Location Efficiency and Home Location Choice

by

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A thesis submitted in partial fulfillment of the requirements for the degree of

Doctor of Philosophy
in
Urban and Regional Planning

Earth and Atmospheric Sciences
University of Alberta

Abstract

Canadian cities are continuing to grow in order to accommodate population increases, and the majority of this development remains situated along the edges of cities. This paradigm perpetuates a host of issues that accompany sprawling suburban housing development, such as unsustainable infrastructure costs, and increasing GHG emissions. To address these issues municipalities are attempting to encourage and stimulate redevelopment and growth within their inner neighbourhoods and along transit corridors. Location efficient home choice (homes that minimize household transportation costs with accessible transit and active transportation to services and employment) has been identified as an important part of limiting sprawling suburban development. While a growing number of homebuyers may prefer location efficient homes, new suburban homes are still the predominant choice amongst homebuyers.

In the second chapter of this thesis, a narrative literature review is used to illustrate the evolution of location efficiency and situate it within housing and urban planning fields. This chapter also provides a new scale-based definition of the term which clarifies its current usage within grey and academic literature. The third chapter utilizes a Q-method card sorting technique and analysis to segment a sample of homebuyers in Edmonton, Alberta by their location efficiency related preferences, producing three distinct groups. The fourth chapter presents data from qualitative interviews with homebuyers inquiring about their experiences integrating location efficiency in their home location choice.

Through three interrelated papers, this thesis investigates the concept and necessary clarification of the term 'location efficiency', identifies segments of homebuyers who employ varying levels

of location efficiency in their housing choices, and finally investigates how and if homebuyers are integrating location efficiency into their home buying decision making. The findings presented provide a deeper insight into home location choice and location efficiency, and contribute to our understanding of household energy use and the built environment. This knowledge provides important evidence to both municipalities and academics that can be leveraged to support the reduction of municipal energy use, while increasing the functionality, economic sustainability and livability of our cities.

Preface

This thesis is an original work by Kurtis Borth. The research project, of which this thesis is a part, received research ethics approval from the University of Alberta Research Ethics Board, Project Name "A Q-Method Investigation into Rationale and Motivation for Varying Levels of Household Location Efficiency in Edmonton, Alberta.", No. MS3_Pro00020634. March, 2012.

Chapter 3 of this thesis has been published as Borth, K., & Summers, R. (2018). "Segmentation of Homebuyers by Location Choice Preferences". Housing Policy Debate, vol. 28, issue 3, 428-442. I was responsible for the data collection and analysis as well as the manuscript composition. R. Summers was the supervisory author and was involved with concept formation and manuscript edits.

Dedication

To Faye (& Freddy), words fail to encompass the gratitude and love I feel for you.

You have been there throughout this, always unwavering in your support and somehow always

knowing I would prevail.

I'm sorry for all the lost weekends, vacations, projects … and life. I will try my best to make up

for it.

Thank you

K

Acknowledgements

My partner Faye and our 'boy' Freddy, you are my family and this couldn't have happened without you. To my parents, thank you for your unwavering love, support and understanding. I can never repay this debt, I can only hope to live my life as positively as you have.

There are numerous other people without whom this thesis would not have come to fruition. I will thank them simply here as I hope they know how their support and friendship throughout this journey has helped me complete it.

My supervisor Dr. Robert Summers, who provided valuable insight and direction throughout this process. He showed me how to engage students in teaching, how to navigate the bureaucracy of large institutions (not that kind of institution!) and how being a nice person goes a long way in academia. Thanks also to Dr Damian Collins for his considerable help in getting this thesis to the finish line and Dr John Parkin's for his advice and guidance.

To the original innovation lab members, Dr's Fujie Rao and Brian Joubert, the circle is now complete. Thanks to Dr Joubert for making grad school much more interesting and setting a new record for malware infections on a desktop computer, and to Dr Rao for his moon cakes and postcards. Thanks also to my HGP grad school peers for the occasional destressing beverage and commiseration.

The dedicated EAS staff and faculty that have helped me over the years and were always willing to lend a hand, sort out a problem (and sometimes share a sip).

Thanks also to my EAS/Grad school friends over the years, the lifelong friendships I've forged throughout this journey outweigh this thesis by orders of magnitude. Your support, laughs and experience has gotten me through this and will continue to in the future. Thanks also to the gentlemen's gaming group that provided much needed comradery and outrageous ridiculousness over the years.

Thanks to Dr's Hilary Corlett and Shawna White, their animals and other members (over the years) of the cat house.

And a huge thanks to the people of the greater metropolitan area of Edmonton for participating in my research.

Kurt Borth

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Glossary/Abbreviations

CNT – Center for Neighborhood Technology, Chicago Illinois.

Infill - Residential infill is considered the development of new housing in established neighbourhoods. This new housing may include secondary suites, garage suites, duplexes, semidetached and detached houses, laneway homes, row houses, and other residential and mixed-use buildings.

LAI – Location affordability index provided by CNT, focused on providing individual and household scale transportation and housing costs data for potential homebuyers and renters.

LEM – Location efficient mortgage uses location efficiency as a metric to rate mortgages based on their location efficiency and implied lower transportation costs.

LEV – Location efficient value, an econometric model that incorporated household factors into assigning a value to mortgage applicant home locations for the LEM.

TCM – Transportation Credit Mortgages are a similar lending tool the LEM.

TOD - Transit Oriented Development/Design

VMT – Vehicle miles travelled.

Chapter 1: Introduction

1.1 Overview

This thesis investigates how location efficiency (LE) is integrated into home location choice. Through three distinct but interrelated papers, the relationship between home location choice and location efficiency is explored. This relationship is investigated by: establishing the history and evolution of LE with a literature review and the provision of a new consolidated definition; segmenting homebuyers with regards to location efficiency in home location choice through q-method based factor analysis; and examining homebuyers' utilization of location efficiency in their decision making through qualitative interviews and analysis. The thesis provides significant theoretical and methodological knowledge towards establishing and advancing location efficiency within academic research on housing, transportation and urban planning, as well as clarifying the current confusion around the term as used in academia, grey literature[1] and advocacy. This thesis also investigates the deeply nuanced and complex area of home location choice by utilizing a location efficiency based lens and innovative home location choice research methods.

This research is situated within the area of housing location choice research. The unique contribution of this project to these fields of study and to the applied urban planning realm provides a literature review and consolidated scale-based definition of location efficiency to address a current confusion of the term in the academic and grey literature. An identification and analysis of homebuyers, and a qualitative lens on housing location choice to provide a deeper insight into home location choice and location efficiency is also provided. This new knowledge contributes to our understanding of the relationship between household energy use and the built

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[1] *"Grey literature stands for manifold document types produced on all levels of government, academics, business and industry in print and electronic formats that are protected by intellectual property rights, of sufficient quality to be collected and preserved by libraries and institutional repositories, but not controlled by commercial publishers; i.e. where publishing is not the primary activity of the producing body."* The Twelfth International Conference on Grey Literature, Prague 2010.

environment and provides decision and policy makers with important information in addressing the collective goals of reducing the carbon footprint of our urban areas.

1.2   Introduction

Canada is a suburban nation. According to Gordon, Hindrichs and Wilms' (2018) latest white paper assessing Canada's suburban condition, over two-thirds of Canadians lives in suburbs. In Canada's largest cities the percentage of suburban residents is over 80% (Gordon and Janzen, 2013). Edmonton was the nation's second fastest growing metropolitan area after Calgary from 2006-2016 adding over 200,000 people, and also experienced the most growth in automobile suburbs and exurban areas (33%) amongst all Census Metropolitan Areas (CMA) in Canada (Gordon, Hindrichs and Wilms, 2018). The population of Edmonton's CMA in 2016 was 1,321,426 (Statistics Canada, 2017). This dominant suburban growth paradigm still prevails in North American cities as municipalities look to encourage infill[2] and Transit Oriented Development (TOD) closer to their cores, in mature suburban areas and along transit corridors. These strategies endeavour to decrease vehicle miles travelled (VMT's) and greenhouse gas (GHG) emissions, decrease new suburban development infrastructure costs, and reduce negative health and social equity impacts (City of Edmonton, 2016a; Gordon, Hindrichs and Wilms, 2018; Hoehner, Barlow, Allen, & Schootman, 2012; Litman, 2012; Natural Resources Canada, 2009; Rose, 2010).

Academics, planners, and municipalities alike have advocated location efficient home choice as a means to encourage citizens to choose residences that are less energy intensive (lower transportation based energy requirements) than automobile focused suburban neighbourhoods. Neighbourhoods that are location efficient include compact mixed-use neighbourhoods with accessibility of employment opportunities, shopping and essential services, and convenient access to public and active transportation options (walkability, bicycle infrastructure) (Poticha and Haas, 2006). These location efficient neighbourhoods and home locations allow for more

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[2] Residential infill is considered the development of new housing in established neighborhoods. This new housing may include secondary suites, garage suites, duplexes, semidetached and detached houses, laneway homes, row houses, and other residential and mixed-use buildings.

active transportation options (like walking, biking) and taking transit or shorter commutes that in turn reduce total household automobile use. North American municipalities have undertaken strategies to set infill development goals and foster TOD along newly constructed and legacy transit infrastructure to facilitate more location efficient housing options (City of Edmonton, 2015; Stienbruek, 2014; Tremblay, 2012). In the end, these goals and development directions rely on citizens to choose home locations in location efficient neighbourhoods over traditional suburban options. There are barriers (such as cost) for homebuyers attempting to attain equivalent home attributes (size, rooms etc) in location efficient neighbourhoods rather than newly developed areas.

Edmonton, Alberta, Canada was chosen to be the location of this research into home location choice and location efficiency. Edmonton has led the nation in suburban growth while still endeavoring to meet ambitious infill and TOD development objectives (City of Edmonton, 2017; Gordon, Hindrichs and Wilms, 2018). This pattern exemplifies the suburban growth patterns of most major metropolitan areas of North America and though the growth is high the character is exemplary. This project is focused on home location choice as these individual and household level decisions have an impact on municipal infrastructure costs, health, social and climate related impacts as well as transportation costs for citizens.

The provision of clarified definitions of both location efficient homes and location efficient neighbourhoods are linked to the research objectives discussed below. As will be explored in the forthcoming literature review, location efficiency has become associated with two different meanings. One has developed from a metric created to ascertain home location associated mortgage amounts and the other from a description of neighbourhood amenities and services. The derivation of these definitions will be discussed fully in chapter two. With the integration and application of scale into the definition of location efficiency these variations between location efficient homes and neighbourhoods can be warranted. With scale integrated into location efficiency, the concept can link initiatives at multiple scales, from individual and household locational decisions, through to the design and planning of neighbourhoods, and ultimately to the organization and long term vision of municipalities or urban regions. For this

thesis, *household location efficiency* is described as the location related costs and benefits of transportation for individuals as determined by each person's unique context with regards to their own transportation needs, preferred mode of transit and particular home location. *Neighbourhood location efficiency* is described as compact mixed-use neighbourhoods with accessibility of employment opportunities, shopping and essential services, and convenient access to public and active transportation options (trails, walkability, bike paths).

The increased call from municipalities and academic/grey literature for location efficient development (including infill and TOD) and location efficient choice within existing housing stock stems from several factors. These factors include increasing awareness of household transportation costs to citizens, unsustainable growth and servicing costs of new greenfield development for municipalities and lower GHG emissions and associated benefits from the reduction of automobile usage (City of Edmonton, 2016; Steinbrueck, 2014; Tremblay, 2012). Advocates like the U.S.-based Center for Neighborhood Technology (CNT) have been promoting awareness of combined transportation and affordability costs for people choosing home locations and have created the online Housing and Transportation Affordability index to provide clarity on the relationship between transportation and household affordability. Researchers have proposed two measures of housing affordability: (1) up to 45% of household income, including housing (up to 30%) and transportation costs (up to 15%); (2) a residual income approach, which considers a household in financial stress if they cannot meet their non-housing financial needs after meeting their housing costs. Both measures account for increasing transportation cost burdens brought on by inefficient home locations (Stone, Burke, and Ralston, 2011; Stone, 2006).

Mechanisms like the location efficient mortgage (LEM) that increase lending amounts to households and allow for potential lower automobile usage from location efficient home locations bring transportation costs directly into the housing location choice financing discussion and although not currently in use, there have been calls to revive them (Dymi, 2006; Garvin, 2013). Municipalities prioritize long term financial planning by attempting to ascertain the future

costs of development and servicing residents balanced with income (tax base, etc.). Research has shown that the traditional suburban development paradigm in some North American cities can be financially unsustainable, as new neighbourhood development and servicing costs outweigh the long term income of primarily low density residential areas (Blais, 2010). The City of Edmonton has forecast a $1.4 billion deficit in suburban growth areas over the next 20 years (City of Edmonton, 2016b). To counteract this projected deficit, the municipality is attempting to increase infill development (increase density in mature neighbourhoods) and develop TOD along newly constructed and future transit lines. The reduction of automobile use is also an increasing priority for municipalities and regions across North America which are attempting to reach GHG emission goals as well as manage increasing demands for road infrastructure and traffic management due to increased vehicle numbers (Ewing and Cervero, 2010; Ewing, Hamidi, and Grace 2016). By lowering personal automobile use through location efficient housing choice, residents can also benefit from increased opportunities for active transportation (walking, biking), less commute time and more discretionary time, and less negative health effects associated with longer automobile commuting (Hirsch, 2014; Hoehner, Barlow, Allen, & Schootman, 2012).

Obtaining a better understanding of how citizens choose home locations and how they integrate location efficiency into their decisions can provide municipalities, urban planners, and homeowners with information on attracting buyers, and developing and choosing location efficient homes. Location efficiency has been widely promoted and utilized in the U.S. through the web based H+T Affordability Index created by CNT to help citizens, municipalities and advocates envision the combined transportation and housing costs of choosing a certain home location. CNT has also created the Location Efficiency Hub to promote the benefits of LE residential choices, disseminate information in the form of research and white papers, and advocate for location efficiency in municipal planning and development. In Canada, the Pembina Institute and the Royal Bank of Canada sponsored research into the investigation of homebuying decisions and home attribute preferences as well as an examination of the full costs of home location options to homebuyers. Location efficient home choice is at the core of these advocacy rooted studies and exemplifies the appeal and practical relevance of the term itself.

The City of Edmonton growth report (2015) projects that 2.2 million people will live in the greater metropolitan region by 2044. As the research by Gordon, Hindrichs and Wilms (2018) shows, if existing home buying and development trends continue, the majority of these people will choose a home location in the suburbs. It should be noted that households can be considered location efficient in suburban locations: the reduction of vehicle miles travelled involved in frequent trips and commuting can be mitigated by residing proximate to employment areas outside the city's core, working from home, and taking mass transit from outlying areas. However, suburban areas are usually, in aggregate, home to people who primarily use private automobiles to commute to their employment, services and amenities. Edmonton's workforce is more decentralized than most North American cities, yet those who commute into the core represent a significant portion of the total workforce with 50% of automobile trips and 66% of transit trips ending in the inner core in 2015 (City of Edmonton & R.A Malatest and Associates, 2015).

1.3   Research aim and objectives

Research Aim
This dissertation was undertaken to define location efficiency and clarify its use within academic and grey literature as well as to investigate how and by whom, location efficiency is used in home location choices.

Objectives
1. To examine the origin, evolution, and current usage of Location Efficiency in academic literature, grey literature, and municipal government and urban planning.
2. To produce a new consolidated definition of Location Efficiency.
3. To investigate and identify groups of homebuyers by their housing location choice preferences through Q-methodology segmentation.
4. To explore how homebuyers are employing Location Efficiency in their home location choice and identify novel information regarding Location Efficiency and home choice.

1.4   Organization of the Thesis

This introductory chapter provides the background to the research problem and outlines the research objectives, methods, justification for and significance of the study in both academic and practical applications. It presents the context of the research by introducing the relevant housing, transportation and location choice literature. Chapters two, three, and four address the research objectives above and serve the overarching theme of location efficiency in home location choice.

Chapter two addresses the first and second objectives: examining the origin, evolution, and current usage of Location Efficiency in academic literature, grey literature, and municipal government and urban planning and producing a new consolidated definition of Location Efficiency. The roots of location efficiency are investigated through a narrative literature review and a new scale based consolidated definition is conceptualized. The provision of a consolidated definition will aid academics, planners and municipalities alike in their attempts to study LE, support and facilitate LE development (TOD and infill) and attract residents to LE neighbourhoods.

The third chapter addresses the third objective by investigating and identifying groups of homebuyers according to their housing location choice preferences. It does so by employing a Q-methodology card sorting and factor analysis to group homebuyers by their opinions. This novel methodological look at home location choice uses factor analysis to group homebuyers into related groups that represent similar preferences and opinions regarding their home location choice. This segmentation can improve our understanding of homebuyers' preferences and provides valuable insights into home location decisions and location efficiency. The third chapter addresses.

The fourth chapter addresses the fourth objective of exploring how homebuyers are employing Location Efficiency in their home location choice. It uses semi-structured qualitative interview data and thematic analysis to investigate and evaluate how homebuyers have incorporated LE into their home choice and themes that were identified during the research. The findings utilized

neighbourhood attributes that Poticha and Haas (2006) have used to define location efficiency at the neighbourhood level to guide the thematic analysis in addition to revealing themes as a direct outcome of this thematic analysis. These themes included participants' past experiences in commuting and shared wall living that influenced their recent home location choice and how participants viewed cul-de-sac home locations as positive community hubs. The fifth chapter provides the combined conclusions and highlights relevant findings for academics, planners, municipalities and residents.

1.5 Rationale for the Study

A principal rationale for this study is to consider the costs and benefits of living in housing and neighbourhoods of varying levels of location efficiency to municipalities, citizens, and the impacts on the climate. Municipalities' growth policies and potential development are dictated by future costs of growth and maintenance balanced with projected income. The traditional development paradigm of new growth in the outer edges of the city is financially unsustainable in the long term and to decrease this shortfall, the City of Edmonton is attempting to increase density in mature neighbourhoods through TOD and infill housing development (Blais, 2010; City of Edmonton, 2016b). The overall reduction of trips generated by personal automobiles is also becoming more important for North American cities who are endeavouring to achieve projected GHG emission levels (Ewing and Cervero, 2010; Ewing, Hamidi, and Grace 2016). Location efficient housing and neighbourhood choice can reduce negative health effects related with long vehicle commuting, improved opportunities for active transportation (walking, biking), and less commuting time in general which allows for more discretionary time (Hirsch, 2014; Hoehner, Barlow, Allen, & Schootman, 2012). By investigating how location efficiency is utilized in home location choice this thesis can aid municipalities and developers in the promotion and provision of additional LE homes and neighbourhoods, and academics and advocates with the establishment, clarification, and consolidation of the term. Edmonton's greater metropolitan region was chosen as the geographic boundary for this research project. The context of the study area and the rationalization for the single embedded cast study design are discussed in sections 1.8 and 1.9.2 below.

Although academic research has occasionally utilized the term location efficiency with reference to housing and transportation, it has not been a significant area of inquiry, with few academic urban planning and housing research papers utilizing the term in keywords and titles and no known research focusing on the term itself. This thesis will clarify the term location efficiency by establishing a consolidated definition that can be utilized by academics and advocates alike. Within academic literature there is currently confusion regarding usage of the term, with a recent paper by Renné et al. (2016) describing location efficiency as equivalent to another housing and transportation costs term, location affordability. To date, the term location efficiency has been utilized mainly in grey literature produced by housing and transportation advocacy groups such as the CNT to describe neighbourhood level attributes of compact mixed-use with accessibility of employment opportunities, shopping and essential services, and convenient access to public and active transportation options (walkability, bike paths) as defined by Poticha and Haas (2006). The other use of the term has been to describe a metric used to designate a home location for increased mortgage lending amounts based on the accompanying lower transportation costs (i.e., a location efficient mortgage). Thus, there is dichotomous use of location efficiency as describing neighbourhood attributes as well as a household costs metric. These conflated usages need clarification to reduce confusion. A consolidated definition of location efficiency is provided in chapter 2 that integrates the two current usages of the term with the addition of geographic scale.

The third chapter's segmentation of homebuyers by their ranking of home and location attributes with regards to location efficiency utilized a Q-methodology which is novel in its application to home location choice. This nuanced look into home location choice through a Q-methodology card sorting technique and analysis provides an innovative glimpse into the segmentation of similarly aligned homeowners and provides insights into the preferences behind home location choice. Coulter, van Ham, and Feijten (2011) and van Ham (2012) have called for a deeper contextual understanding of household location choice. These insights are necessary for municipalities and academic studies alike that require a deeper understanding of homebuyers' location efficiency related choices in order to recognize opportunities to influence and

investigate housing choice. The qualitative interviews and analysis of the fourth chapter provide insights that can address previously unknown issues regarding housing choice and location efficiency.

Location efficiency is related to terms like 'Smart Growth' and 'Transit Oriented Development' (TOD), which are associated with increasing infill, limiting urban sprawl, and improving the efficiency of transportation and commuting. These approaches to urban development are ubiquitous in housing and urban planning and the question arises as to why location efficiency is also needed. The term location efficiency fills a void in both the academic and applied literature in discussing the overall urban efficiency of cities and regions. Location efficiency is distinctive from the related terms of smart growth and TOD, and provides a unique approach to housing and location choice with the concept of transportation efficiency included in the term. The term location efficiency is used extensively by municipalities, advocacy groups and grey literature promoting the concept. The term also lends itself to relevance in advocacy, urban planning and geography due to the relative ease of comprehension. Efficiency and location are both commonly used and understood. Some explanation may be required to relate LE to housing and transportation yet the accessibility of the term to broad audiences and research areas justifies the clarification and consolidation of the term itself.

1.6 Contributions

This thesis on location efficiency and housing location choice contributes substantive methodological and theoretical academic knowledge as well as practical applications to the urban planning, municipal governance, and development sectors. The relevance of publically funded universities and their research output has been the subject of continued debate and are under growing pressure to prove their benefit to society while simultaneously generating high-impact, high-quality research. At the core of this debate is that all institutions of higher education should feel a civic duty to engage with their broader society on matters of public relevance (Cuthill et al., 2014). The University of Alberta has outlined multiple strategies in their institutional plan 'For the Public Good' one of which is: 'Engage with government, community, industry, business, and the post-secondary sector to address shared local, provincial, national, and global

challenges' (University of Alberta, 2015). This research project addresses this call by investigating housing location choice in order to provide practical insights into better understanding and achieving location efficient housing development and choice. This research has significant policy and practical relevance for municipalities and other levels of government, developers and urban planners. A better understanding of how people choose their home locations with regards to location efficiency can help provide municipalities, developers and urban planners with important information for achieving TOD and infill housing development targets in cities across North America.

1.7 Literature

Relevant literature is addressed comprehensively in chapter two as the chapter is focused on a literature review that traces the origin, progression and current use of location efficiency in academic and grey literature. Each subsequent chapter contains its own literature section that pertains to the distinct methods and areas of research respectively explored. For example, chapter three deals with the grouping of homebuyers by factor analysis and Q-methodology sorting.

1.8 Study Area

Edmonton is a city of 932,546 with a greater metropolitan population of 1,321,426 (Statistics Canada (2017). Edmonton is North America's most northern city with a metro population of over 1 million. It is the capital city of the province of Alberta and its development has been tied to a boom and bust petroleum based economy since the discovery of oil in the mid twentieth century. The development of Edmonton follows a somewhat characteristic western North American pattern that arose out of the turn of the 20th century adoption of the streetcar (in the Edmonton context). Canadian cities remained relatively compact before the appearance of electric streetcars. In 1908 Edmonton received its first electric streetcars and routes were quickly established to the north and west of the central core which allowed the first streetcar suburbs to be constructed. Streetcars also came across the cities bridges to connect the City of Edmonton to the City of Strathcona (later annexed into Edmonton). Like many other North American municipalities after WWII, Edmonton went through a housing and population boom brought on by government housing incentives and a large oil deposit discovery in nearby Leduc in 1947

(Lowe and Lowe, 2018). From 1947 to the 1960s Alberta experienced some of the greatest economic growth rates in the nation.
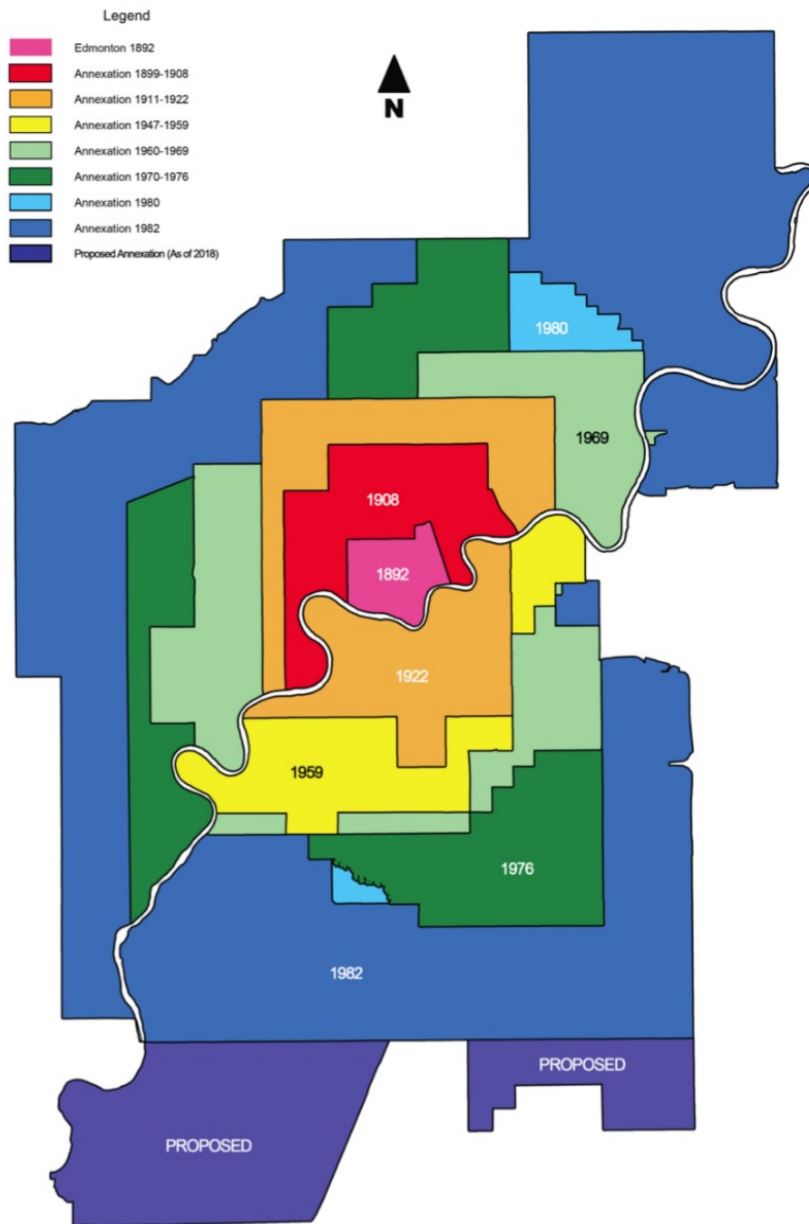
Figure 1.1 – Growth map of Edmonton (courtesy City of Edmonton Growth report, 2017).

