways we could be spending our money" [P8]

There appears to be some inertia involved in continuing to own a vehicle even if the vehicle is infrequently used. However, personal, situational and contextual changes create new

circumstances that sometimes call into question the necessity of purchasing a replacement vehicle that was not and/or would not be frequently used.

4.2.1.4 Examples of the decision-making process

The transcripts suggest that there are three steps in the decision-making process to go car-free/car-lite: the establishment of personal interest in being car-free/car-lite, periodic evaluation of their ability to follow through with such a decision, and then a contextual/situational change which acts as a trigger, translating intention into action. Throughout the analysis process, the links between the five themes were compared in various sections of each transcript and among the participants, resulting in selected quotes that illustrate the participants' perceptions of each specific component. However, within the transcripts, there are examples where participants touch on the three links, 'Who I am', 'What is possible' and 'When I can'. These quotations from the transcripts strengthen the findings by demonstrating the participants' acknowledgement of the steps involved in the decision-making process.

Selected key examples illustrate in the participants' own words the role of the three links in the decision-making process. In the following passages, each link has been individually shaded: 'Interest/inclination', 'Ability' and 'Situational/contextual change'. In the first two passages, the participants describe their experiences of deciding to reduce vehicle ownership from two to one or one to zero vehicles:

> "P1: … our second car was really old, just keep it on the road for short trips kind of car. So when it died a horrible death, we decided we weren't going to replace it.
>
> P2: We had talked about the <car-sharing organization> before that. Because every time we go to one of the big festivals in the park they've got their booth and they've got the brochure and we'd look at it and go 'What a good idea.' But we'd never do anything with it, so this time we did something about it.

P1: But we're in a fortunate situation in that we live centrally, So we're in downtown <city>. And we both live, most of the time, within walking distance from our work. So, it came down to the fact that because of our, both of us work full time outside of the home, and just because of the requirements of our jobs. There's about a few days out of the month where it's absolutely imperative that we both have a car." [P18]

"It was getting old, and we were starting to get to that point where we were having to make decisions about do we spend more money on it or not, or just give it to Car Heaven. We really didn't use it that much, we lived downtown and we consciously chose to be downtown so we can walk to everything, most everything, there are things that we can't walk that we can at least cycle to. And probably I felt this more than <Partner>, but I felt that every time I jumped into a car I felt I was complicit in petro-tyranny … I just thought I don't want to be doing that, and so when the car got old enough and we just thought do we do this, do we continue with it. I think if the [car-sharing organization] wasn't here though, we would have just purchased another car" [P7]

In the following two passages, the participants describe their experiences of reconsidering their car-free/car-lite decision and staying car-free (zero to zero) or car-lite (one to one):

"…you almost get this unsettled part at each new stage where you have to figure out how things work and one of those options that always comes up is do we need a car at this new stage and we try really hard not to and we find those alternatives and as they come out of the woodwork realize we have enough alternative without buying a car then that decision is put aside again." [P12]

"I think the real wake up call was when my husband's boss talked to him about being late. And gave him, you know, a pretty serious warning 'You're not to be late' – you know. So, yeah that brought it home. It was either that or me saying no to out-of-town clients. And I didn't want to do that and financially with the new clients coming in we could afford a second car. Right, but because of the environmental factors we don't want to do that. So the car coop – plus they also reached a point where there service was easy to use and that had a big impact too. In the beginning the car weren't as close as they are now. There weren't as many and their computer

system wasn't as good. There system how they ran it. So I would say that really influenced me too." [P17]

While section 4.2.1 has been organized with **'When I can'** as the final link, the decision-making process is rarely linear. As the above examples illustrate, a contextual change can be both an instigator of a decision-making process and a push to action.

5   INTERPRETATION AND DISCUSSION

The two-staged analysis of the participants' narratives reinforces the conclusion that travel-behaviour change is the result of a combination of common, yet complex, factors: finances, personal values and attitudes, personal history, accessibility and situational life events. For the participants in this study, a car-free or car-lite decision was not undertaken lightly. The analysis illustrates a thoughtful decision-making process, similar to behaviour change theories, where-by interest, need, and ability to go car-free or car-lite are considered. However, this consideration of personal interest and perceived ability to make said decision did not result in a behaviour change adoption. Rather, the role of these factors appears to be conditionally dependent on a change in context provided by a life event. For the participants, a "push" that involved a situation life event was required to stimulate a decision to act. There has been limited research on the role of situational life events in transportation behaviour, but this key finding has implications for behaviour change theory, transportation demand management and transportation research.

5.1 Reflecting on Behaviour Change Theory

The findings of this study are considered in light of the behaviour change theories and research introduced in sections 2.4.1 and 2.4.2 including utility maximization, Theory of Planned Behaviour, Model of Normative Decision-Making, habit and life-course analysis. Indeed, the dominant themes citied by the participants as leading to behaviour change do not stray far from those found in existing behaviour change theory: finances, values, norms, attitudes, habit and ability to change (Schwartz & Howard, 1981; Ajzen & Driver, 1992; Aarts *et al.*, 1997; Guiver, 2007). These factors are markers of the potential to change, and the reasons for considering a

car-free/car-lite decision. However, beyond indicators, only arguments for the inclusion of habit in travel decisions and a life course analysis approach identify the presence of trigger points in the decision-making process. The findings of this study point to the overarching pivotal role of situational life events as the 'push' to decision-making. This section elaborates on the links between the dominant themes and these theories.

That transportation research has been framed primarily by theory related to utility is understandable. However, the theory of utility maximization is too simplistic to deal with a car-free/car-lite decision. The individuals in this study were not trying to find the optimal decision for mode choice or automobile ownership but rather, find a compromise they could live with. Part of that compromise related to utility factors. Indeed, one of the prominent themes to emerge in the participants' narratives is a question of cost, and more specifically whether it makes financial sense. Utility concepts of time and money are represented in the findings in two ways: participants' awareness of the personal impacts of owning a vehicle and the evaluation of the worth of owning a vehicle. These themes are pervasive throughout transportation research and they are commonly found in many behaviour change models (Salomon & Mokhtarian, 1997; Bamberg & Schmidt, 1998; Harms, 2003; Steg, 2005). However, despite the common presence of these themes in both this study and other research, it is less important to mode choice than one might think (Mann & Abraham, 2006; Guiver, 2007). As participant 17 states so succinctly:

> "…if it was just about saving money there are plenty of people
> who still wouldn't do it." [P17]

While utility rationales continue to be a common component of the decision-making process, the disproportionately low modal shift realized from recent improvements in more sustainable modes of transportation prompts interpretation that switching to more sustainable modes goes beyond utilitarian considerations (Schwartz, 1977; Steg, 2005; Verhoeven *et al.*, 2005; Mann &

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Abraham, 2006; Guiver, 2007). So, are standard transportation practices erroneously overestimating the impact of utility factors on travel behaviour change?

Many studies of travel behaviour change and their underlying theories identify themes that go beyond utility concerns and can establish intent to change. The predominant themes, including attitudes, norms, values, and personal past, are to varying degrees core components of life course analysis, Theory of Planned Behaviour, Model of Normative Decision-Making, and the integration of habit into decision-making models (Schwartz & Howard, 1981; Giele & Elder, 1998; Bamberg & Ajzen, 2003; Verplanken & Wood, 2006). These factors are used to establish intent to behave, representing factors that predispose individuals to considering a behaviour change (Bamberg & Ajzen, 2003; Klockner & Matthies, 2004). Indeed, within the participant narratives, these themes were strongly evident and were grouped as: personal attitudes and values, and personal history. These two themes represent important pre-determinants to a car-free/car-lite behaviour change. The roles of these two themes in the decision-making process are further discussed in the following paragraphs.