This suburban age of Edmonton, marked by homogenous single use residential neighbourhoods and automobile oriented planning and design coincided with the last streetcar line being removed in 1951 when the automobile became the primary mode of transportation to reach the newly

developing suburban neighbourhoods (Lowe and Lowe, 2018). Through the 1950s, Edmonton's first urban planner, Noel Dant, created Alberta's first planned neighbourhood with a modified grid pattern, Parkallen. The gridiron development paradigm was considered unappealing, monotonous and unsafe due to shortcutting by automobiles (Lowe and Lowe, 2018). Parkallen was a neighbourhood of mixed density (with some low apartment style buildings), parks, central business service area with a school on a modified grid. Subsequently, 40 additional inner-ring suburban neighbourhoods were built around the city's core, and were recognized by the American Society of Planning officials as a model of subdivision design and emulated by urban planners across Canada (Lowe and Lowe, 2018). The city experienced numerous housing booms and expansions during the following decades and slowed during recessions in the 1980s. The rampant expansion began again in the late 1990s and rose sharply following 2003 when global oil prices skyrocketed. Since the 1920s, Edmonton's outward greenfield growth has been the norm and is estimated to continue with a projection of 2.2 million people living in the capital region by 2044 (Capital Region Board, 2017).

POPULATION GROWTH BY RESIDENTIAL NEIGHBOURHOOD (2009 TO 2014)

- >200 loss (7)
- -200 to -100 loss (24)
- -100 to 0 loss (88)
- 0 to 100 gain (89)
- 100 to 500 gain (52)
- 500 to 1000 gain (20)
- 1000 to 3000 gain (19)
- >3000 gain (8)

- Transportation and utility corridor
- Industrial neighbourhood
- Other

Data compiled from 2014 Municipal Census

0 1 2 3 4
kilometres

N
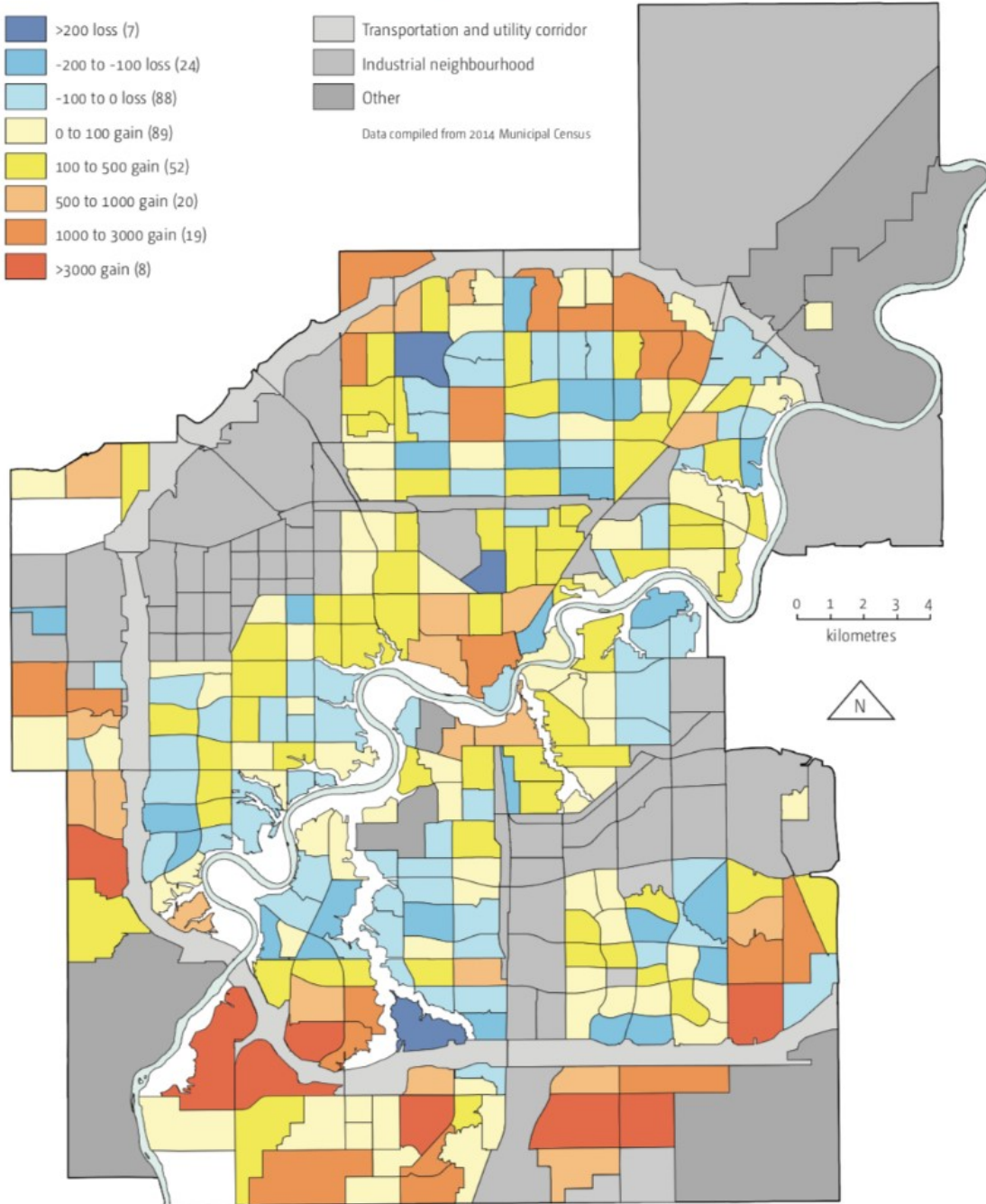
Figure 1.2 – Residential growth by neighbourhood 2009-2014 (courtesy City of Edmonton Growth Report 2015)

The rapid population growth of the last 10-15 years has been reflected in Edmonton's ongoing greenfield development and urban expansion (figure 1.2). In order to counter this outward growth, the City of Edmonton's municipal plan established an infill target rate of 25% of net new housing growth to be in core and mature areas (City of Edmonton Municipal Development Plan, 2010). They reported a 24% infill development rate for 2016 (City of Edmonton, 2017) but it should be noted that the vast majority of these units were apartment and condominium style and not the single family detached or semi-detached homes that 86% of reported consumers prefer (Avid Ratings Canada and CHBA, 2017) (Figure 1.4). Edmonton's demographics represent a fast growing, young city with higher than average incomes. From 2011 to 2017, Edmonton's population has grown by 14.8%, making it the fastest growing major city in Canada (City of Edmonton, 2017). The justification for selecting Edmonton as the case study is discussed below in the methodology section.
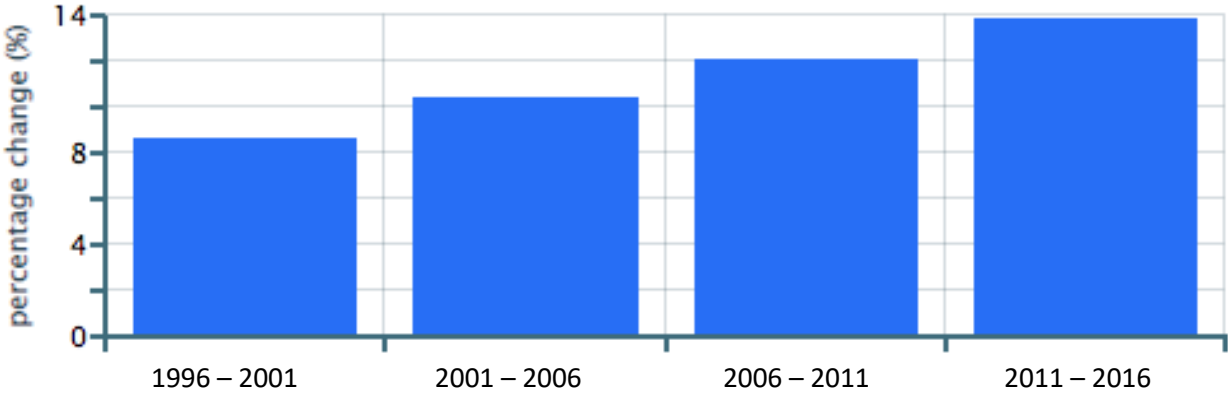
Figure 1.3 Population change in percentage of Edmonton metropolitan area over last 20 years
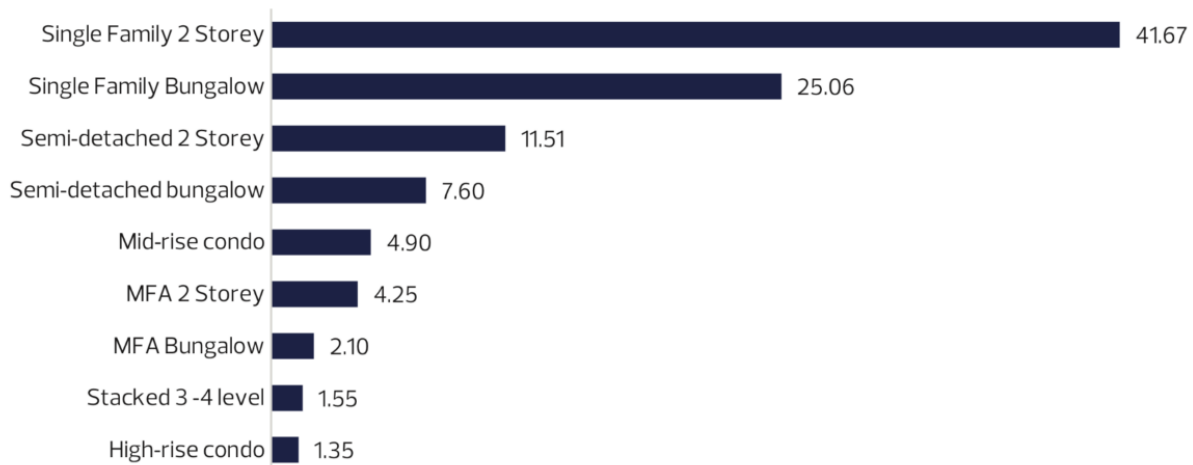
Figure 1.4 - Preferred Home Type (%) – Avid Ratings Canada/CHBA Consumer Preference Survey 2017.

1.9 Methodology

1.9.1 Epistemological Perspective

This research project is rooted in a post-positivist critical realist epistemology (see Yeung, 1997; Gregory, Johnston, Pratt, Watts and Whatmore, 2009). Critical realism suggests that a 'real world', independent of our own individual knowledge, exists, but that our comprehension of that real world is influenced by our social and cultural milieu. This cultural milieu can include our gender, culture, personal history, and environment (Bhaskar, 1989; Sayer, 2000). Unlike constructivism, critical-realism proposes that reality is not entirely experienced within the perception of the observer. Critical realists propose that a near approximation of reality can be attained through corroboration, covering multiple perspectives and recognizing comparable aspects of diverse perspectives (Cloke, Philo & Sadler, 1991; Bryman & Teevan, 2005). Researchers can therefore use agreed upon abstractions and classifications, to define phenomena in the real world.

1.9.2 Case Study Research

This study employs an embedded single case study research design as described by Yin (2009). Case studies have helped contribute to theory construction with some significant breakthroughs in social sciences utilizing an intimate investigation into experiences and narratives (Flyvbjerg,

2006). Stake (2005) describes how as "a particular case is examined mainly to provide insight into an issue" (p. 123). Case studies have also been described as intensive, systematic examinations of an individual, group, community or other unit in which the researcher investigates detailed data relating to numerous variables (Woods and Calazaro, 1980). A case study approach is appropriate when research goals include identifying unforeseen associations or constructing explanations that are not immediately apparent. A context based case study can be a valued tool for increasing our comprehension and as Flyvbjerg (2006) states "in the context of human affairs there appears to exist only context-dependent knowledge" (p. 221). Case studies can rely upon multiple data collection methods (primarily qualitative) to act as sources of corroboration (Lazar, Feng, & Hochheiser, 2017). Yin (2009) describes how case studies contain a significant qualitative component, focusing on inquiries that aid in the explanation or depiction of behaviours.

When a single case study involves subunits it can be considered an embedded single case study design (Yin, 2009). In this study, the greater metropolitan geographic region of Edmonton is ws chosen as the single case, and the multiple households that participated in both the Q-methodology study and the qualitative interviews are considered the embedded subunits. The embedded single case study design is represented in Figure 1.5. Yin (2009) also provides foundations for rationale of utilizing a single case design for research. Multiple or comparative case studies are generally considered more compelling yet the execution of these studies usually involves extensive time and resources that are beyond the means of a lone student or researcher (Yin, 2009). Yin's (2009) description outlines that this case can be considered a representative single case study as it sets out to capture the 'circumstances and conditions of a commonplace situation', in this case being the suburban growth and housing development of a North American metropolitan area (p.48). Other limitations include that as a single geographic area, the greater metropolitan region of Edmonton could exhibit phenomenon that are solely unique to the specific territory. However, this research project provides the groundwork for future investigations that can be done in other municipalities to identify what patterns of homebuyer choice exist in those cases. Also, given the similarities between cities in other studies of

homebuyer choice, the findings of this research are likely to provide insights into other cases even if the regions are not identical.

Single Case Designs

Holistic (Single unit of analysis)	Context Case	
Embedded (Multiple units of analysis)	Context Case Embedded Unit of Analysis 1 Embedded Unit of Analysis 2	
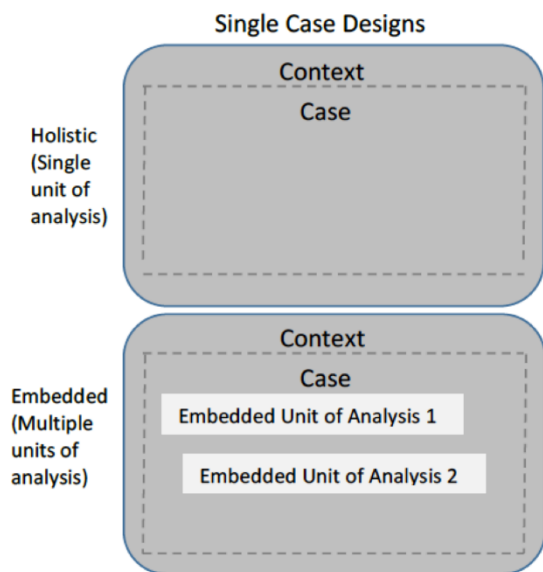
Figure 1.5 Types of case study design adapted from from Yin (2009)

A single case study was also chosen for this research due to the desire to utilize multiple methods of research to provide an in-depth understanding of the case. For this study a narrative literature review, Q-methodology, and qualitative interviews were employed. This single embedded case study research design allows for both a quantitative segmentation based upon factors affecting home buyer decision making as well as a deeper qualitative understanding of motivating aspects behind those factors. The narrative literature review provides the opportunity for this study to guard against becoming 'stuck' at the subunit level (the household) that Yin (2009) describes as essential to an embedded single case study design. A single case allows for a richer depth of understanding than if, for example, a Q-methodology study was to be done in three distinct municipalities. Through this in-depth single case, this research provides the exploratory groundwork to look at homebuyer motivations and location efficiency.

Creswell (2007) describes the researcher's selection of the case and the decision to study a certain bounded system as a critical step in the method. This case selection also requires that the researcher establish a rationale for the sampling strategy and the boundaries of the case itself (Creswell, 2007). For this study, the greater metropolitan area of Edmonton, Alberta was

selected as the geographical boundary of the case. Edmonton offered a number of key aspects that made it a valuable case to study, these include the following:

1. Edmonton was the 2nd fastest growing metropolitan area in Canada from 2006 – 2016.
2. Three housing types (Figure 1.4) make up 72% of homes in the Edmonton greater metropolitan area) and take up the bulk of land use in Edmonton (Statistics Canada, 2012).
3. Edmonton has few natural barriers to growth as it is surrounded by primarily agricultural land in most directions.
4. Edmonton experienced the most growth in automobile suburbs and exurban areas (33%) amongst all Census Metropolitan Areas (CMA) in Canada from 2006-2016 (Gordon, Hindrichs and Wilms, 2018).
5. Edmonton has one of the lowest apartment style housing rates in Canada at 24%. Comparatively, Montreal (58.4%), Vancouver (58.1%), Toronto (40%), Halifax (35%), and Winnipeg (30%) (CMHC Canadian Housing Observer, 2016)
6. Since 2014 the City of Edmonton has set infill development goals of 25% in order to reduce its dependence upon suburban growth.

Although we have described this case as representative, the significant population growth and suburban expansion experienced by the greater Edmonton metropolitan region also possesses some attributes of an exceptional case. These characteristics of suburban development and population growth may be somewhat exceptional, yet they are still occurring within the traditional suburban growth pattern of most North American cities. Although Edmonton may have outstanding suburban growth, it still represents a typical North American region. This research was undertaken to better understand why homebuyers chose these types of housing which contribute to the unabated suburban development of cities like Edmonton as Gordon, Hindrichs and Wilms (2018) point out. This embedded case study research can help illuminate factors that contribute to unsustainable urban sprawl as well as strategies that could encourage more location efficient housing choices amongst homebuyers.

1.9.3 Unit of Analysis

The primary unit of analysis for this research is the household. The vast majority of housing choice literature regard the household as the appropriate level of study for investigation (Dieleman, 2001). In the second chapter the use of geographic scale is applied to location efficiency and utilized to amalgamate current divergent uses of the term. The focus of this scale based clarification is at the neighbourhood and household levels. The data for the Q-methodology and the qualitative interviews were collected at the household level. Bailey, Blake, and Cooke (2004) regard households as an interrelated network of geographically and socially "linked lives" (p. 1618) which influences partners to collectively make home choices through bargaining and negotiation. This study had both couples and single members of households participating in the sorting. When one member of a household was sorting alone, the participant was given instructions to represent the views of the household that were used when the home location was chosen. These instructions were also given to couples that sorted together and were intended to capture the collective views of the household as a unit.

The research papers making up this study are primarily focused on location efficiency at the household level although the narrative literature review and new definition provided in chapter two does apply to the neighbourhood and municipal scale levels as well.

1.9.4 Participation and Housing Context

The criteria for joining the study was having purchased a single detached home, semi-detached home, townhome, rowhome or duplex within the last 1-4 years within the greater Edmonton metropolitan region. The research was carried out in 2013 and 2014. Suitable participants were those who had purchased a home in the Edmonton metropolitan region within the 'last four years' with the vast majority of participants having purchased their home within 1-2 years. This window was considered appropriate as previous research has shown that people who have moved home recently likely reside in a home that closer represents their preferences (Onaka and Clark, 1983).

The three housing types discussed above (Figure 1.4) make up 72% of homes in the Edmonton greater metropolitan area) and given that they are usually lower density than other forms (such as apartments and condominiums), they also take up the vast majority of geographic space in Edmonton (Statistics Canada, 2012). These types of housing were set as the criteria for the study mainly due to link between housing and suburban sprawl. The location choice of homebuyers purchasing lower density related homes (single detached, attached, rowhome) is an underlying impetus for this study. People choosing apartment style condominiums would be an interesting follow-up study but for the purposes of this research these types of homes were not included.
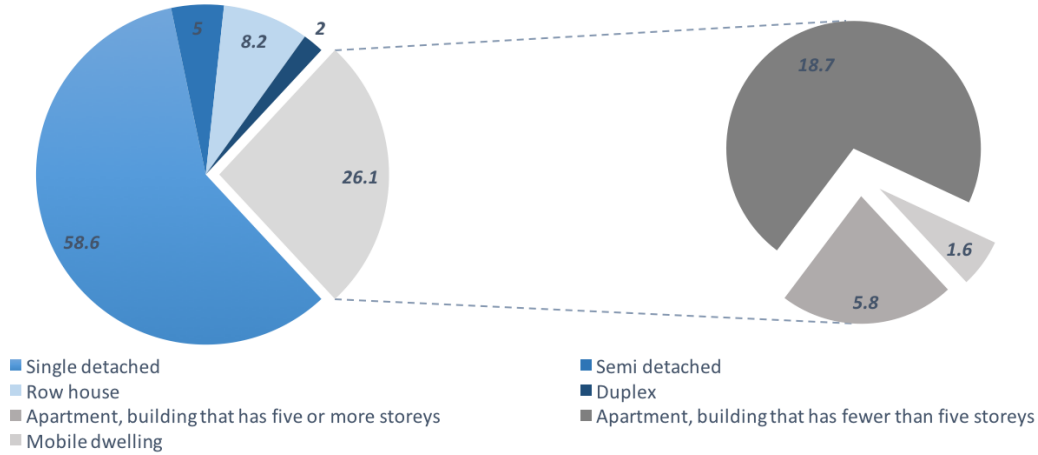
Figure 1.6 – Percentage Distribution of Housing by type in Edmonton, 2011 (Statistics Canada)

1.9.5   Research overview

Three separate research methods were employed in this thesis. These included:

1. Narrative literature review
2. Q-methodology
3. Qualitative semi-structured interviews

These methods were each identified, chosen and utilized for their application toward achieving the research objectives. The first two objectives were addressed by employing a narrative literature review that was used to establish a background and history of location efficiency's use in academic and grey literatures. A Q-methodology was then used in order to garner subjective

viewpoints and group homebuyers by these opinions. The third research method utilized semi-structured interviews that examined how homebuyers were employing location efficiency in their home location choices. Qualitative research (Q-methodology and interviews) has been deemed an appropriate methodology for obtaining individual experiences to certain phenomena (in this case housing location choice) and the meaning they attribute to that experience (Creswell, 2012). As Denzin and Lincoln describe (1994, p 37) qualitative inquiry involves an 'interpretive, naturalistic approach' that attempts to interpret experiences in their natural setting or how people bring meaning to them utilizing representations like interviews, recordings, field notes, and photographs. This research seeks to explore the participants' reflections of their own experiences regarding housing location choice and location efficiency by utilizing the methods described below.

1.9.6   Narrative Literature Review

Chapter two employs a narrative literature review to present the establishment and progression of the term location efficiency into its current imprecise and dichotomous use within academic and grey literature today. Narrative literature reviews offer a comprehensive perspective on a selected idea as well as outlining the progression of a concept over time (Green, Johnson, & Adams, 2006). They help to facilitate discussion of significant topics and complex ideas (Jahan et al., 2016). As Baumeister and Leary (1997) outline, they survey the state of knowledge on a particular topic, identifying a problem, contradiction, or weakness with the topic being reviewed, and outline the history of a concept and the influence and/or limitations of different contributions to the field. The narrative literature review method was employed in chapter two in order to document the history and evolution of the term location efficiency, and to demonstrate the requirement for the new consolidated scale-based definition of location efficiency.

1.9.6.1 Narrative Literature Review Analysis

A widespread search was used to recognize instances in both academic and grey literatures that utilized the term "location efficient" or "location efficiency" in their title, text and/or keywords. Six electronic databases were comprehensively searched for the academic sources: Academic Search Complete, Science Direct, Scopus, Web of Science, Taylor and Francis Complete and

JSTOR. The academic search criteria included all works published in international peer-reviewed journals before May 2018. Searches on Google and Google Scholar, and WorldWideScience.org were utilized to find any grey literature sources not already identified by the academic literature search. In addition, the reference sections of all identified applicable literature were reviewed to ensure all relevant literature was considered.

The results of the literature search included 1014 journal articles and grey literature with 747 excluded after abstract, keyword and title review for being non applicable. Duplicate results were discarded and results that were considered 'not relevant' were discarded. Numerous non-relevant results that included 'location efficiency' as a keyword, abstract or title word were related to appraisal of the siting of industrial seaports and the placement of newly built hospitals as well as aquatic biology (e.g. 'The functional response of drift-feeding Arctic grayling: the effects of prey density, water velocity, and location efficiency'). Twenty grey literature sources were also evaluated and added. The 287 articles remaining were then fully reviewed to determine their relevance and significance to this investigation. The total of identified applicable literature was 126.

1.9.7 Q-Methodology

In the third chapter a Q-methodology is utilized to investigate segmenting groups of participants by their home location preferences. This thesis represents an innovative application of the card sorting based Q-methodology to home location choice segmentation (grouping) through a location efficiency lens. The foundations of Q-methodology were developed by William Stephenson in 1935 as a means to systematically examine and understand participants' subjectivity regarding a specific topic (Simons, 2013). This subjectivity can consist of our perspectives, meanings, opinions, preferences. Stephenson sought a scientifically rigorous way to measure participants' subjectivity which led to the combination of statistical factor analysis with card sorting in order to explore correlations between opinions/perspectives of persons.

Q-methodology has been identified as a valuable addition to the social scientist's toolbox for better understanding how people think about a particular subject (Danielson, 2009). Ellis, Barry, and Robinson (2007, p. 523) have described Q-methodology as "a bridge between the positivist

and post-positivist schools of policy analysis" in that it employs statistical methods and outcomes in the study of participants' subjectivity (e.g., attitudes, preferences). The Q-methodology is used in this research to provide a unique segmentation of homebuyers into groups based on shared attitudes regarding home location choice and location efficiency. Although this Q-methodology study is not considered statistically representative of a population, these groups provide valuable contextual information for municipalities and developers looking to understand homebuyers' location choice, as they seek to encourage infill development and location-efficient developments. Chapter three employs the Q-methodology to identify the opinions and preferences of homebuyers and utilized factor analysis to segment participants by their card sorting responses.

Q-methodology is most often employed when research seeks to study participants' attitudes or opinions (dit Dariel, Wharrad, & Windle, 2010). Compared to normal R method analysis which uncovers correlations between variables (e.g., education, income, age, weight) across a sample of subjects, the Q-methodology searches for correlations between subjects across a sample of variables. As Danielson (2009) describes, Q-method is regular factor analysis 'turned on its side', with correlations compared between participants across a set of Q-statements as opposed to the R method correlation between variables (e.g., height, income etc) across a set of participants. This correlation can be described as one of Q-methodology's key advantages as it allows the participant to define their own subjectivity rather than being measured by analogous traits (Danielson, 2009). Q-methodology is typically considered an exploratory method, as it is not generally used to test hypotheses.

Watts and Stenner (2005) have described Q-methodology as being able to create a sense of coherence for complex research questions that have may have complicated and contested solutions. Housing and location choice has been looked at by various academic disciplines and methods, with a many utilizing economic models endeavoring to predict homebuyers' preferences based on socioeconomic and demographic variables. Aero (2006) discusses how these models may have difficulty in addressing the complexity of a household's decision to move and choose a new home location. These same models have been criticized for their concentration on macro-level market evaluation to the exclusion of micro-level (household) motivations like

opinions, values, and attitudes that influence choices (Coolen & Hoekstra, 2001; Kauko, 2006; Maclennan, 1977). The Q-methodology focus on participants' opinions and points of view addresses this criticism and provides a deeper micro-level look at home location choice.

1.9.7.1 Q-Methodology Process and Analysis

In a Q-methodology study, the participants (referred to as the p-set) are provided with a set of statements that refer to the topic being investigated (referred to as the q-sample) and then requested to order the statements from disagree to agree (Brown, 1993). This 'Q-sorting' process provides each participant's subjective interpretation of the q-sample and uncovers their personal perspective on the topic being investigated. These viewpoints are then factor analyzed (in this study the 'PQ-method' factor analysis software package was utilized) and the results are used to correlate and order the individual responses form the q-sorting (McKeown and Thomas, 2013). By comparing participants' subjective opinions on a topic, the factor analysis involved in the Q-methodology investigation gives information about similarities and disparities between subjects' viewpoints (Barry and Proops 1999). If groups of significant correlation exist, these can be uncovered through factor analysis and utilized to describe similar opinions, preferences or viewpoints.

McKeown and Thomas (2013) describe the five stages usually practiced in a Q-methodology as: (1) identification of the areas of concourse which one wishes to explore, (2) development of the Q-sample, (3) selection of the P-set, (4) Q-sorting, and (5) analysis and interpretation. In this thesis, the area of concourse was determined by the objectives of this thesis project as 'location efficiency and home location choice'. The entirety of this subject area is referred to as the concourse, this concourse may contain a large number of unmanageable statements regarding home choice and location efficiency. Brown (1993) refers to the concourse as 'the stuff of life' (p. 95) that represents an extensive range of views on the subject being investigated. These vast statement possibilities require a sample to be drawn from the concourse to represent the range of options that can be manageably sorted by the participants (McKeown and Thomas, 2013). This is called the Q-sample where the researcher endeavors to represent the variety of options that exist.

After the concourse has been created the next stage is to reduce the list by clarifying statements to reduce ambiguity and eliminating statements to remove redundancy.

Q-sampling can be assisted by consultants with subject matter experience to validate if the statements are related to the topic area. It can be beneficial for the researcher to recruit independent advisors to help identify repetition and eliminate duplication. The next phase utilized piloting to check if the statements achieve representativeness.

This study narrowed down statements from a number of sources including three pilot consultations with recent homebuyers, popular news sources, home buying preference surveys, and a thorough review of relevant areas of academic and gray literature. The principal sources for the home buying preferences and surveys were the National Association of Realtors Community Preference Survey (Belden Russonello Strategists, 2011), the City of Toronto Home Preference Survey (Toronto Public Health, 2012), the Urban Land Institute (Belden Russonello Strategists, 2013) survey on housing, transportation and community, the Canadian Home Builders Association (2015) Canadian Home Buyer Preference National Study, and the two RBC-Pembina Institutes Home Location Studies (Burda, 2012, 2014). The most sought after neighbourhood and housing attributes identified in housing preference research were also used in the formation of the concourse and the Q-sample (Boumeester, 2011).

As per Watts and Stenner (2012), 62 statements were reduced from an original concourse of 110 statements. Forty-eight of these 110 statements were eliminated due to redundancy and repetitiveness. The 62 remaining statements were then provided to colleagues (two graduate students who owned homes and three volunteer homeowners) who aided in the clarification of the wording and added any relevant statements that were missed as per Watts and Stenner's (2012) recommendations for refining the Q-sample. Following Donner's (2001) suggestion, 31 statements remained after refinement and were tested with five pilot card sorts to further eliminate any redundant, unclear, or extreme statements (see Table 3.3). The statements were printed on cards and laminated. At the beginning of the card-sorting procedure, the participants were instructed to: "Please rank these items according to their importance to your home buying decision." Following Watts and Stenner's (2012) and Donner's (2001) suggestions, participants

were first encouraged to examine all the cards and place them into initial stacks of agree, neutral, and disagree. This aided in separating the statements into manageable quantities to which more in-depth examination could be applied. Participants were then asked to arrange the statements from most disagree (RHS) to most agree (LHS) on either end of the grid, with more neutral statements in the middle columns of the grid (see Table 3.1). After completing the sorting, participants were asked to fully review their choices and were offered an opportunity to discuss any questions they possessed about the Q-sort and if they thought anything should be added or altered.

PQMethod software package developed by Schmolk (2014) was utilized to analyze the q-sorting data. The PQMethod software requires the data from each participant's q-sort to be entered into the program and correlated against all other sorts. The correlation-matrix that is produced, is then factor-analyzed by the PQmethod software using Barry and Proops (1999) suggested centroid method. These subsequent factors are then automatically rotated by the software package using varimax rotation to reveal the range of discourses amongst the participants (hand rotation of the factors was attempted and did not achieve improved results over the software package). The automatic varimax rotation uncovers distinct patterns amongst the sorts, and three factors emerged that were differentiated by distinguishing statements (see chapter three). The factors that were revealed in chapter three comprise a 56% cumulative explained variance of the q-sorts, Kline (2014) considers explained variances above 35–40% a "sound solution." Chapter three contains a comprehensive methodological description of the factor choice and explanation of how the study identified and classified each factor.

1.9.8   Qualitative Interviews

Semi-structured qualitative interviews were used in chapter four to uncover homebuyers' incorporation of location efficiency into their home location choice. Coulter, van Ham, and Feijten (2011) and van Ham (2012) have called for a deeper contextual understanding of household location decision-making, and further calls for contextual qualitative studies into better understanding homebuyers' rationale for home location decisions have been also been made (Borth & Summers, 2017; Clifton & Handy, 2003). Qualitative research is understood to place more emphasis on depth of knowledge versus breadth, entire cases over isolated segments,

flexibility over structure throughout the research process and subjective meaning and comprehension over broad explanatory theories (Kaplan and Maxwell, 2005; McLennan, 2009; Stake, 2005). Qualitative research can also generate unexpected data that may shine a new light on longstanding problems that can expose innovative solutions and potential policies (Rubin & Rubin, 2005). Akinyode & Khan (2017) have described qualitative research as offering an important approach in uncovering complex matters in housing research. Maxwell (2013) considers qualitative research appropriate for better understanding how and why individuals interpret and ascribe meaning to societal problems, to other parts of the world (other people), or to their own actions. Berg, Lune & Lune (2004) describe qualitative research as allowing the researcher to investigate how participants assign meaning and provide structure to their own individual experiences and share their own opinions and knowledge with others.

Semi-structured interviews with recruited participants and subsequent snowball sampled informants were used for gathering detailed information regarding home location choice and location efficiency. These interviews were undertaken after the participants sorted the Q-statements. According to Shinebourne (2009) Q-methodology can be used as a "first step with participants in conjunction with follow-up in-depth interviews" (p. 96). The attributes of the definition of neighbourhood location efficiency by Poticha and Haas (2005) formed the foundation of the semi-structured interview questions. A snowball technique as described by Lewis-Beck, M., Bryman, and Liao (2003, p 1043) was utilized to identify subsequent interview participants. Interviews were conducted in comfortable locations in order to make the participants feel as relaxed and calm as possible (Seidman, 2006; Kvale, 2007). Typically, the interviews were conducted at the participant's home or in a quiet conference room at the University of Alberta.

1.9.8.1 Qualitative Analysis

Qualitative coding is a fundamental step in qualitative analysis as it enables the interpretation and conceptualization of the data, uncovering relationships within the data as well as allowing for the revelation of novel data (Strauss, 1987). According to Miles and Huberman (1994, p. 56) codes can refer to 'tags or labels for assigning units of meaning to the descriptive or inferential

information compiled during a study...codes are usually attached to 'chunks' of varying size'. By using this type of data reduction (coding), the researcher can further conceptualize the data and begin the process of investigating relationships and causes (Miles and Huberman, 1994). Post interview analysis involved the open-coding of transcripts using the NVIVO 10 software package to assign codes and potential thematic labels in order to organize the data into practical categories (Bryman and Teevan, 2005).

Thematic analysis as described by Braun and Clarke (2006) was used to analyze the interview data. Thematic analysis is a widely used flexible method for recognizing and analyzing patterns in qualitative data. Inductive analysis was used to identify themes regarding location efficiency and home location choice (Braun and Clarke, 2006; Boyatzis, 1998). The thematic data analysis involved four steps as outlined by Braun and Clarke (2006): 1) Familiarization with data (through notetaking during interviews, transcribing interviews and reviewing all audio recorded transcribed interviews); 2) Coding (labels generated for relevant items that emerged through transcripts, being attentive to subjects participants considered important); 3) Searching for themes (seeking out highly related codes and merging them, then collating and constructing general themes amongst the coded data); 4) Reviewing and defining themes (checking that the generated themes 'work' with the data set, and constructing a comprehensive analysis of each theme).

1.10 Research Quality

According to Baxter and Eyles (1997) credibility may be utilized for determining research rigor and validity. Lincoln and Guba (1985) describe credibility as the degree to which an account of a participant's experience is immediately recognizable to those having the experience and also comprehensible to those outside the experience. Credibility refers to the association between the concepts that the researcher utilizes interpretation to reconstruct the original experiences of participants (Baxter & Eyles, 1997). Following Baxter & Eyles (1997) purposeful sampling, triangulation, peer debriefing, and a positionality statement were employed in order to maintain and establish validity and rigour. Construct validity as described by Yin (2009) was also used to aid in the substantiation of the quality of this research study.

1.10.1 Purposeful Sampling

Purposeful sampling is when the researcher selects participants and sites for study due to their ability to purposefully inform an understanding of the core research question (Cresswell, 2007) Purposeful sampling is most often used by qualitative researchers wanting to investigate areas that are considered information-rich (Baxter and Eyles, 1997). Purposeful sampling was used in this study by recruiting participants who had purchased a home within the last four years (maximum, the majority of participants had purchased their home within the last two years of the study). These participants had to own their own home and have been directly involved in the choice of its location. The credibility of the study increases when purposeful sampling is used due to the participants' knowledge and expertise on the research subject. After initial contact with a perspective participant, recruitment utilized a snowball sampling method. Snowball or chain sampling utilizes cases of interest from participants who are aware of potential participants that meet the study criteria and are potentially information rich (Creswell, 2007). Each participant was asked if they would refer another participant after the interviews and card sorting.

1.10.2 Triangulation

In qualitative research, triangulation is considered one of the principal validity testing strategies. Triangulation signifies an attempt to scrutinize the data from diverse perspectives, which may provide more in-depth and rich analysis by validating the replication of a researcher's observation or interpretation (Denzin & Lincoln, 2005; Stake, 2008). Denzin (1978) recommended various types of triangulation including 'method triangulation' which is when multiple methods (two or more) are used and the data from these methods support similar interpretations. This research utilized a document analysis through a narrative literature review, a Q-methodology card sorting technique as well as qualitative interviews which provided rich supportive data regarding home location choice and location efficiency in order to triangulate evidence. These multiple methods allow the researcher a deeper understanding of the research issue which can also support the validity of the research (Creswell, 2012). Another form is 'source triangulation' which is when multiple sources are used to corroborate the interpretation of the data. In this research, numerous quotations from multiple sources were utilized to support

the thematic interpretations of the collected data.

1.10.3 Peer Debriefing

Stake (2010) reports how utilizing knowledgeable peers to assess and review research findings can be valuable for endorsing or challenging research analysis. After building interpretations from data analysis from both the Q-methodology and qualitative stages, evaluation was sought from credible peers who were external to the study but familiar with the phenomena being explored. These peers consisted of the author's supervisor, post-doctoral researchers and graduate students familiar with housing and urban planning research.

1.10.4 Robustness

Robustness was ensured by the researcher being deeply involved through all stages of the research planning, preparation, design, training of transcription assistants, interviewing and Q-sorting, analysis and writeup. All efforts were made to adhere to the highest standards of research conduct and all final decisions and approvals regarding the research project and its process were those of the author alone. The author followed the approach recommended by Creswell (1998) to provide 'thick, rich' descriptions of the qualitative and Q-methodology research data collected to observe to the interpretive traditions of qualitative research. This practice, along with the full recording of notes, transcriptions, audio recordings and Q-sorting data helps to make these investigative findings dependable and transferable (Bryman and Teevan, 2005).

1.10.5 Member checks

Member checking involved checking the research participant's original data and interpretations to ensure their opinions were accurately recorded (Baxter and Eyles, 1997). Each participant was instructed that they could contact the researcher at any time (until a deadline that was six months from the data collection date) in order to assess, alter or remove any of their responses. These participants were also contacted in a follow-up email after all stages of the research were completed and the Q-methodology data had been analyzed and compiled. The general findings from the Q-methodology study were shared with them in this correspondence and they were

given an opportunity to review the findings and another occasion to adjust or remove their data. All participants who responded were satisfied with their experience. The results of this study will also be made available to the participants (e.g., thank-you email with link to the entire thesis) as it is important to provide value to the individuals who so generously shared their personal experiences to make this research possible

1.11 Limitations of this research

Researchers in human geography and other social sciences that employ qualitative analysis have called for a better understanding of the subjectivity of the principal researcher as an essential process for self-reflection (Behar, 1994; Kirschner, 1987; Rose, 1997). McDowell (1992) stated that researchers should take particular account of their own 'positionality' in relation to the participants, setting and their analysis in research. A researcher should state their positionality with respect to education, gender, race, class and culture to offer an improved means for comprehending the dynamics of researching people and phenomena in society (England, 1994; Rose, 1997). I am a middle class cis-gendered, white male, born and raised in Canada, studying to attain my PhD at a University in Canada. I am also a homeowner who lives within a 15-minute walk of two mass transit stations that I use in my commute to work each day.

The principal limitation in this project was the use of the greater metropolitan area of Edmonton as the case. The justification for this decision is covered in section 1.9.2. Additional limitations in this research project include some temporal, financial, and logistical constraints. Participants were recruited based on their recent purchase of a home, which was a maximum of four years prior to the interview date. If budgetary research restraints were not a reality, more wide reaching advertisement methods (local newspaper and print ads) could have been employed to attempt to only recruit participants who had purchased their home within a shorter timeframe so as to facilitate a sample of participants likely to have a better recollection of the event. In recruitment of subjects, the researcher utilized email lists and research message boards that were affiliated with the University of Alberta, community based social media sites (The Edmonton Federation of Community Leagues) and promoted the call for participants on social media networks. All of the initial participants who were recruited through community and university affiliated emails

lists and research message boards were requested to refer non-University of Alberta affiliated participants in an attempt to limit over representation.

A large n survey is beyond the scope of this research, yet it could be a natural follow up as these projects have helped identify foundational evidence needed to inform a large survey which could be applied to a general population. Follow-up research based on a large n quantitative survey addressing location efficiency and home location choice is recommended to realize the further application of this investigation into location efficiency and home choice.

1.12 Ethics

This research was approved by and conducted in accordance with the requirements of the Research Ethics Board of the University of Alberta. Before each interview/q-sort a document containing the general research objectives, risks and privacy protocols was provided or read to the participant. The participants were each given an information sheet containing this information as well a participant consent form (see appendices for consent form). Informed consent was required and received for each participant as well as approval to record each interview digitally. Included in the consent form was acknowledgement that all identifying information would be removed from the transcripts for purposes of confidentiality. Interview and Q-sorting excerpts used in the third and fourth chapters are identified with participant numbers only (with 'a' or 'b' added for couples). Every effort was made to ensure confidentiality for the participants. The ethics approval letter is attached in the appendices.

1.13 Summary

This research was undertaken in order to clarify the concept of location efficiency and investigate the connection between location efficiency and home location choice in order to further understand current prevailing home consumption and development tendencies. The methods utilized generated data which contributed to three distinct yet connected research papers into location efficiency and home location choice. Chapter two examines the origin, evolution, and current usage of location efficiency in academic literature, grey literature, and municipal government and urban planning as well as producing a new consolidated definition of location

efficiency to clarify the current dichotomous usage. Chapter three utilizes a Q-methodology segmentation to identify homebuyers by their shared home location choice preferences and uncovers insights into the nuanced complexities of homebuyers' housing location choice. The fourth chapter is an exploratory qualitative study into LE and home location choice which provides both theoretical knowledge through the themes uncovered, as well as the addition of new insights regarding location efficiency and home location choice. Through this thesis these three papers provide a narrative that begins with the origin and current dichotomous use of location efficiency, then defines, examines and illuminates the association between location efficiency and home location choice which provides a deeper understanding and clarification of location efficiency and home choice.

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Chapter 2: Conceptualizing Location Efficiency: A Consolidated Definition

Kurt Borth, Robert Summers, Damian Collins

2.1 Introduction

Many North American cities have identified a need to shift from the dominant paradigm of auto-oriented greenfield development towards *smart growth* approaches that emphasize transit-oriented development, densification and walkable communities (City of Abbotsford, 2016; City of Edmonton, 2016; City of Vancouver, 2019; Steinbrueck, 2014; Tremblay, 2012). The City of Vancouver has recently declared '6 big moves', two of which address walkability and transit accessibility, with goals of 90% of people living within an easy walk and roll of their daily needs and having two thirds of trips in Vancouver made by active transportation and transit by 2030 (City of Vancouver, 2019). These shifts are promoted as a means of reducing municipal infrastructure and service costs, decreasing greenhouse gas (GHG) emissions and vehicle miles travelled, and encouraging active transportation. In the context of these goals, the concept of location efficiency has arisen to consider and measure the interconnection of household location and transportation costs, with reference to particular neighbourhood designs and urban forms.

The concept of location efficiency (LE) has been used to understand the transportation-related dimensions of household locations for the past three decades. Over that period, research on LE has been used to link home locations with vehicle miles travelled (VMT), as a metric to validate novel location based mortgage lending tools and most recently as a description of neighbourhood attributes. While the concept has been demonstrated to be valuable in understanding the costs and benefits of alternative household locations and sought after neighbourhood characteristics, an absence of overall clarity and a lack of consensus around its definition reduces its potential utility. This paper will utilize a narrative literature review to investigate the creation, evolution and current divergence of the location efficiency term.

This paper examines the comprehensive history, evolution and current divergent usage of LE based on a review of academic and grey literatures. The contribution of this paper is to provide a

comprehensive history, conceptual framework and definition of LE. To achieve these goals, a chronological account of the development and influence of LE is provided as a narrative literature review with key areas of inconsistency noted. Following that, various definitions and usages of LE are assembled and analyzed, and a comprehensive definition focused on household and neighbourhood scales is developed. Through providing a conceptual framework, establishing a comprehensive scale-based definition for LE, and positioning it in the literature amongst concepts such as smart growth and Transit Oriented Design, this paper helps to provide clarity for researchers, planners, policymakers and municipalities as they make use of the concept moving forwards.

2.2 Background

Neighbourhoods are considered location efficient when they provide residents with convenient access to desirable services (healthcare, cafés, banking, restaurants), jobs, shopping, schools and transportation options that provide cost-effective, easy-to-use alternatives to private vehicles (Brookings, 2006). The concept of location efficiency (LE) was first formally identified (and popularized) by research into the relationship between urban density and gasoline use, which found that higher density neighbourhoods within global cities had less gasoline consumption per capita than low density North American cities (Newman and Kenworthy, 1989). This led to further work on the effect of neighbourhood density on household vehicle miles travelled (VMT). Subsequent studies into the link between VMT and walkability, transit accessibility, and residential density led to the creation of a further concept, the location efficient mortgage (LEM).

The LEM brought household transportation costs into home buying and lending calculations and was applied at a household scale. It used location efficiency as a metric to rate mortgages based on their location efficiency and implied lower transportation costs. Through the evolution of this research the concept of LE became associated with the neighbourhood scale attributes that strongly influence personal transportation: residential density, transit accessibility, neighbourhood shopping accessibility and pedestrian accessibility (also known as walkability). These characteristics remain the principal means to describe location efficient neighbourhoods:

Simply put, location efficiency converts driving from a necessity into an option. Location efficiency requires neighborhoods that provide high-quality transit, a mix of uses, and pedestrian-friendly design. Proximity to transit is just one of several key variables that determine the location efficiency of a neighborhood. Other critical factors include net residential density, transit frequency and quality, access to community amenities, and a good quality pedestrian environment (good sidewalks, safety, reasonable topography). (Belzer and Autler, 2002, p1).

Critically, the 'efficiency' of a location is understood in terms of the opportunity for reduced reliance on private vehicle travel for frequent trips like commuting (which may be realized in terms of fewer VMTs). Since its initial development in the early 1990s, the concept of LE has continued to evolve, and led to the identification of related concepts like location affordability, which has been utilized to varying degrees by planners, advocates, municipal governments and developers to promote and describe housing costs in more efficient locations. From around 2000, consideration of LE began to diverge, as both academic and policy users investigated two somewhat subsidiary concepts: the metric-based location efficient home value and mortgage (LEM), and neighbourhood-based attributes like transit access, walkability and accessible services and jobs. The divergence of the term location efficiency as a household level metric and as a neighbourhood attribute description provides an opportunity to introduce a consolidated definition through the application of geographic scale. Research on housing location has been inconsistent in using the term. For example, Renne et al. (2016) have equated location efficiency directly with location affordability (a related term that will be discussed below). These types of conflicting definitions and differing uses lead to confusion and hinder progress in this area of academia and planning and are the impetus for this paper and its consolidated definition.

2.3 Methods

This research employed a narrative review method in assessing and examining grey and academic literatures (Baumeister & Leary, 1997; Green et al., 2006; Ferrari, 2015). Narrative reviews are helpful in offering a comprehensive perspective on a chosen concept or theme and are also are often utilized to describe the development of an issue or concept over time (Green et

al., 2006). Narrative literature reviews aid in the facilitation of a discussion of important topics on a certain theoretical point of view (location efficiency), and they are considered an important instrument in academia (Jahan, 2016). According to Green et al (2006), narrative literature reviews are useful   educational tools as they are helpful in presenting a broad perspective on a topic and often describe the history or development of a specific topic or issue. This approach facilitates description of a concept's origins through its development, evolution and current use (Ferrari, 2015; Green et al, 2006). The steps for undertaking a narrative literature review outlined by Green et al (2006) include, identifying sources of information (e.g. databases), outlining the search terms and delimiting, and outlining the selection criteria employed.

A comprehensive search was used to identify sources in the academic and grey literatures that used the term "location efficiency" or "location efficient" in their title, text or keywords. For academic sources, six electronic databases were searched: Academic Search Complete, Science Direct, Scopus, Web of Science, Taylor and Francis Complete and JSTOR. The academic search included works published in international peer-reviewed journals before May 2018. Searches on Google, Google Scholar, and WorldWideScience.org were utilized to find grey literature and any academic sources not already identified. In addition, searches were also performed by the first author on the reference sections of all relevant reviewed literature.

These searches returned 1014 journal articles and grey literature reports, with 747 being excluded by abstract, keyword and title review for not being applicable to this topic. Duplicate results and any results that were deemed to be 'not relevant' were also discarded. Examples of non-relevant results that included 'location efficiency' as a keyword, abstract or title word were related to aquatic biology (e.g. 'The functional response of drift-feeding Arctic grayling: the effects of prey density, water velocity, and location efficiency') as well as the evaluation of the siting of new industrial seaports and the location of new hospitals. With 20 grey literature reports reviewed and added, the 287 articles remaining were then fully reviewed to ascertain their relevance and value to this research. The total number of relevant literature items identified was 126.
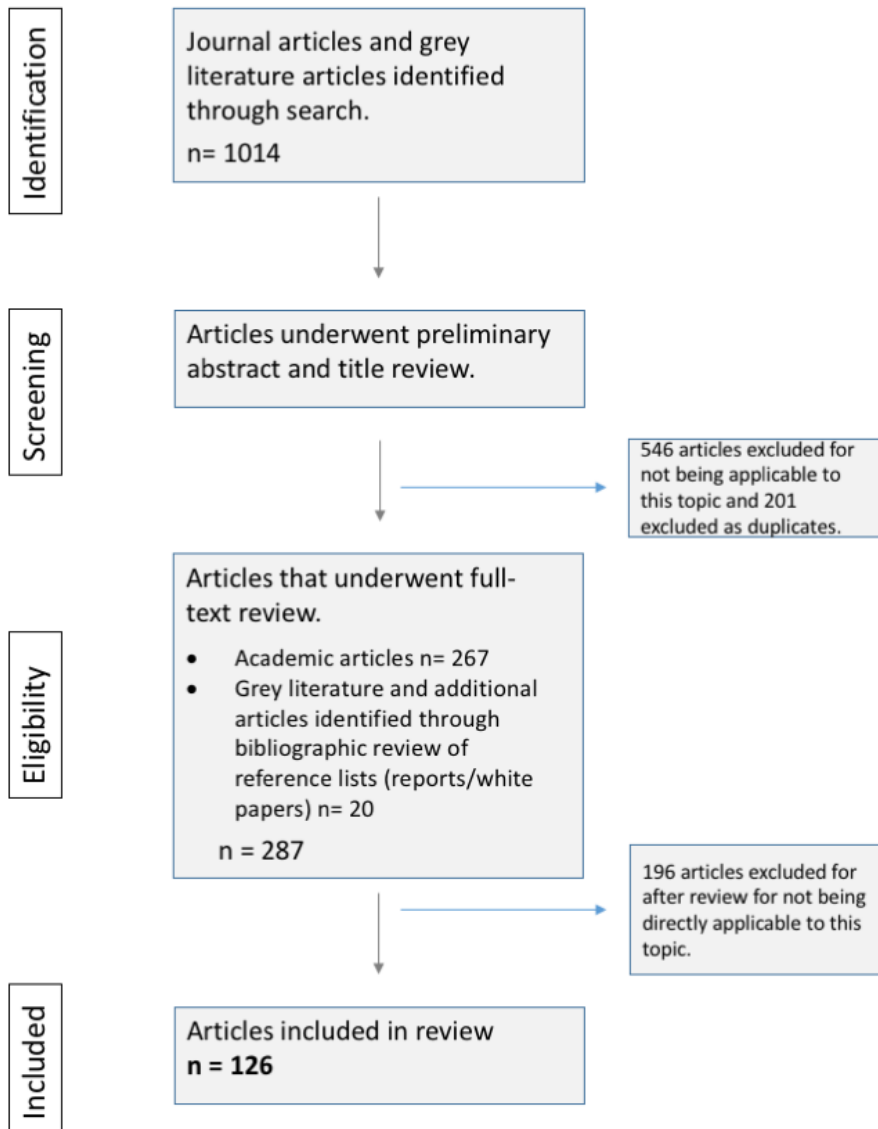
Figure 2.1 - Flowchart of review method

2.4 Results

2.4.1 Early Research

This narrative review commences with the foundational beginnings that evolved into the concept of location efficiency. As each successive step in research led to further understanding of related terms and concepts, their connection and relation to location efficiency will be presented. This

review is based on the successive development of the term location efficiency as it was shaped by researchers, advocacy groups and government agencies. The basis of the concept of location efficiency originated gradually with early research on the links between public transportation and automobile use by Pushkarev and Zupan in 1977. The significant foundations of location efficiency came from Newman and Kenworthy (1983; 1989a; 1989b) comparing density differences and gasoline use per capita in Australian cities (at first) and then later expanding to include major cities in the U.S. and globally. Newman and Kenworthy were looking for a discernable link between urban form/density and residential gasoline consumption as a proxy for automobile use. They found that as metropolitan area densities increased, average VMT decreased (Kenworthy and Newman, 1983; Newman and Kenworthy, 1989a; 1989b). Newman and Kenworthy quote Beaumont and Key (1982) in their influential 1989 book 'Cities and Automobile Dependence' to explain their impetus for looking at a cities built form and its implications for energy use: 'there has been insufficient examination of what an energy efficient urban form is actually composed of and how such a state can be reached given the present arrangements' (p.130). Although they did not utilize the term location efficiency, they identified some of the factors like transit accessibility, commute times, and 'human vitality, intimateness and neighbourliness' (1989a, p. 6) (due to mixed use zoning for services and amenities) that became the foundations of the concept of location efficiency. Their research and its replicability, comparison of diverse cities from around the globe and methodology has since been criticized yet it was an important step that led to further studies looking to link VMT and density/built form, which later evolved into location efficiency (Dujardin et al., 2012; Ewing, et al., 2017; Gordon and Richardson 1989; Perumal and Timmons 2015).