In this study, where individuals had a choice to adopt a car-free/car-lite lifestyle, a decision was made because they wanted to, not because they needed to. An individual's preferences are based on their personal values and attitudes. Within the narratives, values and attitudes, such as those toward sustainable travel modes, are linked to travel behaviour and prompt the consideration of modes other than driving an automobile (Nilsson & Küller, 2000; Rose & Ampt, 2001; Bamberg & Ajzen, 2003; Klockner & Matthies, 2004). Individuals wish to live in accordance with their values and these values are activated whenever a behaviour choice is presented (Schwartz, 1977; Schwartz & Howard, 1981). Likewise, attitudes towards particular entities, such as the car or environment, play an important role in assessing intention to change

travel behaviour (Nilsson & Küller, 2000; Steg, 2005). Indeed the variety of values and attitudes expressed demonstrate the often-conflicting nature of one's values and attitudes. Pragmatic concerns, some of which are linked to other themes such as finances and accessibility, and altruistic values and attitudes, related to the environment and the car, are present both in this study's findings and previous research (Schwartz & Howard, 1981; Salomon & Mokhtarian, 1997; Klockner & Matthies, 2004; Anable, 2005; Cao & Mokhtarian, 2005).

The values and attitudes related to a desired lifestyle, such as healthy and active or simplified living, is particularly significant. This finding is especially important as past research identifies lifestyle values as important to the way in which participants respond to TDM strategies (Salomon & Mokhtarian, 1997; Cao & Mokhtarian, 2005). The private automobile has been identified as an essential lifestyle component of a dominant segment of the population, obsessed with efficiency, safety and freedom (Nilsson & Küller, 2000; Steg, 2005; Mann & Abraham, 2006). While values and attitudes are included in behaviour change theory, little attention has been given specifically to the role of lifestyle in the decision-making process. In those studies that focus on lifestyle, values and attitudes appear to play a key role in travel profiles and change over time (Schwartz, 1977; Krizek & Waddell, 2002; Anable, 2005; Cao & Mokhtarian, 2005). As stated previously, it is assumed that the individuals in this study are outside society's norm; therefore an area of further study is to look more closely at the lifestyle values that individuals hold.

An individual's past is relevant and important to travel mode choices at later times (Krizek & Waddell, 2002; Bamberg *et al.*, 2003). Throughout the interviews, participants shared reflections on past experiences that impacted their car-free/car-lite decision. Their stories involved traveling/living in other cities and countries, the role of family, where they grew up and

what they learned along the way. The decision-making process can be linked to such influential past experiences that highlight the importance of life events in general. Life course analysis supports the leading role of past events in future decision making (Giele & Elder, 1998). In addition, the link between acquired knowledge or awareness and behaviour change has been recognized (Schwartz, 1977; Rose & Ampt, 2001; Gollege & Gärling, 2003). Each participant in this study had one or more past experiences that increased her/his awareness of issues related to transportation and modal options. In general, past experiences play a role in creating or modifying values, norms and attitudes, and in turn past values, norms and attitudes are often references against which new ones are created (Schwartz & Howard, 1981). Lastly, existing habits are hard to break and participants were aware of this (Verplanken & Wood, 2006). Interestingly this awareness was present in both those individuals who were breaking a habit by decreasing the number of vehicles they owned as well as those who were preventing the formation of a new habit by remaining car-free. In general, the car-free or car-lite decisions discussed in the interviews were far from isolated events. Rather they are a part of a longer process of accumulated and changing knowledge, experiences and social settings.

While values, attitudes and personal history are fundamental to considering a decision, there remains the practicality of following through (Nilsson & Küller, 2000; Krizek & Waddell, 2002). The practicalities of car-sharing, transit or non-motorized travel are considered given the individual's life circumstances and needs. Accessibility has become a dominant theme within transportation research, and the constraints it presents in limiting an individual's perceived decision-making power is reflected in most of the behaviour change theories (Schwartz & Howard, 1981; Ajzen, 1985; Handy, 2002; Collins & Chambers, 2005). This theme draws our attention back to utility factors, comparing the cost, time, distance and attractiveness involved in

travel. The most dominant element in the narrative was the location of home. A majority of participants chose to live within the downtown core of the city, and this choice was often mentioned as a conscious decision in part related to accessibility. Indeed, accessibility is determined by preceding life choices, such as residential location (Krizek & Waddell, 2002; Steg, 2005). Despite the importance placed on accessibility, the narratives continually hinted at its variable nature. Changes in the location of home, work, and activities as well as family structure were instrumental in the continual re-evaluation of their transportation choices.

The discussion of the above four themes as factors that form an intent to change a behaviour are consistent with those identified in behaviour change theory (Schwartz & Howard, 1981; Bamberg & Schmidt, 1998; Guiver, 2007). However, the overarching theme that arose through the coding process was that of changing life events. The key to actual or considered behaviour change is a push by outside situational life events. It represents the trigger point where intentions are translated into action.

In the proceeding four themes, the dynamic nature of things over time is frequently highlighted in discussions of changing life events. Ever changing financial priorities, household structures, careers, experiences, locations, and services, as well as the impact of past decisions speak to the unpredictable nature of life. A small body of recent research has noted the impact of life events on automobile reliance and the impact of specific events to induce re-evaluation of travel habits (Krizek & Waddell, 2002; Gollege & Gärling, 2003; Harms, 2003; Verhoeven *et al.*, 2005; Prillwitz *et al.*, 2006; Ryley, 2006). Meanwhile, other studies have touched on the variability of predicting behaviour change over long timelines, and some have called for further research on the impact of life changes over time, as well as the changes in individuals' values and attitudes (Ajzen, 1985; Krizek & Waddell, 2002; Bamberg *et al.*, 2003; Cao & Mokhtarian,

2005). This theme reflects the tenets of life course analysis and illustrates that, longitudinally, very little in the decision-making process is constant (Giele & Elder, 1998). For each participant, the impact of each life decision, event, and experience goes beyond that immediate state. As participant P12 states, finishing school, getting married, starting a career, buying a house and having a baby each required a re-evaluation of their transportation needs, and at no point were the timing or changes predictable.

The comparison of the study findings to behaviour change theories highlights the absence of dialogue reflecting the role of social norms in the decision-making process. This absence suggests that, for these pioneers, it is less important than otherwise implied. Those who choose to go car-free or car-lite, especially outside of a metropolitan area, are different than the typical North American (Millard-Ball *et al.*, 2005; Steg, 2005). While many of the participants acknowledged living outside the social norm of car ownership, most indicated that this did not influence their decision. Instead, the only presence of social norms pertained to a few isolated examples in which participants described the types of individuals within their social group and the similarities they had to them. It is important to note that these descriptions were used to exemplify how this decision made them different despite their similarities. These findings reflect the experiences of early adopters. Therefore, as car-sharing gains popularity in Canadian metropolitan areas, future research documenting the experiences of individuals prior to the decision would be useful in tracking changes in social norms.

5.1.1 Reflecting on the Decision-Making Process

The findings of this study indicate that mainstream transportation research and behaviour change theory do not reflect the importance of situational life events in the decision-making process. Transportation research is adept at identifying the characteristics (attitudes, values,

socio-demographics and travel patterns) of individuals who are considering or have made a change in travel behaviour (Thorpe *et al.*, 2000; Steg, 2005; Verhoeven *et al.*, 2005). But often contextual changes are only considered in relation to the implementation of a service, program or strategy (Fujii & Kitamura, 2003; Verplanken & Wood, 2006; Guiver, 2007). Similar to transportation research, behaviour change theory such as Theory of Planned Behaviour and Model of Normative Decision-Making highlight the importance of attitudes, values and norms and perceived control as creators of intention but they do not isolate the point at which an individual does change. Indeed, both these models view decision making as a reasoned process in which established intention leads to behaviour change. Yet, research has shown that intention does not directly translate into action (Nilsson & Küller, 2000).