Following this, in 1991, the Natural Resources Defense Council (NRDC) in the United States supported research into density, neighbourhood form and amenities (Holtzclaw in CEC, 1991). It found that proximate shopping, walkability, and high public transit access were correlated with higher density areas, while lower densities were associated with a lack of local shopping opportunities, reduced walkability, and poor transit connections. This study also reported that residents in these higher density communities drove 20-30% less on average as density levels doubled (Holtzclaw in CEC, 1991). This led to further NRDC sponsored research in 1994 by

Holtzclaw et al. which attempted to predict VMT and auto ownership for neighbourhoods based on walkability, transit accessibility, and residential density. This research looked at 27 neighbourhoods across California with varying densities, finding substantial reductions in VMT correlated with transit service coverage and higher density. When residential density was doubled, both VMT and automobile ownership were reduced up to 16%, while doubling transit frequency led to an additional VMT reduction of 5% (Holtzclaw et al., 1994; Holtzclaw et al., 2002). Around this same time Frank and Pivo (1994) found characteristics like population density, employment density, land-use mix and the balance between jobs and housing in an area were associated with lower automobile usage. The Center for Neighborhood Technology (CNT) reports that its co-founder Scott Bernstein coined the term 'location efficiency' which was first used in an academic paper by Holtzclaw et al. in their 1994 study (Bernstein and Tholin, 2013; Holtzclaw et al., 1994). The concept of LE has generally been investigated and utilized from within the United States and Canada with very limited interest and uptake in other jurisdictions. Only five articles included in this review focus on jurisdictions outside of North America.

2.4.2 Location Efficient Mortgages

In their 1994 paper, the NRDC, CNT and the Surface Transportation Policy Project joined forces to demonstrate the case for location efficient mortgages (LEM) (Holtzclaw et al., 1994). LEMs (also known as transportation credit mortgages - TCM) were proposed as a way to curtail urban sprawl by making home buying more affordable for moderate and lower-income potential homebuyers who may otherwise be limited to choosing homes in less expensive and less location efficient suburbs (Blackman and Krupnik, 2001; Riggs 2017). LEMS were to be applied on a household scale and calculated for each potential home purchase, offering a way for homebuyers to increase their borrowing capacity for more expensive homes in urban and mature suburban neighbourhoods. LEMS were based on the premise that the homebuyers would have more disposable income for mortgage payments due to lower total transportation costs (including fewer vehicles per household) in these neighbourhoods (Bryan, 2010; Poticha et al., 2006; CNT Location Efficiency Hub, 2017; Henry & Goldstein, 2010).

A multi-year research project started in 1994, and sponsored by the NRDC, CNT and the Surface

Transportation Policy Project, ultimately formed a new non-profit organization called the Institute for Location Efficiency (ILE). It evaluated prospective homes and homebuyers based on an econometric model that incorporated household factors (income, occupant numbers), transit access, centre proximity (a measure of neighbourhood concentrations of jobs and shopping), neighbourhood density and walkability, and automobile expenses based on commuting needs (Bryan, 2010). This contributed to the creation of the LEM, a private market finance tool that allowed mortgage underwriters to assign a location efficiency value (LEV) to potential homebuyers and home choice based on the criteria above and provided additional credit and/or a smaller down payment to facilitate the purchase of a location efficient home (Siegel, 2007). Based on this research the Federal National Mortgage Association (FNMA aka Fannie Mae) provided LEMs in pilot projects starting on 2003 in Seattle, Los Angeles, Chicago and San Francisco (Bernstein and Tholin 2013; Krizek, 2003; Riggs, 2017).

LEMs were offered after the pilot term by Fannie Mae until 2006 and despite their potential benefits and calls by homebuyers and academics alike, have not been offered again by Fannie Mae (Chatman and Voorhoeve; 2010). Due partly to the difficulty in calculating the LEV, complications with local land-use and lending policies, the ease of borrowing before the U.S. housing crash (in 2008), and tighter lending restrictions after the crash, the LEM was officially discontinued in 2008 (Blackman and Krupnik, 2001; Bernstein and Tholin 2013; Riggs, 2017: Siegal, 2007). Fannie Mae also introduced a similar product in 2002 called SmartCommute, which was a competing mechanism that used a simpler calculation (than the LEM) for giving households credit for living near public transport and allowed them a small advantage in qualifying for loans. Subsequent research on the effectiveness and value of LEMs and similar lending mechanisms found that the majority had no delinquencies or foreclosures and some generated up to a 30% reduction in automobile ownership (Blackman and Krupnik, 2001; Rauterkus, Thrall & Hangen, 2010; Riggs, 2017).

2.4.3   Housing and Transportation Affordability Index

Following the research that led to creation of the LEM, the CNT, based in Chicago, took on a key role in promoting location efficiency through grey literature and public advocacy campaigns.

It sponsored some of the foundational research on location efficiency by Holtzclaw et al. (1991, 1994) and helped produce many reports, white papers and position pieces bringing to light the connection between housing and transportation costs, and ways in which households could benefit from being aware of this connection. In 2006, CNT and the Brookings Institute attempted to quantify the impact of transportation costs on the affordability of housing choices. Their aim was to provide homebuyers and renters alike with detailed, accessible information regarding the actual costs of choosing a residence in one location compared to another. This led to the production of the location affordability index (LAI), to build on and operationalize the fundamental precept that household transportation costs are determined by the built environment and socioeconomic characteristics (Poticha et al., 2006). The use of this index in place of conventional measures of housing affordability illustrated that when transportation expenses are incorporated, auto-dependent urban areas are often considerably less affordable than they first appear.

The CNT has applied this index to over 900 metropolitan areas in the US based on data from the 2006-2010 American Community Survey (ACS), which replaced the long form U.S. census (Hickey et al., 2012 CNT/Center for Housing Policy - Losing Ground). This led to the creation of the Housing and Transportation Affordability Index (H+T®). Hosted on CNT's Housing and Affordability website, H+T® allows prospective homebuyers and renters in the United States to search locations and find out the potential costs of their combined housing and transportation. This tool is focused on providing individual and household scale transportation and housing costs data while also including neighbourhood and city level aggregate data. CNT describes the index as being part of a "broader effort to explore urban sustainability through location efficiency" (Centre for Neighborhood Technology, n.d). It has been utilized by planners in Chicago to identify potential bus rapid transit alignments and as a livability measure in their 2040 comprehensive regional plan. The Metropolitan Transportation Commission (MTC) in San Francisco credited the H+T® index with helping to establish the Bay Area Transit Oriented Affordable Housing (TOAH) Fund and the New Mexico Mortgage Finance Authority (MFA) (a not-for-profit housing organization) is using it to educate potential homebuyers on how to better comprehend and control their transportation costs while saving for a first home. More examples

and research into the H+T® index are available at https://htaindex.cnt.org/applications.

The Environmental Protection Agency's (EPA) Smart Growth Program developed its own Smart Location Database in 2012 to 'compare the location efficiency of various places' (Smart Location Database user guide, 2014). This database can be utilized by researchers and practitioners in four ways: Assessing and comparing neighbourhood conditions; Conducting nationwide research studies and developing tools; Comparing urban form among metropolitan regions; and Modeling impervious surface growth (https://htaindex.cnt.org/applications/). The Smart Location Database summarizes more than 90 diverse indicators associated with the built environment and location efficiency. Indicators include density of development, diversity of land use, street network design, and accessibility to frequent destinations as well as various demographic and employment statistics (https://www.epa.gov/smartgrowth/smart-location-mapping).

2.4.4   Location Affordability

The concept of Location Affordability centres on the household and its ability to afford combined housing and transport costs. It enables a comprehensive view of the expenses associated with different home locations, at the household scale. It highlights the transportation costs associated with homes in location inefficient areas, which often necessitate long commutes, and the economic benefits (cost savings) that may accrue to households from more location efficient choices. In a 2016 paper, Tremoulet et al. discuss the effort in the past decade for a reconceptualization of 'housing affordability' research towards a combined 'cost of place' that can incorporate the transportation costs that are associated with choosing a home in a particular location as well as typical housing costs like mortgages or rent, and maintenance (Tremoulet et al., 2016). Here, the 'residual income approach' is helpful in illustrating the challenge that households face in balancing their housing costs (actual or potential) versus their transportation costs within their financial constraints (Stone, 2006). Residual income is the household financial resources leftover after paying for basic housing expenses (Kutty, 2005; Stone, 2006). Works by Stone and Kutty focused on subtracting only housing related costs from available income with a growing amount of recent research into the inclusion of housing and transportation costs into

measures of affordability (Coulombel, 2017; Fisher et al., 2009; Renne and Sturtevant, 2016).

Since the early 1990s there has been a growing recognition that housing costs are closely related to household transportation costs and that they should be combined to represent comprehensive housing costs more realistically. The Housing and Transportation (H+T) Affordability index that was first proposed by the CNT in 2006, combined these measures (Siegel, 2007). CNT and others noted that in North American cities which continue to grow outwards, the majority of new development takes conventional suburban forms. However, most understandings of the affordability of new suburban development consider only housing costs, and not transportation costs. Homebuyers' perceptions that more 'affordable' housing is available in the newly developed suburbs (referred to as "drive 'til you qualify") can lead to excessive transportation costs, which are not accounted for in the home buying equation. CNT's H+T index report (Poticha & Haas et al. 2006) and the subsequent U.S. government H+T affordability hub (see below) have suggested that households should spend no more than 45% of their household income on H+T expenses (up to 30% for housing and up to 15% for transportation). Location affordability encompasses the combined housing and transportation costs that a household can theoretically support. There remains confusion about the definitions and use of these concepts, as the following quotation from Renne et al. (2016) Transit-oriented development (TOD) has become a popular strategy advocated by planners and developers to encourage location affordability, also known as location efficiency" (p. 819).

Although LE was initially applied to individual households in the form of the location efficient value to calculate the location efficient mortgage, the more prevalent use of the term now focuses on neighbourhood level attributes like proximity to schools, employment, amenities and transit. LA comprises each household's particular situation based on their residual income, transportation habits and lifestyle. LA has been described as encompassing the transportation-related characteristics of home's location as well as the household's economic circumstances. Like LE, these characteristics include the accessibility of employment, services, and affordable transportation modes (Adkins, Sanderford and Pivo, 2017). Housing and planning research over the past few years has attempted to reconceptualize housing affordability as a 'combined cost of

place' using location affordability as a term for this wider set of characteristics that account for the costs and benefits of residing in a particular location (Adkins, Sanderford and Pivo, 2017; Hickey, Lubell, Haas & Morse, 2012; Tremoulet, Dann, Adkins, 2016). Tremoulet, Dann and Adkins (2016) consider LE 'a closely related concept to location affordability' (p. 692). As discussed in the proposed definitions to follow, LA should be considered a part of location efficiency at the household level; however, it does not apply readily to other scales since its definition relies upon household income levels and household financial behaviours. Household level income levels and transportation related contextual circumstances (frequent trips) are difficult to apply in aggregate as household behaviours are unique. Households can use tools like the H+T affordability index to shed light on their own unique household location affordability.

2.4.5   Divergence of Location Efficiency

The CNT, the Natural Resources Defense Council and organizations like the Brookings Institute were instrumental in examining the underlying association of transportation and housing costs yet the general concept of location efficiency has been utilized in development, municipal planning policy and academia. The location efficient value (for the location mortgage) and the inclusion of housing and transportation costs into location affordability has primarily focused on the household and not the neighbourhood itself. Since the creation of the location efficient value for the location efficient mortgage, research linked to LE has touched on various topics related to housing, the built environment, transportation, affordability and GHG reductions. Among these studies have been the NRDC sponsored investigations by Holtzclaw on the link between transportation and density, neighbourhood walkability and transit access (Krizek, 2005). As mentioned earlier, Holtzclaw showed a correlation between auto ownership, vehicle miles travelled, transit accessibility and residential density levels. Holtzclaw's findings were consistent with a later meta-analysis by Ewing, Reid and Cervero (2010), which concluded that households located in neighbourhoods that contained a mix of uses, accessibility to good transit and relatively higher density (than average) tend to drive less and use transit more. These studies concentrated on the neighbourhood scale and how it fits into a regional or city wide context. In grey literature and urban planning vernacular, the dominant use of the term location efficiency is to describe neighbourhood level design and amenities, and this understanding has come to

dominate non-academic considerations of housing choice and transportation costs (Burda, 2012, 2014; Poticha & Haas et al., 2006).

As noted above, there is a general lack of coherence and clarity around LE and the ways in which it has been employed since its inception. The divergence of the term LE into the location efficient 'value' (and associated mortgage) and the characteristics describing a location efficient neighbourhood are shown in Figure 2.2. The household level affordability of transportation costs and the use of that measurement in the location efficiency value and mortgage were connected to reducing vehicle miles travelled. These foundations of location efficiency were also anchored in the investigation of reduction in vehicle miles travelled with regards to neighbourhood attributes. These attributes can first be seen in Holtzclaw et al. (1994) and then more fully realized in Hotlzclaw et al. (2002):

> Our location efficiency study explores the hypothesis that the average household auto ownership and driving decrease measurably as likely trip destinations become more convenient, especially by non-automotive modes. Further, it tests the assumptions that residential density, center proximity, local shopping, public transit accessibility and the pedestrian and bicycle friendliness of the neighborhood are good measures of that convenience (Holtzclaw et al., 2002, p.7).
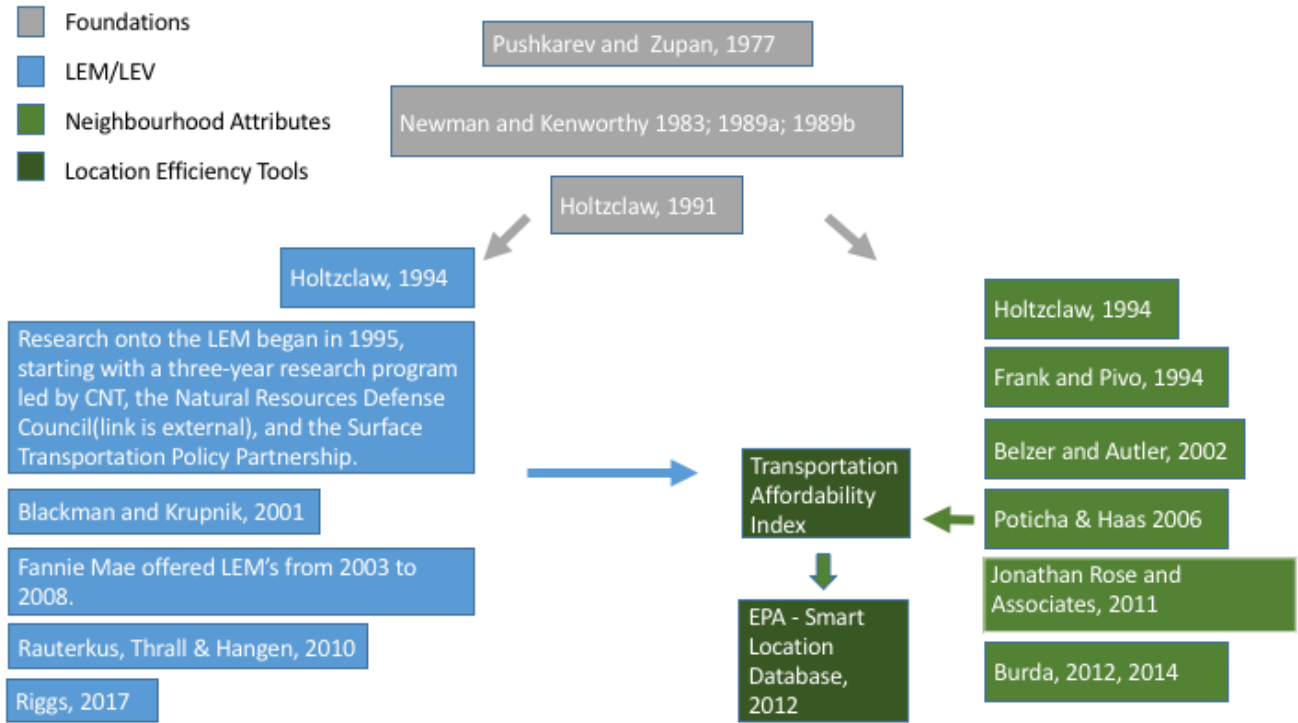
Figure 2.2 – Foundations and Divergence of Location Efficiency

This notion that some neighbourhoods are more location efficient than others due to their density, geographic proximity to urban cores, shopping amenities, areas of employment and what eventually became known as walkability then began to dominate the usage of LE. Definitions of LE centred on neighbourhood amenities and household proximity have come to prevail in planning, government and grey literature. The majority include five core components: accessible employment, compact mixed-use development (density), accessibility of transit, active transportation and walkability options, proximity and convenience to amenities and services as seen in Table 2.1. Over the years, further examples of neighbourhood services and amenities like healthcare and parks/greenspace have also been added (Isalou, Litman & Shahmoradi, 2014). These core characteristics are represented in the amalgamated definition of location efficient neighbourhoods that we provide below.

Table 2.1 – Timeline of Location Efficiency Attributes

Year	Definition of Location Efficiency Components	Title	Author
1994	"In all of these studies, a community with double the density will have 25-30% less driving per family when the impacts of all the conditions generally accompanying *higher density* (including *better transit, more local shopping, and a more pedestrian-friendly environment*) are included."	Using Residential Patterns and Transit to Decrease Auto Dependence and Costs	Holtzclaw (NRDC)
2002	"Location efficiency requires neighborhoods that provide *high-quality transit, a mix of uses, and pedestrian-friendly design*. *Proximity to transit* is just one of several key variables that determine the location efficiency of a neighborhood. Other critical factors include *net residential density, transit frequency and quality, access to community amenities, and a good quality pedestrian environment* (good sidewalks, safety, reasonable topography)."	Countering sprawl with transit-oriented development	Belzer and Autler
2006	"Neighborhood characteristics such as *density; walkability; the availability and quality of transit service; convenient access to amenities such as grocery stores, dry cleaners, day care, and movie theaters; and the number of accessible jobs* shape how residents get around, where they go, and how much they ultimately spend on transportation. Neighborhoods with the above characteristics are considered "location efficient," providing *convenient access to shopping, services, and jobs, and low-cost transportation alternatives to the auto*."	The Affordability Index: A New Tool for Measuring the True Affordability of a Housing Choice.	Poticha and Haas (CNT)

2011	"Location efficient sites are located *near transit and use compact design to facilitate pedestrian access to transit*, linking people to a *range of services, amenities, and employment centers*. They include a *mix of uses, and offer comfortable and convenient transit service*, thereby increasing the number of *viable transportation options* available to residents to commute to work, school, or other destinations."	Location Efficiency and Housing Type — Boiling it Down to BTUs	Jonathan Rose and Associates
2012	"Location-efficient development can most easily be described as the opposite of urban sprawl. Location-efficient homes are a *convenient distance from workplaces, amenities (such as schools, stores and urban hubs) and/or rapid transit*. They provide residents with *shorter commute times and realistic opportunities to use transit and active transportation, such as walking or cycling*, when traveling to *workplaces and amenities. Commercial development* is also part of location efficiency. *Businesses and employment* hubs can locate in areas accessible to transit and population centres rather than sprawling into greenfields."	Live Where You Go (Encouraging location-efficiency development in Ontario)	Burda, Allan, Dunn, Lintner, McClenaghan and Zizzo

2.5 Related Terms

To clarify location efficiency and its role in the larger context of urban planning and housing literature, a discussion the closely associated terms of Smart Growth and Transit Oriented Development are warranted.

2.5.1 Smart Growth/Compact Development

According to the U.S. Environmental Protection Agency (EPA), Smart Growth is considered any

development that supports strong communities, economic growth and environmental health. It covers a variety of strategies that can help protect citizens' health and the natural environment and make communities more attractive, economically stronger, and more socially diverse. Burchell (1999, 2000) defined smart growth as the redirection of development and growth to the inner areas of a city, combined with a more coordinated movement outward. This inward growth would consume far less capital, fewer natural resources and preserve declining ex urban agricultural lands (Burchell, Listokin, and Galley, 2000). In 2005 Downs argued that "smart growth was originally conceived as a reaction to what many planners believed were undesirable features of continuing growth through suburban sprawl" (p. 367). The American Planning Association (2002) advocates that smart growth "enhances ecological integrity over both the short and long term, and improves quality of life for all by expanding (in a fiscally responsible manner) the range of transportation, employment and housing choices available to a region" (p.1). The concept of Smart Growth has been tool oriented since its inception (Gearin 2004). The Smart Growth Network (http://smartgrowth.org/what-is-smart-growth/) developed a set of 10 principles to guide smart growth strategies in development. The principles are:

- Mix land uses.
- Take advantage of compact building design.
- Create a range of housing opportunities and choices.
- Create walkable neighbourhoods.
- Foster distinctive, attractive communities with a strong sense of place.
- Preserve open space, farmland, natural beauty, and critical environmental areas.
- Strengthen and direct development towards existing communities.
- Provide a variety of transportation choices.
- Make development decisions predictable, fair, and cost effective.
- Encourage community and stakeholder collaboration in development decisions.

As Ewing & Hamidi (2015a) state "built environments that are high on the D-variables—development density, land use diversity, walkable/bikable design, destination accessibility, and distance to transit (which is low in compact developments)—are often described as compact" (p. 168). Those that are low in these same variables are often described as sprawling. A major tenet

of the literature on both regional development and neighbourhood design is that compact development reduces driving which aligns with location efficiency on the neighbourhood, city and regional scales (Ewing and Cervero, 2017).

Location efficiency is a significant factor in Smart Growth development. Having households choose LE infill housing options fits within the smart growth development principles of directing development towards existing communities. The smart growth principle of creating a range of housing choices would also aid in LE home choice as the above average costs of location efficient housing can be a barrier to homebuyers (hence the creation of the Location Efficient Mortgage). Smart Growth generally concentrates on redirecting development towards inner areas of a city which are traditionally (assuming employment is concentrated in those areas) more LE than outer suburban areas. Smart Growth and its principles can be seen as a larger overarching direction for growth that Location Efficient choices can be a part of.

2.5.2　TOD

Whereas Smart Growth is an overarching development goal intended to increase the availability and number of Location Efficient homes, Transit Oriented Development (TOD) is a more practical method for achieving greater neighbourhood location efficiency. Dittmar and Poticha (2004) state that the common goal of planning for TOD is to make housing and amenities choices available within an accessible range (by walking, cycling) to public transit options. This is normally accomplished by developing moderate to high densities of mixed use communities around transit nodes. Like location efficiency, TOD benefits incorporate increased accessible public transportation options and ridership, and decreased vehicle miles travelled. Location efficiency is described by Dittmar and Poticha (2004), as being one of the five main goals that TOD should achieve (the other four goals being: a rich mix of housing choices, value recapture, place making and resolution of tension between node and place). Policy initiatives like the location efficient mortgage (LEM) could complement TOD, making mortgages more accessible to potential homebuyers in settings well served by transit. Research has shown that choosing to reside in a compact transit-accessible neighbourhood can help cut household transportation

related costs, freeing up income for housing purchases or servicing a larger mortgage (Cervero, 2007).

TOD has been identified as a method for achieving location efficiency (Dittmar & Ohlund, 2003) (Dittmar and Poticha, 2012), and clearly these two concepts are closely interrelated. Both TOD and LE emphasize the neighbourhood-level characteristics of density; sufficient population within walking/cycling distance of the transit stop, transit accessibility; transit stations and stops that are conveniently located within the TOD and convenient service that allows riders to reach destinations easily, walkability - a network of streets/paths within the area that is interconnected, and a variety of accessible services and amenities (Dittmar and Poticha, 2012). Accessibility to work and frequent destinations is foundational to both LE and TOD. TOD's core goal of situating housing development near transit allows residents to reduce VMT and provides location efficient home choices. If homebuyers frequent destinations are serviced by proximate transit lines, TOD locations can provide an agglomeration of neighbourhood level LE homes that homebuyers can choose.

2.6 A Conceptual Definition of Location Efficiency with the Application of Scale

Household and neighbourhood location efficiency have been the primary focus of research and attention thus far and this consolidated definition will continue that concentration. Much of the literature (particularly grey literature) on LE emphasizes neighbourhood-level characteristics, such as walkability, density, accessible services and transit availability. These characteristics overlap with other related terms like Smart Growth and TOD. Location efficiency has become somewhat of a catch-all term for neighbourhood characteristics of 'good urbanism' as well as for the awareness of housing and transportation costs. By integrating and applying scale into the definition of location efficiency we can justify these variations in LE descriptions between the principal neighbourhood and household levels. Critically, LE can link initiatives at multiple scales, from household locational decisions, through to the design and planning of neighbourhoods, and ultimately to the organization and long term vision of municipalities or urban regions.

2.6.1   Scale

Research into housing and urban planning can utilize varying levels of scale depending on the focus, the intended impacts and outcomes, and the policies or practices that may be impacted or enacted. Potentially relevant scales include the individual, household, neighbourhood, city, regional, national and international levels. A project could include one or even all of these. When levels of a scale are arranged in a series they can represent 'qualitatively distinct levels for organizing and conducting research' (Sayre & Di Vittorio, 2009, p. 22).