The findings of this study illustrate that the decision-making process is not based solely on determining an individual inclination ('Who I am') and ability ('What is possible') to make a travel behaviour change. Rather, the decision to become and remain car-free or car-lite is conditionally dependent on an event that provides a contextual or situational change. So these changes provide the push into or out of the decision-making process. This point is akin to Malcolm Gladwell's *The Tipping Point*, which I read shortly after re-analyzing Chapter 4.2:

> "… when it comes to interpreting other people's behavior, human beings invariably make the mistake of overestimating the importance of fundamental character traits and underestimating the importance of the situation and context." (2001, 160)

The transportation research and behaviour change theories discussed above focus on personal characteristics, but critiques of the dominant theories and the use of life-course analysis are beginning to address situational and contextual changes as pivotal to the decision-making process. Many proponents of the need to integrate habit into behaviour change theory pinpoint contextual changes as opportunities to break existing habits and consider new mobility options

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(Prillwitz *et al.*, 2006; Verplanken & Wood, 2006). Likewise, life course analysis emphasizes the role of turning points in reorienting an individual's decisions (Giele & Elder, 1998; Krizek & Waddell, 2002; Prillwitz *et al.*, 2006). The circumstances under which decisions are made are relevant to understanding the decision-making process.

5.2 Implications for TDM

5.2.1 Strategy Evaluation

The findings of this study have implications for TDM design and evaluation. First, the data suggest that sustainable transportation decisions are not spontaneous or static. The timeframe between intention and action is far more varied and unpredictable than conventional approaches allow for (Verhoeven *et al.*, 2005). The 'low hanging fruit', as practitioners often refer to them, are those individuals that are at the right point to make a modal shift when a TDM strategy is implemented and often represent the only change that is identified using short-term measurement timeframes. A longer-term, more frequent assessment, such as that used in adaptive management would provide a clearer indication of behaviour change (Stewart & Pringle, 1997; Nobel, 2004). Second, outcome-oriented indicators overlook the key ingredients of mode choice decisions, which pertain to personal attitudes, values, and history/experiences, as well as accessibility factors. Future evaluations of TDMs should broaden their scope to incorporate metrics that monitor changes in attitudes and experiences, as these may well lead to future changes in behaviour (Jones *et al.*, 2003; Finke & Schreffler, 2004).

The importance placed on life events as the trigger for a change in travel habits is also significant for transportation planning. In particular, TDM programs that target life events (e.g., location move of home or work) are often far more successful that those focused on stable conditions (e.g., workplaces trip reduction programs). An example is the implementation of

universal bus passes or companies that adopt TDM measures when there is a move (Environment Canada, 2005; Victoria Transport Policy Institute, 2006). TDM strategies should target these situational life events that isolate the 'low hanging fruit'. Alternatively, TDM strategies can be the situational life event themselves (Verplanken & Wood, 2006). A majority of the participants identified the presence of the car-sharing organization as instrumental in their car-free/car-lite decision. A new TDM strategy or enhancement of alternatives can provide a viable option that was lacking. Alternatively, these programs can provide a negative impetus for continued automobile dependence, e.g., road tolls.

Without an alternative to the automobile, there is no decision to be made. As some participants pointed out, to make car-free or car-lite a viable decision, a city must be planned in particular ways and services must be provided that make alternative forms of mobility viable. Thus there is a need for continued commitment to TDMs, even if conventional evaluations show little short-term effect.

5.2.2 From Qualitative to Quantitative: Translating the results

Appropriately, in addition to evaluating outcomes, many trip reduction programs and research use quantitative methods to gauge capacity for behaviour change, identifying the commuter market within a specific location, including the pool of candidates with the potential to change their behaviour (Transport Canada, 2002). The findings from this qualitative study can serve as the basis to improve existing survey instruments used to determine TDM strategy selection as well as baseline and follow-up evaluation.

Foremost, many of the existing survey instruments fail to address the impact of psychological and situational life change on transportation decisions. The questions most often focus on self-identification of interest and attaining travel pattern information including primary

mode, trip details, etc (Transport Canada, 2002). The intentions of the participants are gauged by present mobility patterns, proximity and intentions. However, the data sets are based on current psychological and situational life states and the assumption of these surveys is this baseline is static. The findings of this study support a broader scope of questions that include a review of situational life events in both baseline and follow-up surveys. The remainder of this section provides examples of how this information could be collected in keeping with the dominant types of questions used.

Surveys used by practitioners and academics to assess capacity for modal shift primarily use three types of questions. Practitioners manuals often gauge potential capacity using presence/absence questions focused on willingness to consider an alternative mode, and if so, which strategies would encourage them to do so (Pollution Probe, 2001; Transport Canada, 2002; B.E.S.T., 2005). For example, the B.E.S.T's Go Green Choices manual suggests using the following two questions: "What, if any, types of transportation choices would you consider using? What changes/incentives would encourage you to change your transportation habits?" (B.E.S.T., 2005). Secondly, both academic and practitioners' surveys commonly use rating or ranking questions to determine attitudes related to acceptability or preference of TDM strategies and the impact those services would have on an individual's mode choice (Thorpe *et al.*, 2000; Pollution Probe, 2001; Fujii & Kitamura, 2003). Finally, a growing body of research is utilizing scenario or gaming structured questions to gauge capacity (Fujii & Kitamura, 2003; Andrey *et al.*, 2004).

Presence/absence questions, most often employed by practitioners, ask an individual if they would consider an alternative mode and if so which, yet this response does not demonstrate

prior intent. Instead it would be effective to ask questions similar to those below to gauge both intent and capacity for change:

- Have you ever thought of making a modal shift or change in automobile ownership? If yes, what triggered those thoughts? (Close-ended choices plus other)
- Is there an upcoming change in the location of your home, car ownership, family structure etc.? (Yes/No) Would you consider reviewing how you get around when that change occurs?
- Do you consider yourself within walking, biking or bussing distance of your frequent destinations (work, shopping)?

Despite the potential to provide greater insight into less measurable changes, few practitioner surveys use a rating or ranking system to capture levels of awareness, attitudes and values, and even fewer use these variable in longitudinal evaluations (Jones *et al.*, 2003; Finke & Schreffler, 2004). The above questions could easily be converted to a rating system for example:

- When considering a change in your travel mode what role do you feel each of the following factors would have in your decision? Please rate factors including accessibility, cost, situational life events, local transportation services and amenities, knowledge, etc.
- Have you ever used a travel mode other than your car? Please rate your experience for each mode.
- Please rate your feelings with respect to how accessible your frequent destinations (work, shopping) are without using a car?

An effective rating system would include several scales defined by pairs of adjectives (Fujii & Kitamura, 2003). Finally, many of the above questions can include a scenario. In particular:

- For each of the following events, please rate your feelings with respect to the how each might prompt you to consider a modal shift. (Car breaking down, moving your home, moving job location, changes in local transportation services, etc.)

Similar to gauging capacity, the findings of this research can also be translated into evaluation process questions. For example, it would be prudent to ask participants which factor(s) prompted or triggered their modal shift. This closed ended question would include TDM strategies and new knowledge-related triggers as well as situational life events and attitudinal related responses. For

each of these sets of question, the thrust is to include questions that highlight the changing nature of the decision-making process. In addition to travel patterns, baseline and subsequent evaluation data should include a wider variety of indicators, such as those represented in the questions above, to capture the flux of life experiences that this research has demonstrated to be a key component of the participants' decision-making processes.