Observations of scale can range from international/global down to city/region, to neighbourhoods, and to individual/household. The use of scale is usually relational, observation allows the relation of one item to another to produce information regarding what is being observed (Crawford, 2009). In geography, scales are not assumed to be entirely separate 'levels', sometimes one scale can only make sense when it is considered in relation to others. As Marston (2000, p. 227) stated, scales are not 'unilinearly ordered - with the 'global' theoretically and empirically superior to the 'local' - but can interpenetrate one another'. For example, urbanization is not considered only a local process, but also can be connected with national and provincial/state policies as well as global strategies. The primary scales we are focusing on in our definition are the household level scale and the neighbourhood scale, with the city and regional scales also discussed.

2.6.2   Household Location Efficiency

As the majority of housing choice and house location decision-making literature regards the household as the appropriate level of study; it is important to note that this scale is made up of an individual or group of individuals (families, roommates, co-ops) that choose to reside in a home location (Dieleman, 2001). When a household experiences lower transportation costs to meet their daily transportation needs as a function of their home location they can be considered (more) location efficient. These costs include the household financial costs of transportation, time costs of transportation, GHG emissions of transportation mode, and related health and wellness costs. These can all be considered costs of choosing a particular home location and having to navigate to and from this location for their daily needs (for work, play, services, school

etc.).

When it comes to the household scale, we find that the core component of location efficiency are the costs related to daily transportation needs within the neighbourhood, city or region. While most studies have employed aggregate measures to explore these costs, it is understood that each household (made up of individuals) will have its own unique transportation related costs. Studies have looked at the household level to discuss the relationship between urban form and transportation costs and impacts (Ewing, Hamidi and Grace, 2016; Holtzclaw, et al., 2002). As we have seen in the review section, as research was developed on determining location efficient values for LE mortgages, household costs became the focal point of this inquiry. At this micro level scale, we propose using the term 'Household Location Efficiency'. Location affordability is part of location efficiency at this scale and pertains to each household's income levels and housing costs.

We propose the following definition for Household Location Efficiency:

> *Household location efficiency identifies the location related costs and benefits of transportation for households as determined by residents' unique context with regards to their household transportation needs, preferred mode of transit and specific home location.*

In essence, household location efficiency is associated with the combined financial situations, transportation needs and preferred transportation modes of the whole household. Bailey, Blake, and Cooke (2004) regard couple-based households as interrelated networks of geographically and socially "linked lives" (p. 1618) in which negotiations and compromises occur. As one individual's LE might differ from another's based on work location, frequent destinations and preferred modes, these factors must be compromised or negotiated when choosing a home location as a household. Research on families and home buying has found that in addition to the adult members of the family, decisions are strongly influenced by 'social collectives' made up of the children as well as friends and extended family members (Levy, Murphy & Lee, 2008).

These compromises amongst household members in home location choice have been looked at in home location choice research (Coulter, van Ham, & Feijten, 2012; Ferreira & Taylor, 2008). Research into residential self-selection has shown that commuting and transportation preferences can be integrated in the home location choice and are discussed below (Cao 2009; Bohte, 2009; Ewing, Hamidi and Grace, 2016).

2.6.3   Neighbourhood Location Efficiency

The most common use of the phrase 'location efficiency' in grey literature and municipal planning vernacular relates to what we define as neighbourhood location efficiency. Although households in aggregate make up neighbourhoods, we must acknowledge the way in which neighbourhoods themselves are important contexts for everyday life and related decision-making. There has been a considerable debate in housing choice location and transportation research concerning the possible confounding nature of residential self-selection and the effect of the built environment on travel behavior (Bohte et al., 2009; Cao et al., 2009, Lin et al., 2017). Self-selection bias suggests that households choose their home locations according to their existing travel preferences (e.g., those who prefer to walk will choose more walkable neighbourhoods, and those who want to drive more will choose commuter neighbourhoods). Research by Ewing, Hamidi and Grace (2016) has shown that the built environment may be more of an influence on travel behaviour. Regardless of self-selection bias, the built environment is definitely a key influence in household transportation behaviour. This research on the influence of the built environment on transportation and home location shows that neighbourhood location (within the city, along transit corridors, on the city's edge) and design (neighbourhood characteristics like density, walkability, accessibility) play a large part in determining a household's location efficiency (Ewing, Hamidi and Grace, 2016).

We suggest the following comprehensive definition for Neighbourhood Location Efficiency:

> *Location efficient neighbourhoods are compact mixed-use neighbourhoods with*
> *accessible employment opportunities, shopping and essential services, and convenient*
> *access to public and active transportation options (e.g., trails, infrastructure for*

walkability, cycling infrastructure).

Neighbourhoods are also made up of households with varying levels of location efficiency. The interrelatedness of household and neighbourhood location efficiency recognizes the bi-directional nature of these levels of scale. Of note here, is recognizing that the concept of neighbourhood location efficiency is also related to aggregate measures of behaviour. It is entirely possible that some residents in a highly location efficient neighbourhood possessing all the attributes outlined above could have low individual or household location efficiency due to their own context and transportation habits. Figure 3 shows the nested hierarchy of location efficiency and scale.
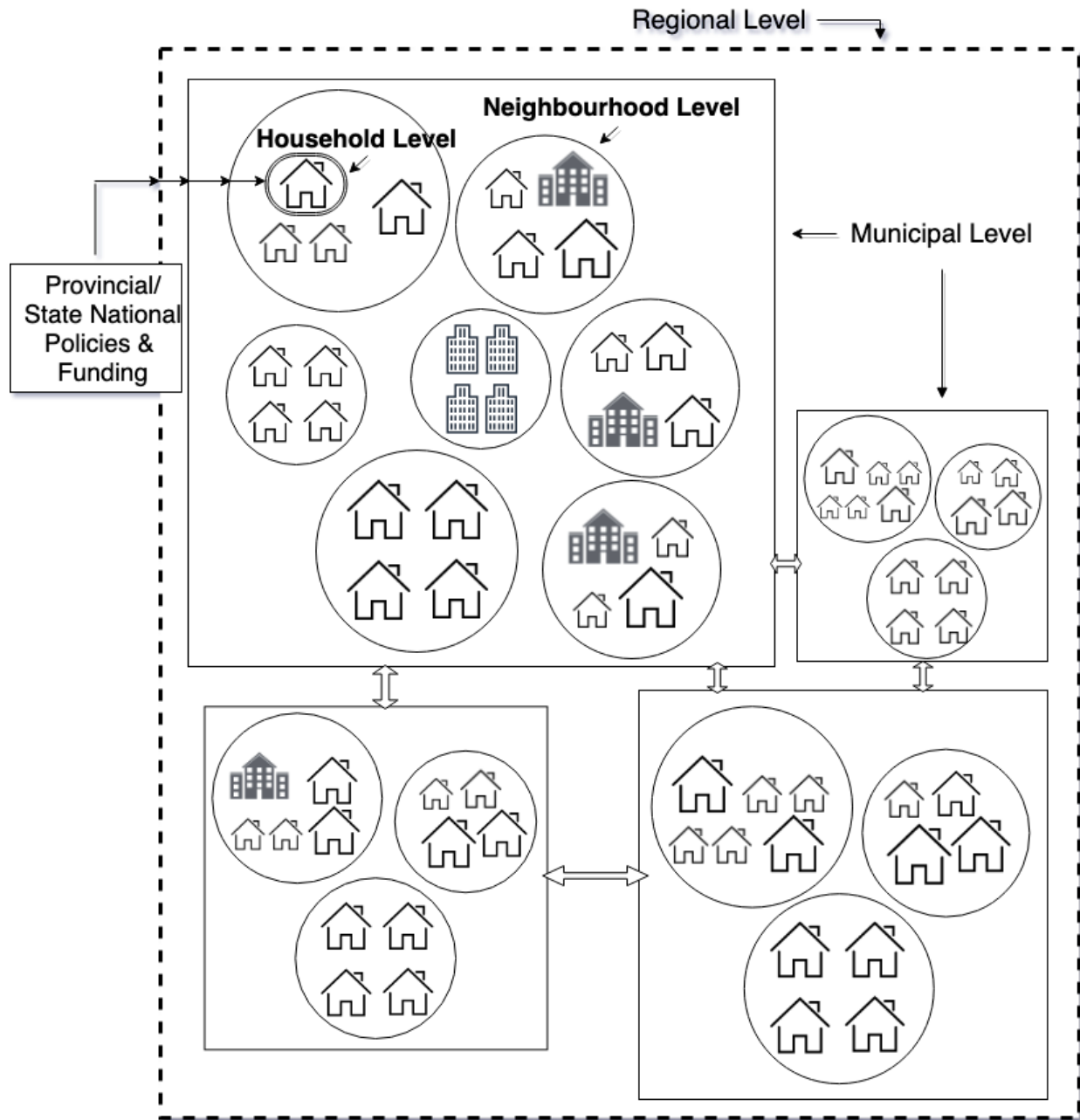
Figure 2.3 – Location Efficiency and Scale

2.6.4 Municipality/Regional Location Efficiency

Although household and neighbourhood scale location efficiency are the focus of this analysis, there is merit in discussing location efficiency at municipal and regional scales for both inter-regional and intra-regional planning and policy implications. The foundation of

municipal/regional location efficiency is made up of the household and neighbourhood scales within its boundaries. Just as neighbourhoods are made up of households, cities are made up of neighbourhoods and regions are made up of varying municipalities. Location efficiency at these levels can help illuminate the regional disparities between municipalities that can lead to sprawl related issues between proximate cities. As shown in Figure 2.3, the interrelatedness of neighbourhoods within municipalities, and of municipalities with regions, is also significant with regards to citizens choosing home locations proximate to centres of employment and services. As neighbourhoods are delineated differently in each municipality, if direct location efficiency comparisons are made between cities, an appropriate unit or scale of analysis of location efficient areas would be required. This unit of analysis could be a Canadian census tract level or postal codes to allow a direct comparison between cities and regions that employ varying internal neighbourhood demarcations.

Similar to location efficient neighbourhoods, a location efficient city/municipality would be made up of an area that provided accessible services, amenities, housing, employment and provided transit and active transportation options. The scale and application of these characteristics would be at the municipal level (e.g. coverage of transit system for the entire city) and the city's location efficiency would be achieved with the provision of these services/amenities to all citizens equitably. Equity and accessibility become explicit at this level of scale as the location efficient inequality (provision of LE attributes like healthcare services, grocery stores, transit and walkability) between neighbourhoods, cities and regions can illuminate variable levels of funding and infrastructure provision between areas. Although households and neighbourhoods are the primary focus of this study, having a city scale based location efficiency definition can provide an indication for equitable housing and service provision to all citizens.

We suggest the following definition for City/Municipal Location Efficiency:

> *A location efficient city/municipality provides accessible services, amenities,*
> *employment and accessible transit and active transportation options equitably to all*

citizens.

Policies that cities/municipalities may employ include prioritizing TOD to increase the transit accessibility of neighbourhoods and increasing infill housing development rates to achieve greater densities in mature neighbourhoods. Location efficiency policies at a national scale could also be utilized to facilitate federal funding for municipal/regional transit and housing strategies that encourage LE. Policies and programs like the EPA's smart location database, Location Efficient Mortgages and the Canadian Public Transit Infrastructure fund that have been developed by U.S. and Canadian federal governments could be sponsored at a national scale and implemented at a regional/municipal scale.

Regional location efficiency would involve the interactions of the municipalities within the region. Regional policies that could be employed include regional growth boundaries (e.g., Metro Vancouver's Urban Containment Boundary) to stem the loss of agricultural or natural lands to exurban low density growth, and regional transit systems (e.g. Metro Vancouver Translink and Toronto region Metrolinx) that move commuters from bedroom communities to employment centres in other municipalities more efficiently (Metro Vancouver Regional Growth Strategy 2040, 2017; 2041 Toronto and Region, 2018). Regional considerations could be investigated in further related research.

Table 2.2 - Location Efficiency Scale Based Definition

Scale	Details	Related Terms
Household	Household costs and affordability measures (based on personal travel, habits, income etc.) Comprised of household members. Workplaces, frequent trips, family etc.	Location Affordability, Location Efficient Values and Location Efficient Mortgages

Neighbourhood	Location efficient neighbourhoods are compact mixed-use neighbourhoods with accessibility of employment opportunities, shopping and essential services, and convenient access to public and active transportation options (trails, walkable infrastructure, and bike paths). Incorporates the aggregate sum of household LE.	TOD, New Urbanism, Walkability, Velomobility
Municipal	Majority of areas with accessible and equitable services, amenities, housing, employment with accessible transit and active transportation options. The scale and application of these characteristics would be at the municipal (e.g. coverage of transit system for the entire city) and the cities location efficiency would be achieved with the provision of these services/amenities to all citizens equitably.	Smart Growth, TOD
Regional	Interactions of the municipalities within the boundaries of a region. Regional planning policies and tools can help reduce sprawl and increase LE.	Regional transit authorities, Regional growth boundaries
National	National funding for municipal/regional transit/housing strategies that encourage LE.	EPA's Smart Location Database, Location Efficient Mortgages', Canadian Public Transit Infrastructure fund

2.6.5   Conclusion

With this narrative literature review we have presented the origins and evolution of location efficiency from a concept to discuss the lower fuel use of dense international cities to the current description of neighbourhood amenities that allow for minimal personal vehicle transportation

relayed trips. We have shown how the use and definition of LE shifted from a metric for calculating household level transportation affordability to depictions of TOD based neighbourhoods and regions depending on the topic being discussed. By applying scale to location efficiency, the clarity of the term overall becomes much more straightforward and its application less ambiguous. Future research and related use of this term will benefit from this new definition as it provides necessary clarification to the academic and grey literature regarding location efficiency. The comprehensive definitions provided and their positioning to related established terms like TOD and Smart Growth aids in the clarification and consistency of location efficiency as well as its establishment as an important tool in the academic and practical areas of urban planning. The consolidated definitions and figures of the scale based hierarchy of location efficiency as well as its current divergent uses that have been provided should present academics, planners, municipalities and developers alike a clearer understanding of the term and a practical scale based application to utilize in their housing location related work.

A suggested next step in continuing this research would be the creation of a metric to be employed in comparing the location efficiency of places to each other. This metric would require the use of an appropriate delineation (census tract or postal code) in order to directly compare areas in different geographical locations. A location efficiency metric could also be utilized as a foundation for the creation of a housing and transportation cost tool for Canadian municipalities. This tool would be valuable for providing clear housing and transportation information to people engaged in home location decisions. This metric and tool could also be utilized to compare municipalities and regions which may influence further location efficiency policy implementation.

Location efficiency has developed over the last three decades as an important concept in focusing attention on the associated costs of living in locations that necessitate extensive automobile use. Lower GHG emissions, lower infrastructure costs to municipalities, higher rates of active transportation and higher quality of life have all been given as benefits of location efficient home choice with location affordability of combined housing and transportation costs becoming a significant factor in research and grey literature. The consolidated scale based

location efficiency definition provided can continue to illuminate the geographic implications of combined transportation and housing costs as well as the design, planning and upgrades of transportation networks and residential neighbourhoods. Although the academic and grey literatures regarding location efficiency went through a shift from an early focus on the metrics of a specific household's efficiency to a more general concept that can be utilized to describe neighbourhood attributes the scale related definitions provided above can aid in allowing location efficiency to be utilized consistently at all levels of research and analysis. The figure outlining the scale based levels of location efficiency will also help municipalities, planners and non-profit organizations establish a solid foundation for their outreach and education in promoting location efficiency

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Chapter 3: Segmentation of Homebuyers by Location Choice Preferences in a Canadian Metropolitan Region

Kurt Borth and Robert Summers

3.1 Background

Many municipalities across North America are attempting to encourage infill development[3] and attract homebuyers to mature neighbourhood in order to retain both population and services and to address the implications of long-term infrastructure costs and issues related to longer commuting times from new developments along city edges. These pressures are evident in Alberta, Canada, which has been experiencing rapid population growth and related high amounts of housing development. In 2013-2014, Edmonton, Alberta, Canada experienced a population growth rate of 3.3% compared to the national average of 1.1% (StatsCan, 2015). This rate is similar to the fastest growing comparably-sized U.S. cities including Austin, TX and Denver, CO, which were 2.9% and 2.4% respectively for 2013/2014 (US Census Bureau, 2015). Edmonton's growth rate from 2011-2016 was 13.9% (second only to Calgary at 14.6%) and almost triple the national average of 5% for this period (StatsCan, 2017).

Extraordinary population growth rates coupled with accessible greenfield lands for development have contributed to an abundance of low-density single detached 'suburban'[4] homes on the developing edges of Edmonton. This both reflects and contributes to a national trend, which sees a majority of Canadians reside in auto-dependent suburbs (Gordon, 2013). New suburban developments are still predominantly sought after by homebuyers, even though municipalities

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[3] Residential infill is considered the development of new housing in established neighborhoods. This new housing may include secondary suites, garage suites, duplexes, semidetached and detached houses, laneway homes, row houses, and other residential and mixed-use buildings.

[4] In an extensive international literature review Harris (2010) proposed a definition of 'suburban' consisting of three components; density, location, and newness. For the purpose of this study the terms 'suburban' or developing area will be utilized to describe a housing area comprised of a majority of single-detached family homes (density), are parts of an urban or metropolitan area outside the core or historical city area (location) and are considered 'new' compared to other areas of the city (Forsyth, 2012). Mature neighbourhoods will refer to areas that are generally outside the inner city core and were completed prior to 1970.

are attempting to attract people to live closer to their cores and along transit corridors to help prevent inner city school closures, decrease new development infrastructure costs, reduce health and social impacts, and decrease energy use and GHG emissions (City of Edmonton, 2016; Hoehner, 2012; Litman, 2012; Rose, 2010; NRCAN, 2009). Recent research suggests that municipal programs that can successfully incentivize infill development could be a possible instrument in reducing sprawl development along the outer edges of cities (Landis, 2017).

Consumer choice in housing, including both location and dwelling style/type, is a well-researched topic, beginning with Rossi's (1955) seminal look into the organization of families that led to changing needs and decisions to move homes. Research into housing preference and choice comes from a deep multidisciplinary pool that includes psychology, sociology, economics and geography each with many branches and sub disciplines. This paper provides a segmentation of Edmonton homebuyers by their location preference opinions using a Q-methodology factor analysis. These emergent segments provide support to municipalities and developers in better understanding homebuyers' preferences and aid in targeting their efforts to promote more efficiently located housing choices and development.

The Canadian transportation and residential sectors make up 29% of total national secondary energy use (the energy used by final consumers in various sectors of the economy e.g. electricity, vehicle fuel, natural gas for heating) and 33% of Canada's total GHG emissions (NRCAN, 2016). The Urban Archetypes project by CanmetEnergy compared energy consumption profiles of varying neighbourhoods in eight cities across Canada. They found that neighbourhoods that were closer to the urban core had less energy use, energy costs and GHG emissions. Studies suggest that infill development projects generate substantially lower Vehicle Miles Travelled (VMT) and therefore lower greenhouse gas (GHG) emissions per capita than greenfield development (Ewing et al., 2008; Litman, 2012). Some estimates into urban form and GHG emissions show that urban emissions could be reduced by 5-20% with the promotion of compact urban development and infill development (Ewing et al., 2008; Lee and Lee, 2014).

The U.S. Environmental Protection Agency found that when comparing homes varying only in their geographic location the more 'location efficient' home could save up to 38% of their total energy use (including transportation) due to location alone (utilizing public transit, active transportation, less vehicle miles travelled) compared to a home in a 'conventional suburban development' (Rose, 2010). Location efficiency refers to the total energy efficiency of housing location and the ability of homeowners to make less energy intensive transportation choices (public transit, active transportation), especially for frequent trips. The Brookings Institute and the Centre for Neighborhood Technology (2006, p. 1) describes places that are Location Efficient as possessing:

> …neighborhood characteristics such as density; walkability; the availability and quality of transit service; convenient access to amenities such as grocery stores, dry cleaners, day care, and movie theaters; and the number of accessible jobs shape how residents get around, where they go, and how much they ultimately spend on transportation.

Residents of location efficient neighbourhoods tend to have fewer vehicles, utilize active transportation and public transit, and drive less (Litman, 2016).

Housing location efficiency may have the greatest impact on total household energy use, yet relatively location inefficient homes (typically associated with greenfield suburban development and longer commutes in more than one vehicle) remain a predominant choice among homebuyers and developers in North America (Rose, 2010; NRCAN, 2009; Gordon, 2013). However, both large-scale surveys and academic studies have shown that the number of households that desire traditional suburban housing is projected to decline while demand for more location efficient and innovative forms of compact housing is expected to increase due to both market and demographic trends (Burda, 2014; Litman, 2016; NAR, 2015; ULI, 2015). Recent research also shows that younger average ages and immigration rates (both Edmonton demographic characteristics) may have an impact on reducing sprawl development and increasing core growth rates (Landis, 2017).

Economic models based on socio-economic and demographic variables have been important in the endeavour to predict timing of residential moves and homebuyers' preferences under varying market conditions and situations. These economic models may have difficulty addressing the depth and complexity of a household's decision to move and choose a new home location (Aero, 2006). According to Fu et al. (2010) the intricate nature of household location choices have been under-developed due to the inherent "computational challenges associated with modeling multiple choice dimensions" (p 3). Economic housing choice models have been criticized for their focus on aggregate level housing market analysis and the exclusion of micro level (household) motivational factors, like values, goals, opinions, and attitudes on consumption choice behavior (Coolen and Hoekstra, 2002; Kauko, 2006; Maclennan, 1977). Coulter (2011) and Van Ham (2012) have called for a deeper contextual understanding of household location decision-making and further calls for qualitative based contextual studies into better understanding homebuyer's rationale for home location decisions have been also been made (Handy and Clifton 2001).

Over 80% of Canadians live in an urban setting (Malenfant & Malenfant, 2007), including inner cities, mature neighbourhoods, suburbs and exurban developments. Gordon and Janzen (2013) estimate that 80% of these urban Canadians (and thus almost 66% of the national population) live in suburban locations. In Edmonton, growth continues to be focused on new suburban neighbourhoods located on the city's outer edges (COE Growth Report, 2015). Specifically, 86% of new housing construction is located in in developing suburban neighbourhoods and 14% in mature areas (hereafter referred to as 'infill development'). However, the City of Edmonton has designated targets to shift these figures to 75% and 25%, respectively (COE Infill Report, 2014). Edmonton's core neighbourhoods gained almost 6000 residents from 2009-2014 while the developing neighbourhoods gained 76,000 (COE Growth Report, 2014). This predominant suburban development paradigm has been identified by the City of Edmonton as financially and environmentally unsustainable. As well as having one of the fastest growth in North America, Edmonton also has a younger than average population and higher than average immigration rates, both of which have been implicated as factors in the possible reduction of sprawl development (Landis, 2017; StatsCan, 2014).

There have been many studies attempting to ascertain the cost associated with sprawling greenfield suburban development compared to infill development. A summary of these studies by Burchell (1998) found that compact development (including infill, smart growth and transit oriented development) can save a municipality up to 25% on road costs, 5% on schools and 20% on utilities. A report commissioned by the City of Edmonton shows the cost of servicing new suburban developments will largely exceed predicted revenues in the years to come. The projected cumulative shortfall is projected to be nearly CAD $1.4 billion over the next 50 years (City of Edmonton, 2016). The City of Edmonton asserts it will mitigate this projected shortfall with the promotion of greater density and consider the possible reduction of service to citizens in all areas (City of Edmonton, 2016). In Edmonton, a recently adopted citywide zoning bylaw to increase density through dividing existing lots over 50 feet wide into two lots for 'skinny' homes has received unanticipated opposition. Even if new developments are highly valued, many homeowners are opposed to higher density housing being located nearby (Danielsen, Lang, and Fulton 1999; Farris, 2001).

This research utilized an exploratory Q-methodology to establish distinct segments of homebuyers' preferences that provide insight into their choices regarding home location decision-making. The Q-methodology provides a unique reduction of homebuyers into groups based on shared opinions regarding home location choice and location efficiency. Though not statistically representative of a population, these segments provide valuable contextual information for municipalities and developers looking to understand homebuyers' decision-making, as they seek to encourage infill development and more location efficient transit oriented neighbourhoods. This research responds to calls for a deeper contextual understanding of homebuyers' preferences by offering a novel segmentation method and the emergent factors that were revealed. These groups or segments can provide a valuable contextual snapshot of homebuyers' opinions and inform housing and development policy and direction with regards to infill and suburban home choice. This paper first considers the extensive literatures around housing location choice, housing market survey and segmentation research. It then introduces the Q-methodology, before identifying and interpreting the three emergent segments and how they

provide novel viewpoints to inform the current development conversation concerning traditional suburban and inner urban housing choice in Edmonton.

3.2 Literature

Since the 1950's research into housing preference, choice and its related travel implications has been conducted from diverse academic and market based perspectives. Since 1955, when Rossi began looking at family scale motivations in housing and migration decisions, a large body of literature looking to better understand the residential relocation process has progressed (Coulter et al., 2012). Much of the basis for the understanding of residential mobility and choice is rooted in a widely accepted two stage process. There is typically a 'decision to move' phase followed by a 'search phase' of the neighbourhood and housing choice itself (Clark, 2012). Households are thought to constantly evaluate their current living situation and if they are not happy with their current state of housing, they may consider a move (if their financial situation allows it) (Clark, 2012). This decision begins the search and evaluation process to find a possible housing opportunity that better fits the household's needs. Distinct areas of literature have also been dedicated to the motivations of housing choice, providing ample evidence for changes in consumers' preferences with regards to their current stage of 'life-course' (Mulder, 1993; Clark and Dieleman, 1996). These areas of study have been important in further understanding why and how homebuyers choose homes in certain locations. In contrast, this paper is primarily concerned with the grouping of homebuyers by their shared opinions on home location choice and location efficiency in order to facilitate a further understanding of housing location preference in Edmonton. The following areas of literature illustrate research into the description and segmentation of homebuyers in order to better understand and predict housing trends and preferences.

3.2.1   Segmentation

In academic and market research, segmentation is the practice of differentiating significant sub-groups of individuals (Hair et al.,1998; Wedel and Kamakura 2000). This study's focus is the segmentation of homebuyers (by their opinions on home location choice) into smaller groups that share similar viewpoints. Segmentation market research begins with the assumption that

there is little value in targeting the 'average' customer and more value in treating different people in different ways because they are motivated by varying rationale (Anable, 2005). The principal goal of segmentation is to reduce the original number of individuals being investigated into smaller groups that share distinct characteristics. Once these groups have been recognized, marketing strategies, behavioural interventions or outreach/education campaigns can be better-designed and targeted to address research or policy goals (Anable, 2005). Traditional market segmentation is almost exclusively based on 'R' analysis, using statistical techniques to attempt to find correlations within and between socioeconomic and demographic variables.