5.3 A Longitudinal Approach

The discussion thus far has highlighted the implications of the research findings on TDM strategy evaluation, but there are implications for transportation research in general. The current transportation planning paradigm focuses on investigating travel behaviour in a linear decision-making process where personal and situational variables are assessed as they related in the short-term (Gollege & Gärling, 2003; Verhoeven *et al.*, 2005; Guiver, 2007). Transportation decisions and habits are about choices – Should I take the bus instead of my car to get to work if it takes ten minutes longer but I can nap? If I do not drive my car that often is it worth keeping? These decisions and choices are entrenched in the field of transportation as the notion that trip generation, trip distribution, modal split and trip assignment are essential to tracking travel patterns. Personal and situation characteristics are used to assess short-term choices that directly impact travel behaviour patterns.

The underlying assumptions of short-term decision making by the current transportation-planning paradigm is manifest in two dominant approaches: the urban transportation modeling system and the activity-based approach. The first focuses on recording and modeling travel behaviour of people in large data sets (Gollege & Gärling, 2003). The second focuses on travel behaviour of people by examining the decision-making processes emphasizing a detailed look at individual experiences on an hour-by-hour basis (Gollege & Gärling, 2003). Indeed, both assume

that travel patterns and decision-making processes captured in a present-day short-term snapshot provide an appropriate data set for forecasting future travel patterns. More specifically, this paradigm assumes that how an individual traveled today and the criteria they used to make those travel decisions will also apply to the future.

Indeed, in a system where we are planning for a tomorrow that looks similar to today, the current paradigm effectively predicts future transportation behaviour. However, recently more attention is being given to TDM strategies focused on changing the transportation patterns of tomorrow. The experiences of the study participants illustrate that regardless of inclination and ability, a travel behaviour change is conditionally dependent on contextual changes, most often situational life events. However, the role of contextual and situational change in travel decisions has not been frequently highlighted in transportation literature (Krizek & Waddell, 2002; Gollege & Gärling, 2003; Verhoeven *et al.*, 2005; Prillwitz *et al.*, 2006). This research has identified the integral role of ongoing contextual changes in the decision-making processes; these situational life events happen at unexpected times and have unexpected impacts. This raises questions about the unrealistic behavioural assumptions that the current transportation paradigm is based on – that travel patterns and choices are part of short-term decision-making processes and the way they unfold is constant. Indeed, the current paradigm focuses on modeling transportation behaviour and not behaviour change (Cao & Mokhtarian, 2005). However, with increasing attention given to travel behaviour change strategies the current paradigm may be ineffective.

The element of time is of crucial importance to the decision-making because of the dynamic perspective of the process (Salomon & Mokhtarian, 1997; Giele & Elder, 1998; Verhoeven *et al.*, 2005). The impact of interest and ability on the decision-making process are

conditionally dependent on a context change that in the case of the study participants were life events. Each participant illustrated a variety of intended and unintended life events involved in the decision-making process. Indeed, life and the decisions made during a life course are not static (Krizek & Waddell, 2002; Gollege & Gärling, 2003; Cao & Mokhtarian, 2005; Verhoeven *et al.*, 2005; Prillwitz *et al.*, 2006). In all the participants' transcripts, life events in the past, present and foreseeable futures were an essential, and often highlighted, component of the transportation decision-making processes. Past experiences and choices inform the knowledge and value base upon which an individual's decisions are made. In addition, current decisions can instigate a behaviour change. But, most importantly, future life changes will provide countless opportunities to re-evaluate and make new decisions. Travel decisions are secondary effects to life events, but life events are not represented in the current transportation paradigm (Gollege & Gärling, 2003).

While the current transportation-planning paradigm is appropriate for making short-term forecasts, our conceptualization of mode choice must evolve as our collective understanding of human behaviour and decision making develops. In particular, we must recognize the non-linear and long-term nature of the decision-making process identified in this research. The experiences of these participants indicate that the decision-making process is complex and different for each person. Indeed, despite inclination and ability the time from first consideration to joining the car-sharing organization ranged from approximately one month to almost nine years. In addition, identifying the contextual and/or situational changes that instigate or finalize the decision-making process and their timeframes can be unpredictable. The adoption of longitudinal analysis is essential for capturing the full picture of travel behaviour change. In particular, transportation research could benefit from using a life-course analysis approach (Prillwitz *et al.*, 2006). This

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approach and other longitudinal approach, not widely used in the transportation field, highlight the importance of studying behaviour in the long-term context of changing situations, attitudes, attitudes and contexts (Krizek & Waddell, 2002; Bamberg & Ajzen, 2003; Prillwitz *et al.*, 2006).

5.3.1 Life Events Over A Life Course

For the participants of this study, a car-free or car-lite decision is part of a non-linear and long-term process of which situational life events are often the trigger points into or out of the decision-making process. The concepts of life course, life stage, life status, life cycle and life events are prominently used within the field of psychology, medicine and marketing as predictors of change in personal development, health, and consumer behaviour changes (Wells & Gubar, 1966; Dohrenwend *et al.*, 1978; Andreasen, 1984; Wilkes, 1995; Elder, 1998).

The commonality between these disciplines is the notion that each individual experiences transitions that alter lifestyle and life course. In particular, common life events or life status changes can be categorized under the following headings: school, job, marital status, household composition, residence and financial status (Dohrenwend *et al.*, 1978; Andreasen, 1984; Elder, 1998; Verhoeven *et al.*, 2005; Liu & Aaker, 2007). These life events transition households through life stages or cycles categorized by household composition and employment (Wells & Gubar, 1966; Wilkes, 1995). These life events and transitions provide periods in which resource reallocation and reevaluation of previous decisions are considered in light of changes in household circumstances and demands (Wilkes, 1995). It is important to note that life cycle analysis differs from life course analysis. Life cycle analysis, views life changes as transitions through standardized stages such as single, married, married with young children, etc. Life course analysis is more flexible and accounts for the diversity of experiences while viewing life experiences as a cumulative process accounting for how people adjust in response (Li, 2004)

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In a North American context, there are also key events in an individual's life that affect mobility. In particular, the spectrum of these key events begins with gaining a full-license between the age of 16 to 18[4] but also includes buying a first car which occurs often in conjunction with a individual moving out of the home or gaining employment, having children, and concludes with giving up or loosing one's drivers license or personal mobility sometime after the age of 80 and in some cases sooner (Handy *et al.*, 2005; Verhoeven *et al.*, 2005; Goddard *et al.*, 2006). One article identified four key events that strongly impact automobile ownership growth: "changing number of adults in a household, birth of the first child, changing weighted monthly income, and change of residence from a regional core to a regional core area" (Prillwitz *et al.*, 2006, 71) .

Life events such those identified in the broader literature emerge in the participants' narratives as factors affecting the decision-making to go car-free or car-lite. Each of these life events were part of the decision-making process for multiple participants: school graduation or returning to school (P 2, 7, and 12), changes in work status and/or location (P 2, 9, 10, 12, 13, 14, 17 and 18), creation or dissolving of partnerships/marriages (P 3, 4, 10 and 12), changes in household composition which includes changes in childcare responsibility such as children entering into a more independent age (P 1, 4, 17 and 18), children moving out of the home (Participants 1, 4, 13, 14, and 15) and recent new additions (P 7 and 12), residential relocation both within a city and to a new city (P 1, 2, 3, 4, 5, 6, 7, 8, 11 and 12) and finances including other financial priorities, job loss and retirement (P 3, 4, 7, 9, 11, 13, 14, and 16). Life events that change mobility were less common within the participants' experiences. The presence of children was often identified as changing household mobility as were events that provide

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[4] Some Canadian provinces and American states have a graduated licensing whereby individuals can obtain a provisional licence at the age of 16 and gradually over a year to two years obtain full-licence privileges.

opportunities to purchase a car such as moving away or entering the workforce. While changes in mobility are certainly important steps, it is life events in general that have a greater impact on the car-free-car-lite participants in this study.

Identifying key life events that impact mode choice and automobile ownership more clearly can help to isolate the low hanging fruit, i.e., those individuals at the right point to make a mode shift decision. In particular, residential relocation identified through home ownership transfers or change in utility bill address is an easily identifiable and potentially effective opportunity to impact modal shift. Several studies have tried to further ascertain the impact of this life event on mode choice and automobile ownership, and have identified it as an opportune time for an intervention (Bamberg, 2006; Prillwitz *et al.*, 2006). Household relocations often occur in conjunction with other key events such as new employment, marriage and birth of a child. Additionally, the transition from school (secondary and post-secondary) to the workforce is another identifiable key event. These opportunities are times when individuals are of legal driving age and potentially have the means to own an automobile for the first time. The final key event to target is workplace relation, not of individuals separately but of an entire workplace. These events mark times when a large group of people is changing a major daily travel destination. While all of the life events documented were pertinent to the decision, it may be more difficult to isolate and target individuals who for example have recently married/divorced, lost their job or had a baby.

6   CONCLUSION

Transportation congestion and related impacts to human and environmental health are a pressing issue in North American cities. It is clear that with increasing number of trips, limited land for expanding transportation networks and consequences of such trends, sustainable transportation behaviour and measures that promote such behaviour are becoming more desirable and even necessary (Newman & Kenworthy, 1999). However, the experiences of implementing such measures have often lacked translation into a modal shift (Ogilvie *et al.*, 2004).

With the limited successes of TDM strategies, the transportation field has begun to direct increasing attention to gathering a "greater understanding of the psychology of human behaviour in making travel decisions" (Mann & Abraham, 2006). Research in this vane has begun to uncover the influence of attitudinal, experiential, situational, normative and other qualitative variables on travel and modal decisions (Salomon & Mokhtarian, 1997; Bamberg *et al.*, 2003; Cao & Mokhtarian, 2005; Steg, 2005; Verhoeven *et al.*, 2005). However, despite their potential importance in the decision-making process, these 'softer' variables are seldom incorporated into or measured in models of travel behaviour.

6.1 Summary of Findings

This exploratory study contributes to improving our understanding of travel behaviour change decisions. More specifically, the study identifies common factors involved in a car-free/car-lite decision and the manner in which those factors work together to create the decision making process(es). Reflecting on the conceptual framework presented in section 1.1.3, the key findings of this research contribute to answering the posed research questions and to reframing the decision-making process. A revised version of the conceptual framework based on the research findings illustrates the key factors involved in the decision-making process, how those

factors work together to create the decision-making process creating intention (interest/inclination, and ability) and action, and the common presence of a trigger point to enter and/or exit the decision-making process (See Figure 6.1: Revising the conceptual framework based on research findings). The key research findings are elaborated on here.

Figure 6.1: Revising the conceptual framework based on research findings
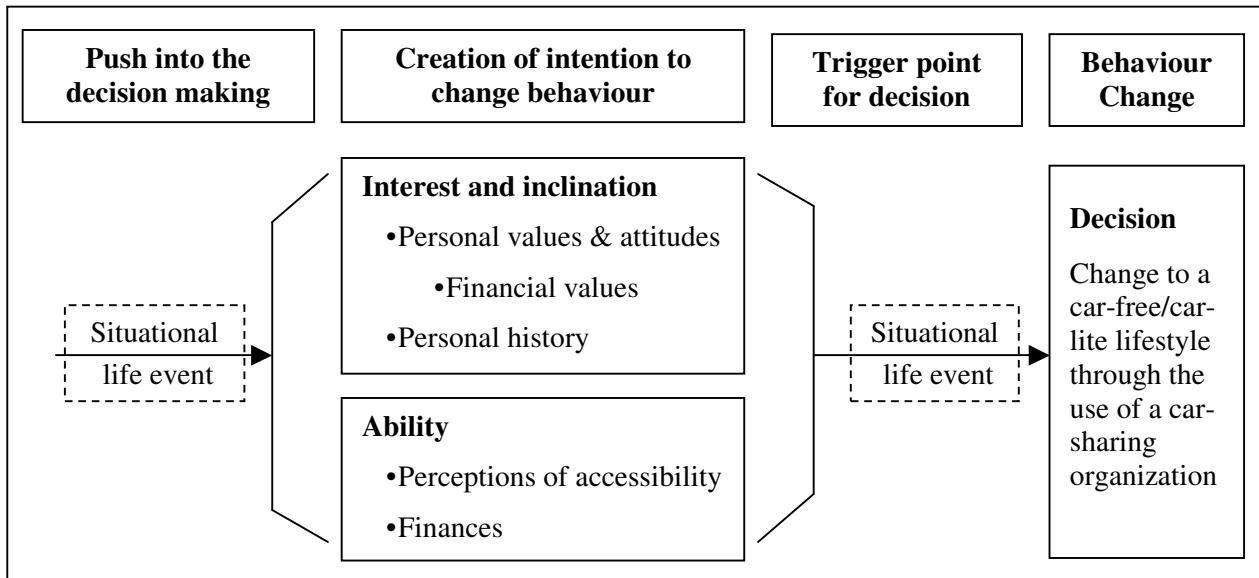
The findings of this study point to the conclusion that travel-behaviour change is the result of a combination of common, yet complex, factors, which include the dominant themes of finance, personal attitudes and values, personal history, perceptions of accessibility, and situational life events. These dominant themes reconfirm much of the existing transportation behaviour literature (Schwartz & Howard, 1981; Ajzen & Driver, 1992; Aarts *et al.*, 1997; Guiver, 2007), but also reinforce the, only recently identified, importance of situational life events in the decision-making process (Krizek & Waddell, 2002; Gollege & Gärling, 2003; Verhoeven *et al.*, 2005; Prillwitz *et al.*, 2006; Ryley, 2006). Each of these factors contributed to

the decision to reduce or forego vehicle ownership through joining a car-sharing organization – a decision not undertaken lightly.

Additionally, the key conclusions are that the decision-making process requires more than intention to create a behaviour change and that this process is often non-linear. Indeed, much of the behaviour change theory and transportation research pinpoint the role of inclination and ability as key to the decision-making process (Schwartz, 1977; Ajzen & Driver, 1992; Thorpe *et al.*, 2000; Steg, 2005). However, the research findings suggest that an individual's inclination and ability to make a travel behaviour change create an intention to behave but do not create an action. Rather, translation from intention into action appears to be conditionally dependent on contextual and situation changes, specifically life event, that provide the push into or out of the decision-making process. This finding corroborates a small body of literature that identifies life events (Krizek & Waddell, 2002; Verhoeven *et al.*, 2005; Prillwitz *et al.*, 2006) and other contextual and situational changes (Bamberg & Ajzen, 2003; Fujii & Kitamura, 2003; Verplanken & Wood, 2006) as opportunities to reassess a mode choice. As illustrated by the variation in timelines between intention and adoption, the process is often more unpredictable and complex than conventional approaches allow for. Furthermore, by identifying that the decision to become and remain car-free/car-lite is conditionally dependent on an event that provides a contextual or situational change, one can begin to appreciate how an individual adopts a lifestyle consistent with the principles of sustainable transportation. The research findings emphasize the paramount importance of those "fuzzy" less quantifiable factors such as present and past life events, values and attitudes to mobile ownership and modal shift.

6.2 Limitations of the Study

It is particularly important, as a qualitative researcher to reflect on how the sample design may have affected the outcome and how my own position and views as the interviewer might have influenced the degree to which a participant shared their experiences or feelings. There are several limitations and delimitation to the study.

First, is that the information is not supplemented with quantitative analysis. A couple of transportation research papers have argued that transportation behaviour research should be conducted using a mixed method approach, more specifically applying both quantitative and qualitative research methods (Gunnar Roe, 2000; Cao & Mokhtarian, 2005). The purpose of this research was to explore the factors and process involved in decision making, using a grounded theory approach. The results, thus illuminate what question could be asked in a generalizable survey, but quantitative analysis *per se* is beyond the scope of the current study.