Research into the segmentation of homebuyers has included studies that used factor analysis of home survey data in order to gain a better understanding of socioeconomic predictors for choosing certain housing locations. Varady (1991) looked into the grouping of homebuyers in Cincinnati and found that households with no children that had a college education would tend to choose home locations with highly proximate workplace accessibility and 'cosmopolitan' amenities (close to downtown, accessible parks, cultural institutions, views of the river and older 'stately' homes and neighbourhoods) within the city, and that income and ethnicity were important determinants of a household's location decision. Varady (1990; 1991) and other studies (Spain, 1989) looked into the aggregate characteristics of homebuyers relocating between the 'city' and the 'suburbs' and (like the majority of 'R' quantitative studies) based their interpretations on socioeconomic variables as determinants on varying housing locations. These studies have provided valuable information in aiding housing choice forecasts and models yet homebuyers' behaviors and preferences present inherent complexities for research. Van Ham (1999) considers homes complex 'packages of bundled goods', which may complicate the examination of consumers' preferences. Maclennan (2012) expresses that in location choice research through economic modeling "a concern remains that conventional economic reductionism in housing throws out key babies along with the bathwater" (p. 6). Existing quantitative housing location research has attempted to bring in these complex behavior and preference focused variables in current models yet a deeper understanding of homebuyers and their opinions and preferences may answer some of these concerns and add relevant data to the existing 'R' quantitative segmentation literature.

3.2.2   Homebuyer Preference Surveys

Large-scale profile and preference data for homebuyers is primarily obtained through home buying market surveys and government population studies (annual censuses). Annual home buying surveys — predominantly carried out by research institutions and housing market related organizations in both the U.S. and Canada — provide relevant demographic information tied to neighbourhood attributes, location, transportation, and housing preferences. In recent years, these surveys have shown that homebuyers are interested in more location efficient housing and desire single family detached housing that is located in walkable transit oriented neighbourhoods. The 2014, Pembina - Royal Bank of Canada Home Location Study found that more than 81% of homebuyers surveyed in the greater Toronto area would trade a large home and yard to live in a more location efficient modest home located in a walkable, transit accessible neighbourhood (Burda, 2014). This study established that only 19% would purposely choose a larger home and yard where a vehicle is required and commuting takes more than 30 minutes one way. They also found that 60% of respondents would trade a larger home and choose to live in a more rapid transit accessible area in order to give up one vehicle to save $200,000 over 25 years (Burda, 2014). A U.S. Urban Land Institute survey on housing, transportation and community found that 32% of respondent's desire nearby public transit while over 50% prioritize the walkability of a neighbourhood (ULI, 2015). The 2015 Canadian Home Buyer Preference survey found that walkability and health concerns are ranked the highest in community preferences. This study also showed that 53% of respondents listed 'walking and bike paths', as their biggest preference in a new community (Avid Ratings Canada, 2015).

Location with regards to commuting and work proximity is also an important concern in many homebuyer surveys. A study by the Demand Institute in the U.S. found that 20% of those asked reported that the location of their home was more important than the home itself and 25% stated being 'closer to work' as their main reason to relocate (Housing and Communities Survey, 2013). This report also found that 30% of all respondents reported commuting costs as 'very important' and 64% of this group said that convenience to their job was the most important factor in choosing their neighbourhood (Housing and Communities Survey, 2013). A home

buying survey by Century 21 found that 'millennial' homebuyers (born after 1980) are twice as likely as baby boomers (born 1946-1965) to rank location as their highest priority in choosing a home, with 46% ranking 'having a shorter commute' highest when asked what they look for in a home location (compared to 26% Baby Boomers) (Pollara Strategic Insights , 2013). The Pembina Institute study also found that affordability is a key consideration with over 80% responding that they chose their residential neighbourhood due to financial reasons. Even though homebuyers state they desire more location efficient home locations, the financial cost of living in a single family home in mature neighbourhoods or walkable areas near amenities that fit these preferences is unaffordable for many consumers.

Home attributes (as opposed to walkability or location related commuting attributes above) are also ranked at the top of most surveys with a recent U.S. National Association of Realtors (2015) homebuyer profiles report identifying that almost 40% of repeat buyers (68% of all homebuyers) made no compromises on their home attributes whatsoever. The 2015, Mortgage Professionals Canada Profile of Home Buying listed 26% of all buyers saying they compromised nothing in the purchase of their new home, with 21% reporting they compromised proximity to work and 39% reporting they compromised the size of their home and property. A national Canadian homebuyers' preference survey by Century 21 in 2013 listed 'move-in ready' as the highest priority for homebuyers' in Canada. The respondents stated that purchasing a home considered 'move-in ready' was such a high priority that respondents were willing to sacrifice being able to afford a car, have a shorter commute, or live in a community that 'fits them' (Pollara Strategic Insights, 2013). The desire for larger new homes is typically difficult for inner urban and mature neighbourhoods to satisfy, given issues linked to developer predilection, property acquisition and disposition, and land assembly (Aryeetey-Attoh et al., 1998; Suchman 1996).

3.2.3   Urban Revival

Some North American cities (including Edmonton) are experiencing a downtown 'revival' with inner city development and corresponding residential populations increasing over the past few years, yet these rates are still an order of magnitude smaller than suburban development rates. These areas are also experiencing opposition to infill housing policies that municipalities are

introducing to address the low densities of mature neighbourhoods. Urban planners and municipalities have sought to promote migration from their suburban edge developments to their inner urban and mature suburban areas (Sanchez and Dawkins, 2001). Quercia and Galster (1997) have also discussed the financial benefits related to increases in property value resulting from neighbourhood revitalization of having households return to central neighbourhoods. Lang, Hughes, and Danielsen (1997) have argued that it could take a marketing based approach to attract these suburban dwellers to more location efficient neighbourhoods (Sanchez and Dawkins, 2001). Many of the campaigns that have been employed in promoting American cities assume that most suburban dwellers are to some degree anti-urban or afraid of urban areas of cities (Lang et al.,1997). Although consumers are expressing an ever-increasing interest in more location efficient homes, people still desire a single-family home with a yard, and are still able to obtain this North American dream at a (more) reasonable cost in the suburbs (Danielsen, Lang, and Fulton 1999; Downs 1994; Farris, 2001; Karsten, 2007; NAHB, 1999; O'Neill, 1999).

3.3 Q-Methodology

This paper utilized a Q-methodology to identify homebuyers' opinions and ideas on home location choice and used factor analysis to group (segment) participants by their shared opinions. This application of the Q-methodology to home location choice provides a new lens to investigate home location choice and provides insights into home location opinions in a major Canadian city. Q-methodology (hereafter referred to as Q-method) was developed in the 1930's by physicist and psychologist William Stephenson as a way of 'scientifically' studying participants' subjectivity, that is, their perspectives, meanings and opinions about a topic. Normal 'R method' factor analysis finds correlations between variables (e.g. age & weight, income & education) across a sample of subjects. Q-method, on the other hand, looks for correlations between subjects across a sample of variables. Q-method can be considered post positivist, in that "there is no single truth to be discovered, rather a myriad of perspectives to be (better) understood" (Jones et al., 2012, p 1409). However, Ellis et al. (2007) characterize Q-method as "a bridge between the positivist and post-positivist schools of policy analysis" (p. 523) in that it utilizes statistical methods and outcomes in the rigorous study of participants' subjectivity (e.g. opinions, attitudes).

Q-method has been utilized in defining groups of people by their shared viewpoints with regards to perceptions of travel mode behavior (Cools et al., 2009; Jones et al.,2012; Steg et al.,2001; van Exel et al., 2010), stakeholder perceptions on environmental planning issues (Barry and Proops, 1999; Cotton and Devine-Wright, 2012; Cotton et al, 2015; Ellis et al., 2007; Fisher and Brown, 2009), and Canadian regional energy discourses (Parkins et al.,2015). Increasingly, it is being applied to identify segments among concerned stakeholders and citizens in research on regional sustainability issues and renewable energy projects.

Thirty households in the greater metro region of Edmonton, Alberta with a total of 30 participants (21 solo participants, nine couples) were recruited for the study. These were recruited through a general call for research participants who had purchased a home in Edmonton within the last four years, via a University of Alberta graduate research monthly e-newsletter to support staff and graduate students, and several University mailing lists. Snowball sampling from the first set of potential respondents was utilized to recruit further participants not affiliated with the University of Alberta and limited to one connection through each participant so as to limit the possibility of overrepresentation. The criterion for the selection of participants was purchasing a home within the last four years in the greater metropolitan area of Edmonton, as previous research shows that recent movers most likely reside in a home that nearer represents their genuine preferences (Onaka and Clark, 1983). Participation was limited to people who had purchased single detached, semi attached (duplex, fourplex w/ shared wall) and row housing in the Edmonton Metropolitan region which makes up approximately 70% of homes. Apartment style condominiums were not considered for this study as this represents under 30% of all homeowners in Edmonton (City of Edmonton Census, 2016). These housing types were used as the criteria for the study mainly due to link between suburban sprawl and housing. The location choice of homebuyers purchasing these homes (single detached, semi attached, rowhome) is a fundamental motivation for this study as sprawl development is linked with these types of housing. Apartment style condominiums and homebuyers location choice would be an interesting study but for the purposes of this research these types of homes were not included.

Participants who had purchased a home within the last year were prioritized to retain better recollection but recruitment and research restraints made expanding the criteria to four years necessary (Onaka and Clark (1983). The homebuyers in this project were assumed to have had some range of choice in housing options and were engaged in making a decision on which home to choose.

Watts and Stenner (2005) argue that there is value in having a small number of Q-participants (less than 50) as larger numbers can negate important distinctions between viewpoints. Research by Bailey et al. (2004) regard couple households as an interrelated network of geographically and socially 'linked lives' which forces partners to make home moving decisions collectively through negotiation and bargaining (Abraham et al., 2010; Hiller & McCaig, 2007). The majority of housing choice and decision-making literature regard the household as the appropriate level of study for investigation (Dieleman, 2001). This study had both couples and single members of households participating in the sorting. When one member of a household was sorting alone, the participant was given instructions to 'best represent' the views of the household that were used when the home location was chosen. These instructions were also given to couples that sorted together.

The Q-statements are generated from what is referred to as the 'concourse'. Brown (1993) refers to the concourse as the 'stuff of life', a collection of statements that represents a wide range of views regarding the subject being investigated. Concourses can be considerable (depending on the subject) and may include statements from a number of sources. For this study the initial concourse statements were primarily derived from three pilot consultations with recent homebuyers, popular news sources, home buying preference surveys and a thorough review of relevant areas of academic and related grey literature. Predominant sources for home buying preferences and surveys were the National Association of Realtors Community Preference Survey (2011 and 2013), the City of Toronto Home Preference Survey, the Urban Land Institute survey on housing, transportation and community, the Canadian Home Builders Association 2015 Canadian Home Buyer Preference National Study, and the two RBC-Pembina Institutes Home Location Studies (2012/2014).

From an original concourse of 110 statements, 48 noticeably redundant and/or repetitive statements were eliminated by the researcher. As per Watts and Stenner (2012), the remaining 62 statements were provided to colleagues and three volunteer homeowners that aided in the clarification of the statements wording and adding any relevant statements that were missed. Thirty-one statements were refined and tested with six pilot sorts to further eliminate any redundant, confusing or extreme statements as per Donner's (2008) recommendations (Table 3). Statements related to financial motives were intentionally left out of the concourse as the literature provides ample evidence of home finances being the number one decision making factor for the great majority of homebuyers (Litman 2016; Burda, 2012; Burda, 2014). It is generally accepted that economic realities and constraints are the foundation of a household's home buying decisions, thus it was very likely that any financial related Q-statements would have been placed in the 'most agree' position for the vast majority of sorts (Aero, 2002; Burda, 2012).

Before commencing the sorting procedure, the participants were provided with the general umbrella statement: 'Please rank these items according to their importance to your home buying decision.' As per Donner's (2008) and Watts and Stenner's (2012) recommendations, participants were encouraged to first go through all the 31 statements and place them into three preliminary stacks of agree, neutral and disagree. This helped break up the 31 statements into more manageable quantities to which more in-depth scrutiny could then be applied. Participants were then asked to arrange the statements in order from 'most disagree' to 'most agree' on either end of the grid with more neutral statements in the middle columns of the grid (Table 3.1). After completing the sorting procedure, participants were asked to review their choices and then were provided with an opportunity to recommend any statements that they felt should have been included in the sort.

Table 3.1 Fixed Distribution of the Q-set

	Most Disagree				Neutral			Most Agree	
Statement Score	-4	-3	-2	-1	0	+1	+2	+3	+4
Number of statements in column	2	3	4	4	5	4	4	3	2

3.4 Results: Three Segments of Homebuyers

The participants Q-sorting results were recorded and entered into the PQ-Method software (Schmolck, 2014). The researcher utilized the software package to identify three factors of recent homebuyers which represent 'ideal sorts' regarding the opinions of participants and how they sorted the statements. These three segments were labeled by the researcher as 'Location Aware', 'New Suburban', and 'Mature Suburban'. The names of the segments were derived by the researcher during the factor interpretation process which was based upon the relative ranking of the Q-statements in each segment as well as consensus statements and any statement ranking denoted as 'notable' (e.g. segment one, location aware, ranked 'Commuting under 20 minutes each way' at +1 (Table 3), +1 is not considered 'distinguishing' by the software but when compared to segments two and three, it is ranked much higher and therefore considered interesting). These notable relationships provide insight into significant relationships within each factor and can show how participants ranked Q-statements relative to the other segments (Watts and Stenner, 2012). These segments represent three distinctive views with regards to home location preferences and opinions and provide valuable insight into household location choice amongst the participants.

The PQ Method software (Schmolck, 2014) first extracted eight possible un-rotated factors from the 31 sorts that were entered in. These eight factors were reduced down to three using criteria outlined by Watts and Stenner (2012) and Brown (1980). These three factors were chosen for possessing two or more significant factor loadings each, according to Watts and Stenner (2012). Factor analysis revealed three segments that displayed eigenvalues of 10 (Location Aware), 4 (New Suburban), and 3 (Mature Suburban) respectively. Watts and Stenner (2012) recognize factors as significant with a standard eigenvalue of 1 or higher (Kaiser-Guttman criterion) when

selecting factors (Raje', 2007). Factors that display eigenvalues over 1 explain more variance than a single q-sort would. These significant factors were then subjected to automatic varimax rotation by the PQ Method software (Schmolck, 2014) to arrive at distinct patterns and three main factors emerged that were differentiated by certain distinguishing statements (Table 3.2), (Donner, 2008). These three factors hold a cumulative explained variance of 56%, Kline (1994) considers explained variances above 35-40% a 'sound solution'. Participant 10 was left out of the final factor interpretations because they loaded evenly on all three which indicates no identifiable opinion or typology that could be grouped with others.

Table 3.2 Factor Loadings

Q-sort	Factor Loadings		
Participant	Location Aware	New Suburban	Mature Suburban
1	0.3974	**0.5021**	-0.4320
2	**0.4536**	0.1814	0.1655
3	-0.0188	**0.6933**	0.1732
4	0.3699	**0.5401**	0.0050
5	-0.0080	0.1715	**0.8428**
6	**0.6987**	0.0563	0.4108
7	0.2678	0.0287	**0.6391**
8	0.2440	0.1667	**0.6918**
9	0.1932	-0.0132	**0.5279**
10	0.3707	0.5448	0.4446
11	**0.6844**	-0.1614	0.4107
12	**0.7521**	-0.0068	0.1728
13	-0.1457	**0.7889**	-0.0254
14	0.0007	0.3607	**0.7066**
15	0.3038	0.2239	**0.5465**
16	**0.7476**	-0.1879	0.1420
17	**0.7068**	0.2560	0.3129
18	0.2300	0.0645	**0.5244**
19	**0.6523**	0.3076	0.0609
20	-0.1049	**0.6979**	0.4936
21	**0.5443**	-0.3561	0.0440
22	0.3614	-0.0865	**0.6834**
23	**0.6579**	0.1364	0.4914
24	**0.5152**	-0.0285	-0.3840

25	0.1047	0.2162	**0.8167**
26	-0.1195	**0.6554**	0.0460
27	0.0863	-0.1210	**0.8228**
28	**0.5696**	-0.3886	0.3064
29	0.5756	0.0620	**0.6164**
30	0.3081	**0.4815**	0.2782
Percentage Variance Explained	20%	13%	23%

3.4.1 Factor 1 - Location Aware

This factor reveals a strong desire for location efficiency in areas with access to active transportation options, and accessible public transit choices to frequent destinations (q-statement 19: ranking +4). This segment values the ability to get to work by walking or biking (21: +2) more than any other factor and enjoy having easy access to Edmontons' parks and trails system (27: +3). When choosing home location, the desire to keep their 'commute to work under 20 minutes' (4: +3) was also more important to them than to factors 2 and 3. 'Proximity to a community recreation centre' (hockey rink, gym, pool) was also more important to these homebuyers (18: +2). This group also feels that community events and a 'strong sense of community' are important (16: +1) and ranked 'regular interactions with their neighbors' higher than the other two groups (12: 0). They are also more favorable towards neighbors having 'diverse demographic age and income ranges' (26: 0) than other segments. Although not enthused about it, they ranked willing to live nearer the 'centre of it all' higher than the other two groups (30: -1).

This segment's views about neighbourhood design include negative opinions of traditional suburban culs-de-sac and curvilinear streets (10: -3) as well as the lowest ranking of homogenous neighbourhoods made up of a majority of single detached housing (8: -1). This group was also opposed to 'living in a new neighbourhood' that was built less than 10 years ago (3: -3) or 'living in a new home' less than 10 years old (9: -2) and had no need for 'extra parking spots for vehicles' (6: -4). Even though this group ranked having a single detached home (5: +4) and full backyard (29: +3) as or nearly as high as the other segments, they also ranked the need for having a spacious or large home much lower (31: 0).

3.4.2 Factor 2 - New Suburban

Unlike the other two groups these participants are primarily concerned with choosing a location where the value of their home would increase (14: +4). New homes in new neighbourhoods were important to this segment who ranked 'living in a new home under 10 years of age' (9: +3) and within a 'new neighbourhood under 10 years old' (3: +2) considerably higher than the other segments. Revealing their preference for new developments (and potentially a negative opinion for home renovation) this group ranked 'living in a character home' (1: -4) lower than the other two groups as well as ranking 'living in an established neighbourhood (mature trees, older homes)' (15: -1) lower than the other two factors. Commuting was of less concern for this group who ranked 'Commuting under 20 min or less' (4: +1) lower than the other two segments. This group was also distinguished by their low ranking of neighbourhood and community connection related statements. They ranked both 'interacting with my neighbors on a regular basis' (12: -3) and having a 'strong sense of community (events, block parties etc)' (16: -3) much lower than the other two factors. This segment also ranked having 'pre-existing social connections within their new neighbourhoods' lower than the other factors (20: -2). Living in a heterogeneous housing environment appeared less important to this group as they ranked living in a 'neighbourhood with a diverse mix of home designs' lower than the other factors (7: -1). This segment ranked living in a 'neighbourhood with a diverse demographic makeup' (ages, income levels etc.) (26: -3) lower than the other factors as well.

3.4.3 Factor 3 - Mature Suburban

This segment ranked having a full backyard highest amongst the three (29: +4). These areas of Edmonton also contain the character type homes (1: 0), 'established neighbourhoods' (15: +3) and 'neighbourhoods that feel spacious' (11: +3) that this group ranked higher than the other two. They express a desire for 'parking for more than three vehicles' to go with their large yards and were somewhat more concerned with retaining neighbourhood housing homogeneity ('neighbourhood with a majority of single detached homes', 8: +1) than the demographic make-up ('Neighbourhood with a diverse demographic makeup', 26: -2). This group was not interested in 'living in a new home (less than 10 years old)' (9: -3) or a new neighbourhood (3: -4). The

mature suburban segment wanted to avoid living near 'large scale shopping' (24: -3) or the 'centre of it all' (30: -3), and seemed to value the mature neighbourhood and their large yards the most.

Table 3.3 Q-sort values for each statement

Number	Statement		Score		
		Factor	**1**	**2**	**3**
1	Living in a 'character' type home		-1	**-4**	0
2	Quality of local schools		-3	-1	-1
3	Living in a new neighbourhood (less than 10 yrs old)		-3	2	**-4**
4	Commuting under 20 minutes (each way)		3	1	2
5	Single detached home		4	3	4
6	Parking for more than three vehicles (on/off property)		**-4**	-2	1
7	Neighbourhood with a diverse mix of home designs		0	-1	0
8	A neighbourhood with a majority of single detached housing		-1	0	1
9	Living in a new home (less than 10 yrs old)		-2	**3**	**-3**
10	Cul-de-sacs and curvilinear streets		**-3**	0	0
11	Neighbourhood feels spacious (space between houses)		0	1	**3**
12	Interacting with my neighbors on a regular basis		0	-3	-2
13	Easy highway or freeway access		**2**	**2**	**2**
14	Neighbourhood where my home value will increase (investment)		1	**4**	0
15	Established neighbourhood (mature trees, older homes)		1	-1	**3**
16	Strong sense of community (events, block parties etc)		1	**-3**	-1
17	Proximity of parks, playgrounds, fields		2	3	2
18	Proximity to a community recreation centre (pool, rink etc)		2	0	1
19	Easy access to convenient transit options		**4**	0	0
20	Neighbourhood with pre-existing social connections (family friends)		-1	-2	**2**
21	Ability to walk/bike to work		2	-4	1
22	Neighbourhood with families at a similar 'stage'		-2	1	-2
23	Shops, restaurants and cafés within walking distance		1	1	-2
24	Proximity to large scale shopping		-2	**2**	-3
25	Proximity of local schools		-4	0	1
26	Neighbourhood with diverse demographic makeup (ages/income)		**0**	-3	-2
27	Easy access to trails and parks system		**3**	-1	1
28	Having a small outdoor space (patio or balcony)		-2	-2	**-4**
29	Having a full backyard (lawn, garden)		3	2	**4**
30	Living near the 'centre of it all'		-1	-2	-3
31	Having a spacious home		0	**4**	3

3.5 Discussion

Edmonton, like other North American cities, is experiencing a housing development predicament brought on by considerable population growth and the self-imposed goals of limiting further

greenfield housing expansion and encouraging infill development. Research by Landis (2017) has shown that demographics and markets may matter more than housing policy when attempting to reduce sprawling development trends. Edmonton has a younger than average age as well as a higher than average immigration rates which have both been connected to the reduction of sprawl development (Landis, 2017). This studies homebuyer q-method segmentation and improved understanding of homebuyer's opinions and preferences adds to the homebuyer preference literature as well as gives municipalities and developers alike additional information on their target homebuyer markets. This paper has revealed three distinctive segments among recent homebuyers, grouping them by their opinions rather than by conventional demographic and socio-economic variables. These segments can add information to the homebuyer narrative and provide a richer understanding of housing location preferences in a North American metropolitan context. They represent three groups of homebuyers that made home location choices based on neighbourhood characteristics, location based experiences (transportation and proximity to frequent destinations) and home attributes. Each segment provides a deeper contextual understanding of homebuyers and the implications of each group's distinctive housing choice opinions will now be considered.

The 'location aware' group is characterized by preferences for active commuting transportation (walking and biking), convenient transit options and access to trails and parks. This group had a definite inclination towards 'location efficient' homes and neighbourhoods alike and appeared to realize the compromise between the increased commuting and transportation costs of new homes on the edge of the city and the increased initial costs of a home closer to the core. The 'new suburban' group is concentrated on the value of their homes increasing and residing in new neighbourhoods and new homes consistent with development in traditional suburban neighbourhoods along the developing edges of cities like Edmonton. This group has a preference for neighbourhoods with a majority of single detached housing, and favor neighbourhoods with less community connections and less demographic diversity than the two other groups. The 'mature suburban' segment is primarily concerned with large yards, abundant space between homes and quiet established neighbourhoods.

The 'location aware' group is focused on the location of their home while ranking longer than average commuting and new suburban housing and neighbourhood design negatively. Homebuyers in this segment value the efficiency that their location offers and may, like the participants surveyed in the Pembina/RBC home location study, realize the financial, health and time advantages that living in a location efficient home provides (Burda, 2014). This group closely resembles the urbanist groups that choose homes in inner urban locations due to an abundance of amenities, easy commuting and walkable services that previous literature and market surveys have identified (Burda, 2014; ULI, 2015). This study illustrates their prioritization of more efficient locations that provide a shorter commute time, have access to convenient transit options, and allow them to use active transportation to get to common destinations. This segment provides support for municipalities who are considering infrastructure improvements like the expansion of transit lines and transit-oriented development (TOD) and helps give further credence to investments in these areas. Their preference for active transportation, walkable amenities and proximity of trails illustrates the propensity for these types of homebuyers towards supporting municipal investments and development of additional active transportation infrastructure like dedicated bike lanes, walking paths and multi-use trails. Research has shown that a consistently growing number of homebuyers are considering active transportation and the efficiency of their home location each year (Litman, 2012).

The 'new suburban' group prefers 'new homes' and 'new neighbourhoods' (which are commonly located in greenfield developments on the edges of cities) and aligns with the still prevalent pattern of suburban family living (Karsten, 2007). Developing suburban neighbourhoods in Edmonton are built with homes in close proximity to one another compared to established and mature neighbourhoods[5]. The Mature neighbourhood segment, by contrast, ranks 'new homes' and 'new neighbourhoods' very low, while placing 'full backyard' and 'spacious neighbourhood' much higher. The backyards and spacious neighbourhoods preferred by the mature neighbourhood group align with the desire for privacy that, according to homebuyer preference surveys, still ranks highly among homebuyers (Burda, 2014). Both

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[5] Densities in recent residential Edmonton developments average 30 to 35 dwelling units per residential hectare (du/nrha) compared to averages of 26 du/nrha for mature areas and 24 du/nrha for established areas (City of Edmonton, 2014).

segments share a similar preference for a spacious home but differ significantly on other neighbourhood preferences. This difference outlines clear delineations amongst homebuyers that do not prioritize location and provides additional information in the conventional suburban-urban conversation. The 'new suburban' groups high ranking of new homes may demonstrate their potential affinity towards new large-scale compact infill developments currently being undertaken in Edmonton. This segment provides valuable preference information for developers looking to make inner urban infill developments more attractive to consumers that choose homes developed on the edge of cities. This groups preference of new single-detached homes in new neighbourhoods, may point towards innovative infill construction types not being developed yet in Edmonton. New smaller homes built around a courtyard near to one another (cottage homes, pocket neighbourhoods) are being realized in many other jurisdictions and may fit this segments preferences better than shared wall row-houses and condominiums. As Landis (2017) shows, reducing sprawling development may have more to do with housing policies and regulations that allow young and diverse households (like those in Edmonton) to fulfill their own diverse housing preferences for walkable, mixed use neighbourhoods than strict urban development containment policies and programs. This could entail planners and municipalities incentivizing successful models of moderate-density development and facilitating the relationship between consumers and innovative developers (Landis, 2017).

The mature neighbourhood groups' priorities of a yard and spacious neighbourhood provide information for municipalities and developers on informing their design, layout and marketing of new developments. These preferences may point to the need to design higher density infill developments with individual green spaces or small yards that give homebuyers the perception of spaciousness and privacy.

3.5.1   Consensus Statements

Even though these segments were different in many of their opinions and preferences, they did coincide on some consensus statements: 'living in a single-detached home (not a home with a shared wall)' and 'having a full backyard' were amongst the top preferences of all three segments. These shared statements may exemplify the high priority placed on 'privacy' when

choosing a home. Housing surveys still rank privacy as one of the important considerations by homebuyers' and developers and municipalities alike would benefit from keeping these almost universal sentiments in mind when designing and planning developments and marketing strategies to attract homebuyers' to new neighbourhoods. Infill developments that reduce the outdoor space to a small patio may be better served in including a considerable shared green space or a smaller private yard. Infill developers could also increase their structural soundproofing in shared wall developments like row housing and brownstones to appeal to the privacy concerns of homebuyers that share characteristics with this segment.

3.6 Conclusion

The q-method approach of segmenting homebuyers by their shared opinions proved valuable in identifying three diverse segments. These distinct segments demonstrate the complexity of home location preferences in terms of opinions and choices, rather than the socioeconomic and demographic attributes emphasized in R studies. The reasons for municipalities trying to encourage location efficient housing choice include; increased costs of servicing new developments (e.g. sewers, fire, police etc), transit connections to outlying development areas, increased traffic, and increased GHG emissions of increased commuting vehicles. Cities are attempting to mitigate these effects by encouraging infill housing via policy modifications, and information/marketing campaigns of which both can be informed with data from these three factors. Research by Landis (2017) has shown that municipalities that possess reliably managed programs to incentivize infill development can promote less sprawling development. Housing developers may also benefit from these data by introducing innovative infill products that appeal to homebuyers or take into account the high priority that privacy is placed in when building new compact developments. Further research could continue with larger quantitative studies designed with these findings in mind to seek representative populations of these segments and further inform campaigns to educate homebuyers on more location efficient homes.

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Chapter 4: Location Efficiency in Neighourhood Home Location Choice: A Qualitative Investigation

Kurt Borth, Robert Summers, Damian Collins

4.1 Introduction/Background

Through supporting Location Efficient[6] (LE) housing development, municipalities can help provide homes in areas that result in fewer VMT (vehicle miles travelled) while increasing the accessibility of employment, amenities and services, active transportation (walkability, velomobility) and transit options (Poticha and Haas, 2006; Burda, 2012; 2014). Potential benefits to homebuyers associated with choosing an efficient home location can include reduced commuting time and costs, improved health and wellness, lower greenhouse gas (GHG) emissions, and lifestyle effects (e.g. more leisure time) (Lyons and Chatterjee, 2008). A majority of North American homebuyers have still been shown to desire homes in suburban developments, and cities are still adding the majority of their growth in these types of developments (Fulford, 1996; Gordon, Hindrichs and Wilms, 2018; Saville-Smith and James, 2010). In order to decrease transportation energy use, GHG emissions and infrastructure costs associated with new suburban development, municipalities are attempting to promote the development of and the demand for homes that are closer to employment centres and along transit corridors (City of Edmonton, 2016a; Hoehner, Barlow, Allen, & Schootman, 2012; Litman, 2012; Natural Resources Canada [NRCAN], 2009; Rose, 2010). Research has suggested municipal policies that incentivize infill and transit oriented development (TOD) could be a potential tool in reducing auto dependent suburban sprawl development along the outer edges of cities (Landis, 2017).

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[6] Location efficient neighbourhoods consist of compact mixed-use neighbourhoods with accessibility of employment opportunities, shopping and essential services, and convenient access to public and active transportation options (trails, walkability, bike paths) (Poticha and Haas, 2006).

Understanding home location choice through a location efficiency lens will help municipalities, planners, and developers with strategies to attract people to location efficient neighbourhoods. At the neighbourhood scale, compact mixed-use areas with accessibility to shopping, employment opportunities and essential services, and convenient access to public and active transportation options (trails, walkability, bike paths) are considered location efficient neighbourhoods (Poticha and Haas, 2006). Home location choice has been studied by diverse disciplines, yet little is known of how location efficiency factors into home location choice. Studies by Burda (2012, 2014) on housing location preferences show that eighty-one percent of homebuyers surveyed would rather live in a more location efficient home, yet traditional suburban development still continues unabated (Gordon, Hindrichs and Wilms, 2018). Research and residential preference surveys have shown a growing group of homebuyers desiring easy access to amenities, services, employment and frequent destinations that are associated with location efficient neighbourhoods (Becker, Bernstein, and Young, 2013; Borth and Summers, 2017; Burda, 2014; Litman, 2010; Lewis and Baldassare, 2010; Nelson, 2009; Rauterkus, Thrall, & Hangen, 2010).

This study recruited recent homebuyers in Edmonton, Alberta and used semi-structured interviews to look into home location choice and location efficiency. The purpose of this study is to expand upon existing research into both location efficiency and home location choice and investigate how location efficiency factored into homebuyers' decisions regarding their choice. Although location efficiency has been utilized to describe neighbourhood attributes and as a metric to assign location efficient values to homes, little is known about how homebuyers employ location efficiency in their home location choice. These qualitative based findings will contribute to further understanding the inconsistency between homebuyers expressing interest in location efficient homes and the continued unrelenting growth in suburban areas. This research was undertaken to address two objectives; 1) to investigate the factors that influence home location choice with regards to location efficiency and 2) to consider participants' inclusion of location efficiency in their home location choice. This paper will examine the relevant literature regarding the background of location efficiency and home location choice. The pertinent home

buying trends and motive for this research will then be presented followed by a description of the case and the presentation of the results.

4.2 Literature

In this literature review, various ways of conceptualizing housing location choices are illustrated beginning with the background of location efficiency and then looking at the foundations and diverse approaches of home location choice. Establishing the state of location efficiency and home location choice knowledge will set the context and provide further impetus for this study.

4.2.1 Location Efficiency

Location efficiency (LE) was first derived by research into the relationship between neighbourhood density increases and household vehicle miles travelled (VMT). Subsequently, an innovative lending mechanism called the location efficient mortgage (LEM) was produced as a practical tool to provide larger home loans to potential homebuyers who desired homes in more location efficient areas (Blackman and Krupnik, 2001; Riggs 2017). This led to a divergence of the usage of the phrase location efficiency, beginning in the late 1990's. The first usage referred to the description of ideal location efficient neighbourhoods based upon their infrastructure and spatial attributes. The second usage focused on the location efficiency value (LEV) of households using a metric based location measure centered on their specific transportation costs and commuting needs (Blackman & Krupnick, 2001). Both uses of LE - location efficient neighbourhoods and household location efficiency - will be defined and utilized in in this paper.

The concept of location efficient neighbourhoods is well developed (Poticha and Haas, 2006; Rose, 2010; Burda, 2012; 2014). Research for the U.S. Environmental Protection Agency (EPA) found that when comparing homes varying only in their geographic location (i.e. keeping home size, home age, and occupancy constant) the more 'location efficient' home could use up to 38% less total energy compared to a home in a 'conventional suburban development' (Rose, 2010). The Urban Archetypes project, sponsored by Natural Resources Canada, compared energy consumption profiles of varying urban and suburban neighbourhoods in eight cities across Canada. They found that neighbourhoods that were closer to the urban core or central business

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district (generally more location efficient) had lower energy use, energy costs and GHG emissions. Studies suggest that development projects closer to city cores generate substantially lower VMT's and therefore lower greenhouse gas (GHG) emissions per capita than greenfield suburban development (Ewing et al.,2008; Litman, 2012).

Canadian residential and transportation sectors make up 29% of total national secondary energy use (the energy used by final consumers in various sectors of the economy e.g. electricity, vehicle fuel, natural gas for heating) and 33% of Canada's total GHG emissions (NRCAN 2016). Some estimates into urban form and GHG emissions show that urban emissions could be reduced 5-20% with the promotion of compact urban development, TOD, and urban renewal (infill) development (Ewing et al., 2008; Lee and Lee, 2014). Residents of these location efficient neighbourhoods tend to own fewer vehicles, use active transportation and public transit on a more regular basis, and drive less (Litman, 2016).

4.2.2   Housing Choice and Preference Background

The theoretical foundations of housing choice began with Rossi (1955) looking at family motivations in housing choice and migration decisions. In his classic work 'Why Families Move' (1955) he argued that residential moves were a normal part of the family life cycle. His central concept was that families changed residences in order to satisfy their neighbourhood and home attribute preferences that change as a family moves through a cycle of life (Coulter and Scott, 2015). Since then a large body of literature and various frameworks have been attempting to better understand the residential relocation process (Coulter et al., 2012). Rossi's original conceptual framework 'family life-cycle' suggested that the traditional 'nuclear family' experienced different stages in their life-cycle that corresponded to the need for more or less living space. These stages included formation (co-habiting/marriage), expansion (children), contraction (children leaving), and dissolution (separation/divorce/death of a spouse). Awareness and emergence of non-traditional household dynamics and life choices (people with no children, being single, remarried etc.) along with the 'life-cycle' being criticized for being too deterministic led to a progression towards a more holistic 'life-course' conceptual framework

approach to housing choice and tenure (Clark and Dieleman, 1996; Mulder, 1996; Wildish, 2015).

4.2.3   Life-Course Approach

Rossi's original life-cycle approach discussed how a family transition to a new stage could lead to a mismatch in housing as the housing attributes (number of bathrooms, yard size, etc.) may no longer meet the family preferences or even their needs (Jansen et al., 2010). This mismatch can lead to discontent and eventually a move to a different home that better addresses the new situation. Rossi's life-cycle approach (1955) viewed the birth of a first child and the transformation from a couple to a family of three as commonly followed or closely preceded by a transition from renting to owning a home. Related work by Bell (1968) discussed how the decisions of a family who moved to the suburbs after having children could be attributed to attempting to find a more suitable place for family life than what was offered in a city's core. In contrast to the life-cycle, which represents the establishment and development of a family as a static progression of fixed states, the life-course approach analyzes the arrangement of 'careers' of a particular individual or group over time (Kok, 2007).

Mulder and Hooimeijer (1999) demonstrate how in a life-course perspective, individuals are considered as following parallel 'careers' in diverse 'life-spheres', for example a housing career, a scholastic career, and an employment career. Four of these 'careers' may help explain household relocation. The family career, the educational career, the employment career and the housing career have each been shown to possibly trigger a move (Goetgeluk et al., 1992; Mulder, 1993). Clark and Onaka (1983) discuss the example of beginning a university career and how the individual (and possibly household as well) must relocate if commuting to the institution is not a possibility. The life-course approach is attentive to individual life course paths that help inform housing preferences while allowing for household limitations and available resources to help determine if these preferences can be realized (Feijten, 2005; Wildish, 2015). The life-course approach also accepts that the household 'choice set' is delimited by the context of the local housing market (constraints and opportunities) as well as the relevant economic, sociocultural and political conditions (Mulder and Hooimeijer, 1999; Wildish, 2015). Analysis on the life-

course have utilized qualitative data such as interviews, biographies and data from other sources as well as quantitative data including home market statistics and household demographics (Jansen et al., 2011).

4.2.4 Housing Choice and Preference

Housing choice and residential preference inform one another and are considered interrelated. Choice refers to the actual housing decisions and tradeoffs that homebuyers make when faced with real world constraints, with preferences reflecting a more aspirational or long-standing orientation (Jansen, et. al. 2011; Wildish, 2015). Homebuyers are subject to a range of influences when choosing a home and are required to make numerous trade-offs and compromises. Home choice factors can include the interrelated influences of preference, values, family and friends, state of the local housing market, regulations, availability and personal factors such as socio-economic standing (Coolen, Jansen, and Goetgeluk, 2011; Levy, Murphy and Lee, 2008).

Homes can be considered 'complex composite goods' and choosing a residence usually involves a household trading-off diverse housing attributes (Borth and Summers, 2017; van Ham, 2012; Wildish 2015). Dwellings consist of numerous features including quality and style, which cannot be independently purchased or rented. In addition to the physical qualities of a home and property, attributes can also include access to public amenities and services, neighbourhood qualities (reputation, walkability, safety) and the relative location of the home with regards to the rest of the city and its transportation infrastructure (Wildish, 2015). Households' home location choices are constrained by supply and the many other factors outlined above, and due to these constraints people's housing choices do not always align with their housing preferences (Jarvis, 2003; Vasanen, 2012). For example, a household may choose a home location that fulfills their preference for a location efficient neighbourhood but does not meet their preference for number of bathrooms. Jansen et al. (2010) points out that the most significant distinction between housing choice and preference is that preference is a somewhat 'unconstrained evaluation of attractiveness' (p. 2). In the circumstance of a home, choice will always reflect the combined influences of preference, availability, policies and regulations, market conditions and internal

and external individual factors such as social norms, lifestyle, income and class (Jansen et al., 2010).

4.2.5   Housing Choice and Decision Making

Housing choice literature points out that geography, transportation, and planning literature have typically relied upon a utility-maximization framework when examining residential choice (Clark, 1993; Jansen, 2010; Schwanen & Mokhtarian, 2004). This 'equilibrium' approach starts with an assumption that households continually compare the overall utility of their present home with all other potentially available homes that fit within their existing budget, and decide whether or not to relocate based on the current equilibrium or disequilibrium of their housing situation (Clark et al., 2006; Hanushek & Quigley, 1978). Households are thought to evaluate their current living situation constantly, and if they are not content with their current state of housing (or are prompted by a 'life-course' type event like an addition to the family, a new career, or retirement) they may consider a move (if their financial situation allows it) (Clark et. al., 2006). This decision begins the search and evaluation process to find a possible housing opportunity that better fits the needs of the household. The housing utility-maximization framework assumes that homebuyers (allowing for market constraints and budget) will select the housing option that best matches their preferences. The participants in this study were assumed to have assessed the housing market and chosen their home while attempting to maximize their utility to their best ability. Although utility maximization is understood to be employed by homebuyers the cognitive limits and shortcuts to this process are an important factor in decision making.

Bounded rationality was first presented by Simon (1955) as an alternative to the predominant rational choice behaviour models of the time and is a principal model of decision making used in institutional approaches (Brinton and Nee, 2001). Rational choice and utility maximization models suggest that homebuyers are fully rational omniscient actors who perfectly weigh all costs and benefits of each choice, and who then select the option that best optimized our personal utility. Simon challenged this notion of pure rationality when he suggested that humans were "intendedly rational, but only limitedly so" (1976, p 28). As with utility maximization, the key

element of bounded rationality is a process of utilitarian valuation resulting in an individual having a preference of one alternative over others (Simon, 1982). Simon (1955), however, presented two very significant modifications. The first is a suggestion that humans must make decisions with incomplete and imperfect information, and the second is that humans have limited cognitive capacity and as such cannot fully consider (or do not bother fully considering) all aspects of all decisions. Simon argued that a straightforward cost benefit analysis was often not employed in decision making and that instead, individuals regularly employed alternative heuristics to make decisions (Kahneman, 1999; Gigerenzer & Todd, 1999).

Simon (1979) introduced the concept of satisficing, where people are not assumed to be constantly maximizing their utility but making do with the resources (time, cognitive ability etc.) available. Allowing for the use of heuristics in home choice gives homebuyers the procedural shortcuts which can avoid wearisome individual decision-making. Housing search and moving, and even a constant evaluation of one's housing situation, are major cognitive and time intensive efforts. Home location choice can be very complex decision that homebuyers may attempt to analyze with varying levels of precision. Like most decisions, home location choice is subject to the limits of cognition and the heuristics based shortcuts we employ to make them. These heuristic shortcuts to fully rational decision-making could influence the amount of effort and cognitive capacity given to household location choice decisions. To fully analyze all the relevant factors that would provide a perfect rational decision of the housing market prices, all available choices, future costs and benefits as well as the optimization of transportation costs would be almost impossible for a homebuyer. Instead, households may use these heuristics based shortcuts that involve utilizing past decisions, past living experiences, current preferences, and popular trends to aid in their home location choice decision or be influenced by the choices of their peer groups, friends and families.

4.3 Housing Preference Trends

Housing research from North America and New Zealand has frequently shown that the majority of homebuyers prefer low-density, single-use living environments (Breheny, 1997; Fulford, 1996; Saville-Smith and James, 2010) with a consistently growing proportion desiring

neighbourhoods that are accessible, walkable, and allow shorter commuting times (Allen, 2015; Burda, 2012; Talen, 2001). Although this overall trend preferring low density housing endures, studies have also found that homebuyers would pay more for homes (relative to conventional suburban locales) closer to their employment in mixed use areas (Burda, 2012, 2014; Tu and Eppli, 1999, 2001). These preferences for neighbourhood location efficient characteristics are expressed by a growing proportion of urban dwellers.

Recent national home buying surveys have shown that homebuyers are interested in residing in more location efficient neighbourhoods and desire single family detached housing that is located in walkable transit oriented areas. A survey by Burda (2014) found that more than 81% of homebuyers surveyed in the greater Toronto metropolitan area would trade a large yard and detached home to live in a more modest house located in a walkable, transit accessible, location efficient neighbourhood. This same study showed that only 19% would deliberately choose a larger home where an automobile is necessary and one-way commuting is longer than 30 minutes (Burda, 2014). An Urban Land Institute survey on housing and transportation found that over 50% would prioritize the walkability of a neighbourhood while 32% of respondents wanted proximate accessible public transit (ULI, 2015). A U.S. housing choice report found that 20% of respondents reported that the location of their home was more important in their choice than the home itself and that 25% stated 'closer to work' as their principal impetus to relocate (Belden Russonello Strategists, 2013).

Households that prioritize location efficiency often make compromises on other housing attributes such as size, age, number of bedrooms, and others (Allen, 2015; Wildish, 2015; Saville-Smith and James, 2010). Although these studies have shown that some residents are looking for more location efficient housing options, Canadian cities (with Edmonton amongst the leaders) are continuing to add the vast majority of new growth in traditionally suburban areas (Gordon, Hindrichs and Wilms, 2018). This growing disconnect between housing desires and housing realities supports the impetus behind this research and the findings discussed below aim to uncover some reasons why this disparity still persists.

Although preferences for more location efficient homes has been shown to be rising, the Canadian appetite for a house and yard is also increasing. The 2017 Canadian Homebuyer Preference National Study by the Canadian Home Builders Association and Avid Ratings, found the majority of respondents desired a single-family home with the highest rates in the prairies provinces. Almost 68% of Canadians (increasing from 57% in 2015) reported a preference for a single family detached or single family attached home with a yard, with over 86% reporting a preference for a semi-detached (duplex, fourplex, row home) or detached home (Figure 4.1) (Avid Ratings Canada, 2017). The Canadian Home Mortgage Corporation Prospective Home Buyers survey (2018) found that at 61%, single detached homes are still vastly preferred by the majority of Canadians, this figure rises to 71% amongst people who have owned a home previously. In 2016, new dwelling units in Edmontons' developing neighbourhoods[7] consisted of 36% percent row housing and semi-detached homes and 44% single-detached housing (City of Edmonton Growth Report, 2017). Out of all housing stock in Edmonton, single detached and semi-detached/row housing makes up 61% (Edmonton Market Housing and Affordability Study, 2017).
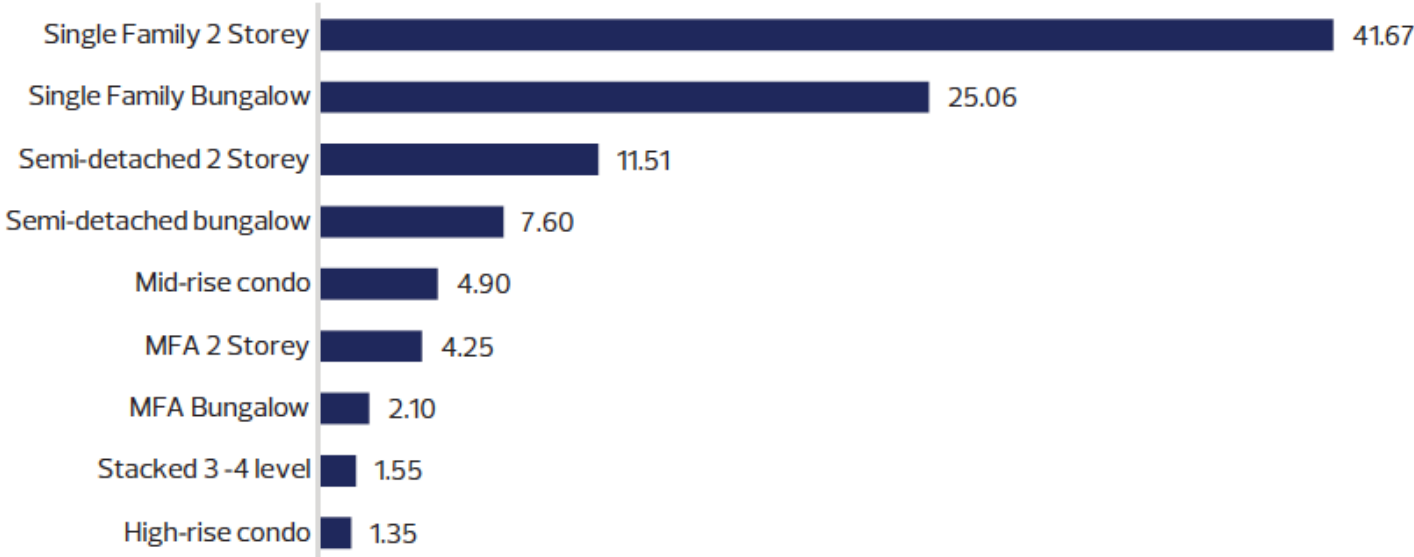

Figure 4.1 Housing Preference Trends in Canada in %, Avid Ratings 2017.

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[7] Developing neighbourhoods refer to neighbourhoods currently under development and planned neighbourhoods where lot registration has not yet started (City of Edmonton Growth Report, 2017).

In other work associated with this study, Borth & Summers (2018) provide segmentation data that differentiated three groups of homebuyers. One group, labelled 'Location Aware', compromised their home attributes in order to afford a home in their preferred efficient location. This segment also prioritized lower commuting times, getting to work by active transportation or transit, and proximity to trails and park systems that are abundant near Edmontons' core. Another segment from this research, labelled 'New Suburban', prioritized home attributes over their location and were less concerned about travelling greater distances by automobile to reach their newly built home.

4.4 Call for Qualitative Housing Research

Aside from the work in the life-course area of housing research, transportation and housing geography traditionally relied heavily on quantitative methods and positivistic viewpoints (Clifton and Handy, 2001; Gunnar Roe, 2000; Levy and Henry, 2003). In a comparative international study, Levy and Henry (2003), determined that positivism continues to be the dominant paradigm in housing preference research. Khoo-Lattimore, Thyne and Robertson (2009) found that the preeminence of the positivist quantitative framework has molded the landscape of housing preference research. According to Gibler and Nelson (2003) this positivist dominance of housing preference research has led to housing markets and property types being defined by narrow physical attributes rather than by any homebuyer benefits. Dieleman (2002) expressed concern that the field of housing research over-emphasizes the positivist approach and encouraged novel means of investigation and shedding new light on what housing means to people (Khoo-Lattimore, Thyne and Robertson, 2009). Coulter (2011) and Van Ham (2012) have called for a deeper contextual understanding of household location decision-making and further calls for qualitative based contextual studies into better understanding homebuyers' rationale for home location decisions have been also been made (Clifton and Handy, 2001). This exploratory project used semi-structured interviews to investigate household location choice amongst homebuyers in the Edmonton metropolitan region and how location efficiency factored into their decision.

4.4.1 Limits of Revealed & Stated Preference Surveys

Most of the research investigating homebuyers' motivations has been based on quantitative data, focusing mainly on either stated or revealed preferences. Stated preference studies are centered on investigating hypothetical or intended home choices by participants expressing preferences, desires and aspirations for attributes (Coolen and Hoekstra, 2001; Mulder, 1996; Wildish, 2015). There are limitations in these hypothetical home choice surveys, as they do not represent real world processes and how participants may alter their preferences when confronted with the realistic choice set and constraints of choosing an actual home (van Ham, 2012; Wildish, 2015). Stated preference studies have been broadly utilized in housing and transport research and have also been criticized as participants have been shown to overstate their responses under hypothetical conditions (Khoo-Lattimore, Thyne and Robertson, 2009; Kroes and Sheldon, 1988; Mulder, 1996).

The revealed preference method investigates actual market based choices that participants have made in order to uncover their underlying preferences and to assess their valuation of certain attributes. Homeowners are surveyed to produce statistics on the demographics of homebuyers (household size, income, age etc.), methods for searching and purchasing a home, and the prices of homes accepted and rejected (Khoo-Lattimore, Thyne and Robertson, 2009; Rossini, 1998). Revealed preference studies over time have been understood to show the urban form and development of a city or neighbourhood as an accumulation of resident, developer, planner and politician preferences over a long period of time (Storper and Manville, 2006). While revealed preference studies have contributed valuable information pertaining to housing choice outcomes they can be limited due to their lack of depth and inability to consider more complex reasons for homebuyers' choices (Khoo-Lattimore, Thyne and Robertson, 2009). Clark (1993) states *"a better understanding of the preference for particular tenures, a better understanding of locational preferences and how those preferences are formed and how they influence choices in the housing market are an important part in understanding how the urban structure will evolve"* (p. 301).

4.5 Description of Case Study

Edmonton, North America's most northern city, has a population of 932,546 with a greater metropolitan population of 1,321,426 (StatsCan, 2016). Edmonton, the fastest growing large city in Canada, has grown at a rate of 14.8% since the federal census in 2011 (City of Edmonton Growth Report, 2017). Like many North American cities, Edmonton has identified urban densification, location efficient infill[8], and TOD as principal components in changing the traditional development paradigm of new greenfield suburban single detached oriented housing. Gordon, Hindrichs and Wilms (2018) have outlined the prevailing suburban nature of Canadian metropolitan centres and their continued growth. This 2018 study shows that of the 231,955 population growth experienced from 2006-2016 in Edmonton, 81% of it was classified as occurring in auto suburban developments (Calgary was the only higher CMA in Canada with 83%). According to Gordon Hindrichs and Wilms (2018), "Auto Suburbs are classified as neighbourhoods where almost all people commute by automobile; there is negligible transit, walking or cycling to work. These are the classic suburban neighbourhoods" (p. 10).

In its Municipal Development Plan, the City of Edmonton has targeted a goal of 25% new growth in existing neighbourhoods (core and mature neighbourhoods) through redevelopment and infill by 2025 (City of Edmonton, 2010). These infill housing development goals have been created in order to decrease the long-term financial burden of new neighbourhood costs, reducing GHG emissions and infrastructure costs from personal automobile commuting, and to create areas of high mixed use density along existing and planned transit routes (City of Edmonton Energy transition strategy, 2015, City of Edmonton Infill Strategy, 2016). In 2018, the City of Edmonton nearly achieved their goal of 25% infill goal set out in their 2011 Municipal Development Plan (City of Edmonton Growth Report, 2017). These numbers were achieved

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[8] Residential infill is considered the development of new housing in established neighbourhoods. This new housing may include secondary suites, garage suites, duplexes, semidetached and detached houses, laneway homes, row houses, and other residential and mixed-use buildings.

primarily through the addition of apartment condo style units. Although these units lead to an increase in density, homebuyers still have to choose to reside in them.