A second limitation pertains to the use of a car-sharing organization as the sampling frame. Car-sharing members represent a small minority of the population and their experiences may be neither typical nor applicable to broader public. As the researcher, however, I would argue that, barring their car-free/car-lite status, in many ways the lifestyles of the study participants are very similar to mainstream society. By exploring their experiences this research elucidates what factors and decision processes made them different from their neighbours, many of whom, based on anecdotes from the participant, own a vehicle(s). Researching the extremes of mode choice enables a greater understanding of process. Indeed, joining the car co-op was often the last, rather than the first step towards being car-free/car-lite.

A third limitation of this study is that recruitment was focused on members who have given their email address (approx. 70%). Those not on the list may be members of the

community who are unable to afford internet access or who may have a lifestyle even further on the fringe of society. Again, this limits the generalizability of findings.

Fourth, some information provided during the recruitment process may have influenced the participants. In particular, one of the parameters set for inclusion in the study (i.e., affordability of a car at the time of the decision) could have influenced the participants' discussion of cost and finances. That one participant stated, "I know you didn't want to focus on cost" [P11], highlights awareness of this element of the study design. Also, finances and cost were present in all the participant transcripts. In addition, I informed prospective interviewees about the the nature of the degree program for which this research was being conducted. Environment is a part of the degree title and could have influenced individuals to focus on this factor. During the interview process the environment was never addressed in any questions unless identified by the participant first after which questioned probed the extent to which the environment was a factor. Upon refection this issue likely did not have a significant impact on the outcome of the interviews but I did notice that some participants brought up the environment despite the limited role it played in car-free/car-lite or other decisions they made.

A fifth limitation of the study is its consideration of individuals as independent decision makers in some instances. Participant recruitment focused on the individual and did not specifically recruit entire households. Of the interviews conducted, the majority did involve all members of a family unit[5], not including children under the age of 4 (n=12). The other participants represented incomplete household perspectives including the parent(s) of a household but not the children (n=2), only one adult member of a household with more than one adult (n=2) and one entire family unit interviewed in two separate interviews. However, to

further qualify, of the 12 interviews representing a complete household perspective nine were households of one adult only. This study focused on the individual rather than the family unit at the outset of the study design. Participants were recruited as individuals and that some participants wanted to participate as a family unit was unintended but welcomed. In addition, the interview questions did not probe the role of the entire family unit in the decision-making process but rather focused on the individual experiences except when interviewed as a household. Indeed, the outcome of the study identified the key role of situational life events, which, at times, involved other members of the family unit or decisions made collectively by the family unit. This individual focus may not have captured the fullness of the decision-making process.

This limitation is illustrated by four interviews with couple members (two interviews conducted with both members present, and two interviews conducted separately for each member of a membership). For those interviews conducted together, I acknowledge that these interviews were often far richer in detail and experience than individual interviews. The presence of more than one participant enabled better recall of experiences and yielded opportunity for cumulative and elaborated responses. These interviews ensured that all sides of the experience were documented. This indeed was validated after the individual interviews of participants of one membership. While the details of their decision were recalled similarly, there was variation. This variation showed most prominently in the differences in relatively importance of opinions, experiences and feelings.

A final limitation of the study is the influence my own position and views might have had on the degree to which a participant shared their experiences or feelings. The rapport and

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[5] An individual or group of individuals living together and collectively involved in a car-free/car-lite decision are considered to be a part of a family unit. However, an individual living in a shared accommodation (roommates) but

neutrality of the interviewer is key to a study's integrity (Patton, 1990). I am a young, female, Masters of Environmental Studies student/researcher, associate member[6] and elected volunteer board member of the same car-sharing organization and a TDM practitioner. My position as both a non-driving member and volunteer elected board member of the same car-sharing organization makes me a part of the car-free/car-lite culture. I certainly could relate to many of the participants responses from my own experiences. I felt that the interviews were conducted as if we were acquaintances through our shared association with the car-sharing organization. For participants who knew about my affiliation with the car-sharing organization, I qualified that the research was not being done for the organization, nor would the information be shared with the organization except in the form of a final report. The interviewees shared stories, experiences, and feelings both positive and negative that were pertinent and yet at times highly personal. The participants shared criticism of a car-free/car-lite lifestyle and corrected me in some instances where I recapped something they had said in an inappropriate way or if a word used in a question was inconsistent with their own perceptions. That I was a member of their community provided a circumstance where I think the participants knew I could relate to the complexity and positive and negative aspects of the decision-making process.

Some of the interview questions were informed by my experience as a TDM practitioner and by what I had read prior to the study. The questions at the beginning remained broad to allow the participants to talk out their decision-making process without any directed questions. However, the subsequent focus on local transportation programs and services as well as how the factors they had identified had worked together where much more directed in nature. While I had

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did not make a car-free/car-lite decision with other household members is considered a separate family unit.
[6] A non-driving membership are for members of the community that wish to support the car sharing organization either by lending their name, volunteer time, or money. These members do not have automobile driving privileges but may be a member of the local bike sharing organization and have voting privileges.

initially expected the role of transportation services and amenities to be key in the decision making, I was surprised by the amount of discussion during each interview dedicated to personal factors that affected the decision. The emergence of unanticipated weight given to different factors, reassured me that I had not consciously or unconsciously gone searching for what I expected to find.

6.3 Areas for Further Investigation

Due to the exploratory nature of current research on travel behaviour, there are many directions in which future research could go. First, the finding of this research should be use to inform a quantitative study, enabling results that could be generalized. There are limited studies that have attempted to look at the impact of situational life events through a quantitative approach (Verhoeven *et al.*, 2005). However, appropriately, many transportation programs and research use quantitative methods in order to gauge and evaluate. Therefore, it is important for future research to find and utilize effective questions that quantitatively capture qualitative factors.

The role of interaction in the decision-making process of travel behaviour change has been identified as a potentially important part of transportation decisions (Frank, 2000; May *et al.*, 2006). Even so, there is little research on understanding how outcomes are related to the combined effects of several variables that operate on different timescales (Thorpe *et al.*, 2000; Shiftan & Suhrbier, 2002; Collins & Chambers, 2005). This research attempted to identify the role of interactive effects in the decision-making process, but, in order to maintain a grounded theory approach, it was necessary not to constrain my interpretation of the participants' experiences and expressed perceptions of how the factors link within the decision-making

process. Interaction is a quantitative concept and its presence may be best detected and understood using a quantitative approach.

Furthermore, transportation behaviour research would benefit from exploratory investigations utilizing a qualitative approach that firmly establish theory on the intricacies of contextual and situational changes within the decision-making process. The experiences documented for this research were accounts of past decisions. Current experiences are often the most accurate (Patton, 1990). Therefore, it would be pertinent to conduct in-depth interviews with individuals about to embark on a specific situational or context change such as a home or business location move. This would provide an isolated case study of the role of situational change in the decision making.

This research suggests that longitudinal analysis of transportation behaviour is key to capturing behaviour change in its entirety. Indeed, regardless of a quantitative or qualitative approach, a longer data collection timeline or questions that probe the history of a decision may collect a more complete picture of behaviour change. As indicated in section 5.2.1, this is important for TDM strategy evaluation. In particular, life course analysis, which promotes a longitudinal analysis, has been used to understand other behaviour decisions but this type of analysis has been used little in transportation research (Prillwitz *et al.*, 2006). Indeed, few articles were found that use a longitudinal or life course approach (Bamberg & Ajzen, 2003; Prillwitz *et al.*, 2006). Nevertheless, longitudinal research could provide insight into the full outcome of TDM strategy implementation and their behaviour change decision-making process.

More generally, this study looks specifically at the case study of individuals who have made a car-free/car-lite decision by joining a car-sharing organization. While car-sharing is increasing in popularity in Canadian urban centers, they remain a small fraction of sustainable

transportation decisions. This research was a first step in isolating an exploratory non-intervention case study for travel behaviour change but the experiences of other case-study group may differ. At the outset of this research, the importance of TDM strategies was overestimated while that of situational life events was underestimated. Utilizing focus groups of different travel behaviour change case studies such as workplaces in order to compare the factors and processes involved could enrich the findings of this research. One question, then, for future research is: *How do other case study groups (as opposed to car-sharing members) perceive the decision-making process of changing their travel behaviour?*

6.4 In Conclusion

In this thesis, I advanced the conceptualization of the decision-making process and shared my experience in applying qualitative grounded theory approach in transportation decision-making-based research. The research provides three main contributions.

First, this research has refined the dominant themes involved in the participants' decision-making process – finances, personal values and attitudes, personal history, perceived accessibility and situational life events. While situational life events have not been widely identified, the participant's experiences reinforce the importance of situation life events in the decision-making process.

Second, this research provides an exploratory look at how the factors work together in the decision-making process. The participants' narratives illustrate that intention is created from an individual's inclination and ability to make a travel behaviour change. Meanwhile, translation from intention into action appears to be conditionally dependent on contextual and/or situational changes, most often in the form of situational life events, that provide the push into or out of the decision-making process.

Finally, transportation research utilizes a qualitative approach fairly infrequently, but this research illustrates the relevance of qualitative work in advancing transportation research – particularly in understanding human travel decisions. While the current transportation-planning paradigm is appropriate for making short-term forecasts, our conceptualization of mode choice must evolve as our collective understanding of human behaviour and decision making develops. In particular, we must recognize that non-linear, non-utilitarian, long-term, often qualitative factors, such as those identified in this research, are not exogenous to travel decision making.

In conclusion, the complexity of human decision making coupled with the uncertainty of external factors that may affect the affordability and attraction of automobile dependence underscore the importance of building resilient cities and fostering conditions that provide individuals with real mobility options. I hope this study will contribute to the literature on sustainable transportation decisions, more specifically transportation demand management and travel behaviour change theory. In addition, this study may also contribute towards the general discussion of a paradigm change in transportation research and help dispel any assumptions about these car-free or car-lite pioneers and what motivated their decisions.

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APPENDIX I – Recruitment Materials

RECRUITMENT FLYER

Has your household made a lifestyle choice to go

car-free or car-lite?

We are looking for volunteers who are driving members of a car-sharing organization to take part in a University of Waterloo study exploring individual's decision-making process of going car-free/car-lite including the role local infrastructure, services and programs has on travel choices.

As a participant in this study, you would be asked to: participate in one face-to-face interview lasting 1-1.5 hour talking about your experience in going car-free or car-lite.

We realize that your time is important and as a token of appreciation participants will receive a $10 People's Car gift certificate.

For more information about this study, or to volunteer for this study, please contact:
Julia Dalla Rosa, Department of Geography, University of Waterloo
at
Tel:(519) 744-5282 or
Email: jcmdalla@fes.uwaterloo.ca

The information gathered in this study will only be used for academic purposes. The names of participants will be kept confidential, and will never be used. This study has been reviewed by, and received ethics clearance through, the Office of Research Ethics, University of Waterloo.

Dear People's Car Members,

I am a graduate student in the Faculty of Environmental Studies at the University of Waterloo and a People's Car board member for the past year. I am writing to you about a research project that I am conducting with my supervisor Dr. Jean Andrey, of the University of Waterloo Department of Geography.

Has your household made a lifestyle choice to go car-free or car-lite?

We are looking for volunteers who are driving members of a car-sharing organization to take part in a University of Waterloo study exploring individual's decision-making process of going car-free/car-lite including the role local infrastructure, services and programs had on travel choices.

As a participant in this study, you would be asked to: participate in one face-to-face interview lasting 1-1.5 hour talking about your experience in going car-free or car-lite. We realize that your time is important and as a token of appreciation participants will receive a $10 People's Car gift certificate.

If you would like more information about this study, or wish to volunteer for this study, don't hesitate to contact me at (Julia Dalla Rosa) tel: (519) 744-5282 or email: *jcmdalla@fes.uwaterloo.ca* or my supervior Dr. Jean Andrey at the University of Waterloo Department of Geography, (519) 888-4567 x 33629 or email: jandrey@fes.uwaterloo.ca.

Please note that information gather in this study will only be used for academic purposes. The names of participants will be kept confidential, and will never be used. This study has been reviewed by, and received ethics clearance through, the Office of Research Ethics, University of Waterloo. If you have any questions or concerns resulting from your participation, please contact this office at (519) 888-4567 x36005.

Thank you in advance for your interest in this project.

Sincerely,

Julia Dalla Rosa
M.E.S. Candidate (Geography)
University of Waterloo
Faculty of Environmental
(519) 744-5282
jcmdalla@fes.uwaterloo.ca

When recruiting potential participants for the study the following script is used as a guideline for providing information about the study:

1. When potential participants makes contact with Julia Dalla Rosa, the primary researcher, introduce yourself, and establish that the potential participant is interested in learning more about the study.

2.
   a. Ensure that the potential participant is a driving member of a car-sharing organization.

   b. Discuss the fact that at present a growing number of cities across Canada, including Waterloo, are adopting transportation demand management (TDM) strategies; these strategies seek to alter travel behaviour in ways that improve the efficient use of current infrastructure or shift travel away from automobiles, to combat traffic congestion and air quality issues. In majority of case studies TDM programs are not living up to the expected results. We believe quantifying results of these programs is difficult due to complex nature of behaviour change. Our study focuses on individual's decision-making process to go car-lite or car-free as a way of exploring that complexity and the role local TDM strategies has on travel decisions.

3. Indicate that participating doesn't require a lot of time but as an expression of our gratitude for their participation as well as to show support of their transportation choice they will receive a $10 People's Car gift certificate.

4. Ask "would you be interested in determining if you qualify for participation in this study?' If potential participant indicates that they would be interested then proceed with the following questions. If not, then thank them for their interest, and politely end the conversation with an invitation to contact me (Julia Dalla Rosa) at jcmdalla@fes.uwaterloo.ca if they would like to learn more about the study at any time.

   If the participant indicates that they would like to determine if they qualify for the study:

   a) Ask, "Has your household sold a vehicle without replacing it or decided not to purchase a vehicle (either your sole vehicle or a secondary vehicle)? Continue if they have made such as change.

   b) Say that we are looking for individuals/households that have made a conscious decision to making this lifestyle change. "Was the decision to go car-free or car-lite a solely financial decision – in other words at the time of this decision could you have afford to keep or buy said vehicle? I ask this because for this research we would like to speak with those that made their decision of their own accord. The decision-making process

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would be very different from someone who made their decision solely based on financial reasons rather than lifestyle. Continue if they indicate that financial constrains were not the sole reason for getting ride of the vehicle.

    c) Is your place of residence located in the Region of Waterloo? Continue if they answer yes.

    d) Indicate that the participant would have to be available for 1-1.5 hours and be willing to participate in a face-to-face interview.

    e) Indicate that the study will be taking place during the month of November and ask if they would be available to participate during that time. Continue if they say yes.

5. Indicate that they qualify as a participant in this study, and ask if they would like to participate, and ask if they have any further questions.

6. If they would like to participate then collect their contact information including name, phone number, address and e-mail address. Let them know how they can contact you (519-744-5282 or jcmdalla@fes.uwaterloo.ca). Ask them if they would like to arrange an interview date/time that is convenient for them while you are on the phone now. If no, thank them for contact you and ask them when a good time to call back to schedule would be. If yes, arrange an interview.

7. Inform the now participant that they can lean more about the study, or express any concerns at the Office of Research Ethics at the University of Waterloo (519-888-4567 x.6005)

APPENDIX II – Example of Participant Drawn Travel Map

Below is a copy of Participant 15's travel map as it would appear when drawn on an acetate overlaying a regional map (i) (to keep the participant's residential location anonymous a different regional map used below and is not the original map used) and as the acetate appears when removed from the map (ii). The participants' home addresses provide a reference point for resituating the travel map on an area map.
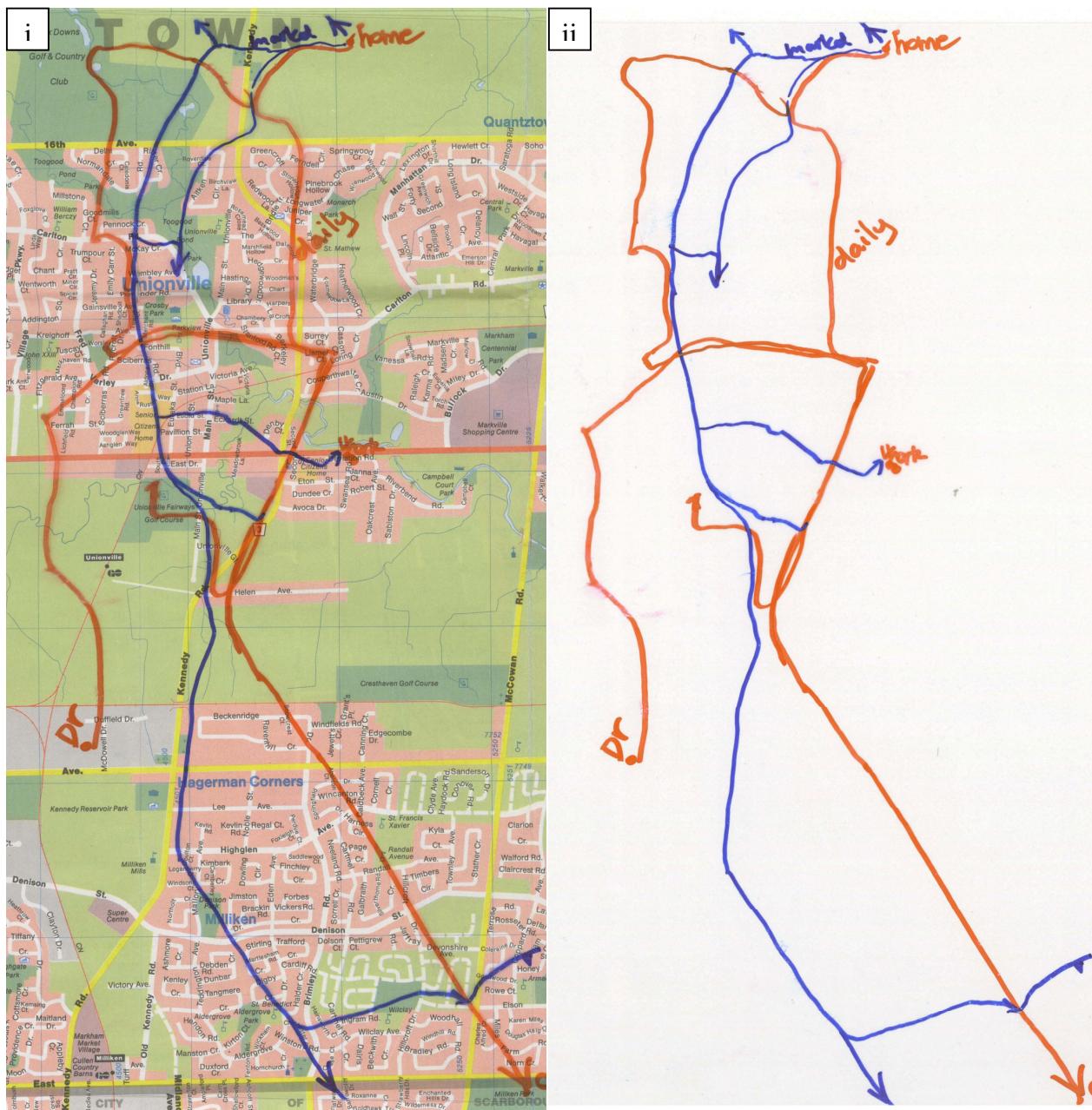
APPENDIX III - Sample Interview Questions

INTERVIEW SCRIPT

I want to thank you for taking the time to meet with me today. I'd like to take the next 1-1.5 hours to talk about your experience going car-free or car-lite. I'd especially like to spend a portion of this time to talk about the how you came to that decision as well as your opinion about **[CITY]**'s transportation infrastructure and programs. I'll be taping the session because I want to ensure that I accurately capture your comments and I can't write that fast! May I turn on the tape recorder? I'm first just going to take a moment to check that the tape is working. Do you have any question before we begin?

6.4.1.1 EXPERIENCE

Let's first talk about your decision to go car-free (meaning to not own/lease a vehicle) or car-lite (meaning to use a car that you own/lease less frequently utilizing other modes of transportation for some trips, in this study it is specifically those that have downsized the number of vehicles their household owns) to get you thinking back about your decision and so I understand how you got to where you are.
1. How long has it been since you gave up your car OR decided not to buy a vehicle?
2. Can you walk me through your decision making process *(like a timeline)*. What first triggered you to considered car-free or car-lite as a possibility?
    a. *PROMPT* - What were some of the steps to considering this change?
    b. *PROMPT* -What was (were) the tipping point(s) to making that decision?
    c. From what you just described what are some of the main reasons that allowed/encouraged you to make this decision?
        i. If _____*(Randomly selected REASON they gave in previous questions)* were the only one present how more or less effective would it have been in encouraging you to change?
3. Under what circumstances would you have not made this decision?
    a. The steps were omitted?
    b. Steps were reordered?

ADD after the 3rd interview -- What life stage do you think you are at and what changes to your life stage may have affected your decision?

6.4.1.2 DEFINING YOUR TRAVEL SPACE

I'd like to get an idea of your travel patterns.
4. Could you outline on this map some the locations you often frequent during a typical week? *(i.e. work, leisure, shopping, family, etc. - Dominate trip paths)*
5. Of these trips you've outlined, what trips have made it harder for you to make this decision and what trips made it easier to be car-free or car-lite?

a. Going car-free or car-lite, how have your travel patterns changed? (*i.e. shopping, leisure, family activities, etc.)?* How would the map you just drew differ?

6.4.1.3 YOUR TRAVEL SPACE

Next now that we have established your travel space I'd like to talk about the features in this area that were involved in your decision making.
6. Generally, what about this area where you live enabled or hindered you to consider and make this decision?
   a. More specifically, what aspect of transportation characteristics *(i.e. paths, bike lanes, design of streets)* had an impact (positive or negative) or no impact on considering this decision?
   b. What local transportation programs/services *(i.e. bus and bike, bus service, iXpress)* had an impact (positive or negative) or no impact on considering this decision?
7. In your experience, what characteristics or programs, not available in your area, would have been useful? *('Ideal scenario')*

6.4.1.4 INTERACTION

8. Of these characteristics and programs we've been talking about which were important because of the existence of another?
9. Had the sequence in which you found out about [programs or new infrastructure been different, what impact would that have had?
10. Let's talk about your car-sharing experience.
    a. When did you first hear about **[Car-sharing organization]**? Before joining, how did you find out about **[Car-sharing organization]** *(please talk about all the ways not just the first)*?
    b. How long did it take you to either contact the organization for more information or someone who knew about it? When did you join?
    c. How did finding out about the **[Car-sharing organization]** affect your decision to go car-free or car-lite?

6.4.1.5 REFLECTION

11. If a new resident your neighbourhood asked you what allowed you to be car-free or car-lite, what would your tell them?
12. How does it make you feel that you've made this decision?
13. Do you think you would go back to car owning a car or a second car?
14. What haven't I asked that you think is important?