In Edmonton concerns over the lack of strong demand for apartment condos driven by low consumer preference and greater prices (compared to suburban apartment condos) resulted in decreasing sales and an increase in unabsorbed units (new homes that have been completed but have not yet been purchased) (City of Edmonton Market Housing and Affordability Study, 2017). According to the Canada Mortgage and Housing Corporation (2017) unabsorbed units in Edmonton have increased 2%, 74%, and 366% for single-detached, semi-detached/row, and apartment condos, respectively from 2015-2017.

4.6 Methods

This qualitative research study is part of a larger inquiry that included a Q-methodology card sort to group the participants by their shared opinions regarding their home location choice (Redacted for peer review), followed by semi-structured interviews. These interviews were undertaken after the participants sorted the Q-statements. This approach followed Shinebourne (2009), who stated that the Q method can be used as a "first step with participants in conjunction with follow-up in-depth interviews" (p. 96). Semi-structured interviews were chosen to gain a deeper understanding of how participants chose their home locations and how that choice related to location efficiency. Research by Minichiello, Aroni, Timewell, and Alexander (1995) has shown that qualitative interviews can be superior to other methods in filling a gap in knowledge, particularly if multifaceted behaviours (like home location choice) are investigated (Young et. al, 2018). Research has shown that interviews can also help to empower participants, instigating changes in policy and improved circumstances for interviewees (Fontana & Frey, 2005).

Eligible participants were those participants who had purchased a home in the Edmonton metropolitan region within the last four years. A four year (or shorter) window was considered appropriate as previous research has shown that recent movers most likely reside in a home that closer represents their preferences (Onaka and Clark, 1983). These participants were recruited from people who had purchased single-detached, attached (duplex, fourplex) and row housing in

the Edmonton Metropolitan region. These housing types make up approximately 70% of homes in Edmonton (75-80% in Edmonton metropolitan region) and given that they tend to be lower density than other forms (such as condominiums and apartments), they take up the majority of residential space in Edmonton (City of Edmonton Census, 2016). These homes are typically associated with lower density developments than apartments and condominiums and cover the vast majority of residential space in Edmonton (City of Edmonton Census, 2016). These housing types were used as the criteria for the study primarily due to the link between housing development and suburban sprawl. The home location choice of buyers choosing home styles correlated with lower densities (e.g. single detached, attached, rowhome) is the underlying motivation for this research. This study was undertaken to better understand why homebuyers chose these types of tenure which contributes to the persistent suburban development of cities like Edmonton as Gordon, Hindrichs and Wilms (2018) point out. Investigating apartment style condominium home choice would be an interesting study but for the purposes of this research these types of tenure were not included. If apartment and condominiums made up 70% of Edmonton's housing, there would be less impetus to perform this research.

Recruitment for the study took place in 2014 and 2015, via multiple e-newsletters and a call for participants sent to several Edmonton based email lists. Participants were also recruited through multiple message boards, social media, references through professional and personal contacts of the primary researcher and through local community groups (e.g. Edmonton Federation of Community Leagues). Snowball sampling as described by Lewis-Beck, M., Bryman, and Liao (2003, P 1043) was utilized to locate subsequent interview participants. Through this approach, 30 households were recruited, with a total of 39 participants (21 solo participants and nine couples). The average age of participants was 38 years compared to the Edmonton average of 34.8 years, with an average household income of $100,968 compared to $101,470 for Edmonton. All but five of the participants had a college diploma or higher, which is higher than average for Edmonton (55% - 2016 Canada Census). Nine of the participants still had children at home with the remaining participants having no children or had children who had moved out of their home. The participants were dispersed throughout the greater metropolitan region of Edmonton as seen in Figure 4.3.
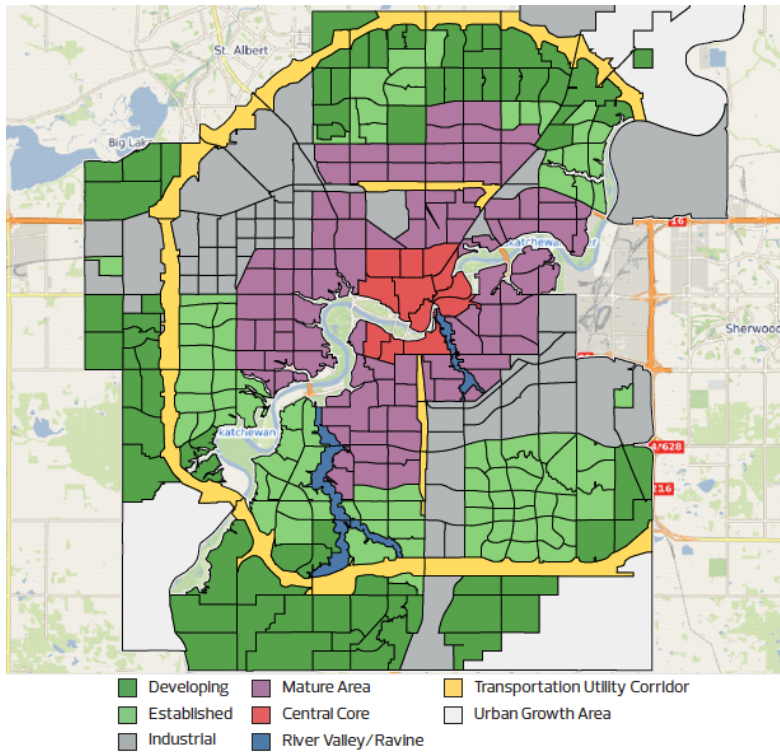
Figure 4.2 – Map of Edmonton Neighbourhood Designations – Courtesy of City of Edmonton Market Housing and Affordability Study, 2018
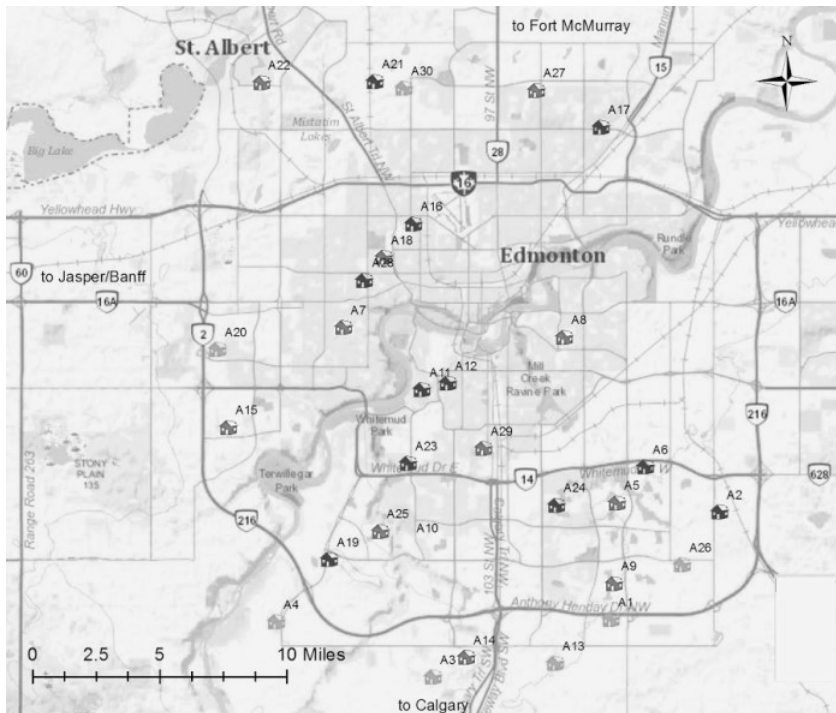

Figure 4.3   Distribution of participants in Edmonton metropolitan region

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The interviews followed a semi-structured guide that provided a framework for the questioning while allowing for open-ended responses from the participants. These guided questions reflected areas of inquiry regarding household choice and location efficiency that included home location choice, neighbourhood attributes (design, amenities, services), home attributes, commuting, transportation costs and habits. The larger themes of home location choice and location efficiency were explored throughout the questions and participants were encouraged to discuss related departures from this central subject. Approval was obtained from the Research Ethics Board at the University of Alberta, and informed consent was obtained in writing at the beginning of each interview. Each participant was provided the opportunity to review their answers after the interview and change/edit anything they may have been unsatisfied with. Quotations used in the findings section have been anonymized with numerical codes being assigned to participants and the letters 'a' and 'b' used to differentiate within participant couples. The numerical codes were assigned by the order in which the interviews were completed.

The semi-structured interviews were audio recorded, transcribed, and analyzed using thematic analysis as outlined by Braun and Clarke (2006; 2014). Thematic analysis is a widely used flexible analytic method for recognizing and analyzing patterns in qualitative data. In this analysis an inductive analysis was utilized to analyze the semi structured interviews (Braun and Clarke, 2006; Boyatzis, 1998). The interview data were analyzed thematically to allow for information regarding location efficiency and home location choice to emerge. These data were also guided by the general attributes of location efficient neighbourhoods and homes consisting of transportation costs, commuting, accessible employment, amenities and services, active transportation (walkability, velomobility) and transit options (Poticha and Haas, 2006). These established attributes were based on the characteristics that make up the current understanding of location efficient neighbourhoods and homes and were utilized as a general guide in organizing the data.

Following Braun and Clarke (2006; 2014), data analysis involved four steps: 1) Familiarization with data (first author made notes during the initial interviews, transcribed a number of interviews and completely reviewed all transcribed interviews with audio track); 2) Coding (first

author generated labels for all relevant items that emerged through reading the interview transcripts and being attentive to topics participants considered important using the NVivo 10 software package); 3) Searching for themes (first author sought out highly related codes and merged them, then collated and constructed general themes amongst the coded data); 4) Reviewing and defining themes (first author checks that themes 'work' with the entire data set, and constructs a detailed analysis of each theme). The established location neighbourhood attributes of transportation costs, commuting, accessible employment, amenities and services, active transportation (walkability, velomobility) and transit options were used by the researcher as a guide to examine the incorporation of location efficiency into home location choice. In this respect, specific interests, knowledge and values of the research team influenced the construction of themes.

Although mitigation efforts were undertaken, contacts through the University of Alberta may possibly have been over represented in the study due to sampling methods. Participants were recruited through multiple message boards, social media, references through professional and personal contacts of the primary researcher and email lists through local community groups (e.g. Edmonton Federation of Community Leagues). Another possible bias from first author's point of view as a white male, and homeowner of a single detached home in a location efficient neighbourhood. Respondents could also be somewhat biased in their responses when confronted with suggestions that their largest lifetime purchase (their home) may, in the long run, be costing them more than they had accounted for.

4.7 Findings

As described earlier, this qualitative research utilized a primarily inductive thematic analysis of qualitative interview data. The component characteristics of a location efficient neighbourhood were also incorporated into the semi-structured interview questions and as a lens of considering how participants integrated location efficiency into their home location choice. The research findings are presented below in four thematic areas relating to home location choice: commuting transportation; perception of transportation costs; local amenities (social, services, commercial) and neighbourhood design (walkability, velomobility etc.); and past experiences with home

attributes. This section presents each of these themes and their component parts. Transportation costs were also added to these attributes as they comprise the central component of location efficient homes. These location efficient attributes were utilized as a general guide throughout the coding and thematic analysis to aid in the interpretation of the thematic areas below while inductive thematic analysis was utilized to uncover themes that related to the discussions.

4.7.1 Commuting Transportation

Commuting was a central topic for the majority of participants, and included discussion of household transportation costs, mode choice and previous experiences. Minimizing automobile commuting is a central component of location efficient homes and neighbourhoods and this theme emerged from responses to numerous questions regarding home location choice. Household transportation costs can include both financial and time expenditures. The majority of participants indicated that these costs were not significant in their total monthly budget. Few participants calculated their full transportation costs based on their new home locations; most reported loosely calculating their new transportation costs and not being overly concerned with the financial differences between their previous location and the new one. Some participants did report calculating their anticipated financial transportation costs due to their new home location and found the change in costs minor compared to other household costs and not a factor in their location choice.

> 15 - *"no… we didn't think about transportation costs. We had a lot of expendable income. We didn't really care too much about that. Our transportation costs increased a little bit."*

> 17 – *"…not really. As long as the length of the commute wasn't too bad. The costs wouldn't be atrocious."*

> 23 – *"A little bit because when I was walking (to work) I didn't even have a transit pass, because I didn't need it. We figured it out per month. Car (gas) doesn't really go into our budget."*

30a – *"We thought about how much it would (cost)…because it's more economical for us to take one car to work than for us to buy both bus passes because actually transit is freaking expensive and it takes more time!"*

The majority of participants discussed the costs of their commute time yet did not appear to relate these time costs to their household transportation costs. When asked outright about transportation costs many said they did not think about it but went on at length about time, commuting, transit, and related issues. Participants did discuss how their commute times were affected by various factors like traffic, transit access, and highway access. This disconnect between stating that calculating transportation costs were not a priority and discussing numerous other costs related to commuting suggests a misunderstanding of the true costs of commuting.

14a "*…but I don't even want to attempt to drive here. It's conducive to road rage. Yeah it hinders more than helps…maybe not based on my costs, it's based on sanity I think more (than financial costs). Cost in environment may play into my decision, but mostly sanity in not wanting that headache of a commute (by vehicle) every day"*.

15a – *"no… we didn't think about transportation costs."*

16a – *"I know there are benefits for me to have a short commute for the environment and for other people but still it is very selfish it is because I don't want to spend my time in a car so it's kind of two things."*

19b – *"the cost didn't really matter… it was either she was going to be driving and parking for free or LRTing (rapid transit) and driving for 'free'."*

29b – *"...for me personally, I'd rather spend less time in a car in traffic where I tend to get a little uptight."*

Some participants focused more on mode choice. Participants were asked if easy access to transit was associated with their home location choice. Some reflected on how they possessed strong negative opinion of the transit system in Edmonton and therefore transit access did not factor significantly in their location decision. Conversely, other participants reported their affection for the Edmonton transit system and it being a deciding factor in their home location choice. Participants who regularly commuted using transit (and also some that did not) were quite concerned with transit coverage and talked about choosing their home locations along transit routes or with access to major routes or light rail transit lines. Using transit to avoid paying for downtown parking was also mentioned by participants. Some respondents also discussed their positive transit experiences and several included how they enjoy taking transit as it allows them to have personal time for reading or other personal pursuits.

> 2a – *"the actual final decision on my part was the fact that they put the (nearby) Transit Centre in… it was just very important to have easy access to transit because I was not paying parking to downtown."*

> 16a – *"I like a variety of transportation options because I've always thought that way, transportation has always been key for me, even if I don't use transit every day I like the option that I have it there."*

> 19a – *"if I had to pay (for parking) downtown, it would be really expensive"*

> 23a – *"I walk through the farm and it's beautiful, on the train we're going way faster than the cars in traffic. I read the entire time."*

> 29b – *"We needed… easy transit options. That was a big factor. She had recently got the job (downtown). So we wanted to be… we wanted those options for transit. Parking's pretty prohibitive. "*

The previous commuting experiences of many participants seemed to deeply influence their responses with regards to home location and commuting. Some participants who reported prioritizing their location with regards to lowering their commute times or commuting by active transportation, appeared to base their commuting related home location decisions on not wanting to repeat past negative experiences. Some of these participants had experienced long commutes in other urban centres (e.g. Toronto and Calgary) and used these past experiences as a comparative 'bar' when choosing their new home. Conversely, others' decisions were influenced strongly by positive previous comfortable commuting experiences. Other participants talked about the long commutes they suffered through during their university or college years (some when they lived at home with their parents) and how these commutes solidified their desire to choose a location efficient home later in life. These participants recount their negative commuting experiences in other cities and how that affected their recent home location choice.

> 11a – *"I think that when we moved back to Edmonton … we targeted this area as opposed to suburbs because we've lived in the suburbs in Toronto, and we didn't want the commute. When we were in Toronto we lived in Bolton, I worked downtown… I can't stand commuting after that."*

> 12b – *"A long car commute. It was often on freeways, and where you get stuck in traffic, and it's kind of a miserable experience. It took between 20 and 45 minutes each way everyday depending on how bad the traffic was… I mean now I don't want to do that again. Not wasting your life in a car. I felt like a big chunk of my time in (Calgary) was wasted in traffic. And it could be up to an hour and a half a day if traffic was bad, in winter or something."*

Several participants discussed how their past perceived negative experiences with long commutes during their university/college careers affected their decision making regarding home location choice. These past commuting memories helped solidify their recent home location choices.

16a – "I car pooled with my parents, and after that one hour commute (one way) I knew I would never want to do it again because it just cuts off two hours of your life everyday… it's a long long time…but half hour is at the top (of their range), like I would never go beyond half hour and below 15-20 is very comfortable. I'm 10 (minutes), 10-15 if the traffic is bad, that was because I've had such a long commute before and I know it's just wasted time."

17b – "Yeah I lived at home when I went to undergrad…it was like an hour and a half each way, and I didn't want to do that again. It was horrible."

23a – "I think doing my (teaching) placement, where I had to take 3 buses for an hour and a half. I think that really made me not want to do it again. Maybe if I didn't have to do that I would have been ok with further away."

Participants used their positive past experiences of easy commuting and walkability during their post-secondary experiences guide their decisions related to commuting and home location choice. The ease of walking to school and having amenities nearby seemed to stay with these participants for years afterwards. Once they had experienced proximate accessible services, walkable and bikable neighbourhoods, and good transit they wanted to retain those lifestyle characteristics.

12a – "So for me, I came from Saskatoon to Edmonton both in Saskatoon and here, so my entire post-high school life I've never in my life had to drive to either school or work. So I've always walked or biked everywhere. And plus I basically don't drive. I had to be in a place where I could get on my own fuel to work consistently, because I just never, ever wanted to have to rely on a vehicle, or even transit for that matter."

29a – "And for me, I mean... you know where I lived before I didn't even have a vehicle. I also didn't take public transportation. I was always within walking distance. And with

school, I moved to Edmonton and the first place I rented was just across the high level
bridge, so I could walk to the university, and when I moved in with (spouse) we took
transit, so for me, the first car I ever bought was when we moved into this house. And I
didn't want it. It was important that we could also take public transportation. I didn't
even have to drive."

In most cases, participants selected housing locations that aligned with their perceptions of cost. Respondents seemed to emphasize specific costs and benefits (either negative or positive) that were rooted in their past experiences versus fully calculating their total costs of their new home location.

4.7.2   Local Amenities and Neighbourhood Design

Accessible amenities and services were discussed often in the interviews. These amenities can consist of shopping and commercial services, health related services, neighbourhood walkability and velomobility, trails and parks and their accessibility. The vast majority of participants expressed their preference for living in neighbourhoods with accessible services and amenities, yet their perception of what accessibility meant differed greatly. Some participants desired parks and trails within a short walk or bike ride with others being satisfied with putting their bicycles in their car and driving 15 minutes to the nearest trail access. This difference in how participants view 'accessibility' with some expressing how they would not want to rely on their car for small trips and others seeing no problem with driving 10 minutes to pick up a snack demonstrates how participants' perceptions of accessibility varied.

Trail and park access is also a highly sought after amenity in Edmonton, due in part to the extensive network of river valley trails and linked parks (the largest continuous urban parks system in North America). Participants spoke regularly of wanting to have access and utilize the network for transportation and physical and mental enjoyment. Many conveyed the appeal that the trail system had on their home location decision. Many participants also spoke about the importance of walkable access to nearby services/amenities and how their home location choice was linked to this. Others emphasized the community building aspects of walkability and

neighbourhood structure and design. This ranged from references of communities that encourage 'bumping into' neighbours frequently, to specific urban forms such as culs-de-sac that promote social engagement.

> 6a- *"I would prefer a walkable area where people would walk places instead of drive. I think if people are in a location where you have to drive everywhere, they feel that they have to drive everywhere, you are less likely to have the sense of community and belonging, especially if you have garages because people will just get into their garage and leave and never see anybody because when you're in a car, you're invisible. And if you have a walkable neighbourhood then you can pass through the street and say 'hi' and it's more personable…it's just nicer and it's healthier and it's better and it's happier."*

Another finding that was brought up by participants were the social connections that grew out of choosing a cul-de-sac home location. Participants reported feeling deep social connections with their neighbours and talked about having bbq's in the cul-de-sac and how they felt safe leaving on vacation as they know their neighbours were watching their homes. Another component of this theme was how participants' children played within the cul-de-sac (physically) and how they had built in social connections because of this. Parents talked about feeling very safe knowing their children were out in the cul-de-sac playing as they could see them from their homes as well as be comfortable knowing that if a strange car or person entered the area, they would be noticed by everyone. These deeper social connections, as well as increased feelings of safety and security are obviously appealing to homebuyers and the participants shared their deep affection of these home locations and talked about their desire to choose another cul-de-sac home location if they ever moved from their current home.

> 9a – *"there was a block party before we moved in that we know about there are quite there are about 3 or 4 other families that have dogs so we will all kinda go out into the crescent and the dogs will play and stuff".*

13a – "No through traffic, you get to know your neighbours because you're forced when you're on a circle, you have to meet everyone. And everybody knows everybody. But even if the street was curved (in reference to former residence in modified new urbanist development), people don't move or gravitate that way. Like all our jackets, our shoes, everything was to the back, you're carrying groceries to the back (i.e. from the garage to the backdoor). In the cul-de-sac, the minute our garage door goes up, there's 5 kids, 'can (child's name) come and play?"

14a- "...(culs-de-sac)...Definitely, more social, I think. The neighbour came out the first day, and was meeting us with the moving van. The other people stopped by but I think they'd had an established idea of who we were... they knew who had lived there before, he was the only owner, he'd given them some indication of who was moving in. They were happy to hear it was a younger family, they have block parties so I think they have a lot of interaction. They kind of all watch out for each other. They'll check your house over (if you're away) and make sure your garage is locked... shovel your walk. If things look suspicious, they'll check into it. Before it wasn't a priority. We have our own friends, you know, we didn't need our neighbours to be our friends. Now I'm finding out how much convenience there is in having your neighbours as your good friends."

27a - "...and that (the cul-de-sac) was also where people talked because the kids are out there and you're watching them, and so the whole neighbourhood knew which kid belonged where and my son as a little guy had to be brought home many times. Because he was wandering and people would bring him back, it was a very good place to have him grow up."

4.7.3   Past experiences with home attributes

Infill and TOD housing development tends to be made up of higher density types of housing. These housing types typically consist of shared wall homes and this theme centred on the reasons participants provided for not wanting to reside in such housing types. This theme includes participants' concepts of privacy, self-reliance, childhood housing experiences and home

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ownership which they assert influenced their home choice. Participants frequently expressed negative associations with past shared wall living conditions, especially in terms of noise. They talked about hearing noises from neighbours or being concerned that they themselves were being too loud. Past experiences of odours from cooking and smoking were also influenced their decision to buy a single detached home that they could afford.

> 12b - *"So in the past two houses we lived in in Edmonton we were renting the main floor and there were separate tenants in the basement, and it got to the point where… I was so stressed out studying that I'd come home and there would be noise in the basement, and I was really sensitive to noise, so we just knew we needed our own place. So duplex, condo, anything with a shared wall was out of the question."*

> 15a – *"…we had lived in a house with tenants downstairs, and I had lived in apartments in the past, and I find depending on who you have there, you can end up with a bad situation, like smoking in the house, different things. You can't control that, right. And I don't like that. For getting a house vs a condo, noise, privacy, was a huge factor, actually."*

> 16a – *"…and the main thing was sound between the apartment walls, almost all of my apartments had terrible sound proofing and I got tired of that and sometimes I want to turn up the radio too and I don't want to disturb my neighbours and in the house I never had to worry about that. That's (soundproofing) what would get me into higher density living, I want quiet, but I want to be able to turn up my radio…"*

> 27a - *"We've lived in townhouses before and we just don't like the noise of having somebody there, noise, smells we could smell them cooking in the townhouse, we could smell their food."*

Another common complaint regarding living in a home with a shared wall or roof was the perceived compulsory involvement in homeowner responsibilities with another party.

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Respondents discussed their dislike of having to worry about sharing maintenance and upkeep of their property with someone else. Some participants talked about not wanting to have to depend on a neighbour (in a townhouse, duplex etc.) for any of the costs or responsibilities of home maintenance.

>5a – *"we had townhouse and we had neighbours and it was terrible so… lots of noise and lots of garbage outside that just moved naturally to your area as well and lots of issues that you have to resolve together. However sometimes with some people it is just impossible to do…like fixing things and stuff that was a huge issue. So we have it (their own detached house) and we are fully responsible for it just us, so that was a big consideration as well"*

>22a – *"it's just about having your own space and you don't have to have the discussion about re-shingling the roof and you don't have to have the discussion about building a new fence"*

Past positive experiences with certain housing types was also discussed by participants who talked about growing up in a single detached home with a large yard and how that influenced their decision to choose a single detached home for themselves.

4.8 Discussion

The themes above uncover evidence that increases knowledge on the integration of location efficiency into home location choice and provide data on new aspects of home location choice. The findings were primarily derived from thematic inductive analysis while using the attributes of location efficient housing and neighbourhoods as a guide and consist of commuting transportation, local amenities and neighbourhood design and past experiences with home attributes and were derived from the participants' interview data and presented above. These findings will now be reviewed with relation to literature and the provision of recommendations for municipal considerations.

4.8.1   Commuting Transportation

4.8.1.1 Past commuting experiences

Some participants had experienced long commutes in the past and reported how these experiences influenced the prioritization of their home location with regards to lowering their commute times. Further, some participants home location decisions were influenced strongly by previous positive commuting experiences. Feijten, Hooimeijer and Mulder (2004), in studying how past experience influences current home choices, showed that past living experiences can deeply influence home location choices. That research, however, focused on people tending to return to a type of area or neighbourhood that they associate with their childhood (e.g. rural idyllic). This research expands upon that to include consideration of past transit and both positive and negative living experience in different housing forms.

The participants who reported the ease of walkability and accessible transit from their university and college experiences and how that influenced their recent home location choice aligns with Zhou's (2012) findings that the choices that university and college students make regarding housing and transportation can influence sustainable living behaviours and choices in the future. The findings from this research study also support Carlos (2003), who has shown that individual behaviours and beliefs adopted during time at university or college can have profound effects on later behaviours and beliefs. In that study, the participants reported wanting to continue their accessible low commuting times that they enjoyed as students. These experiences may also be influencing household location choice as a function of the heuristics utilized in bounded rationality decision making employed by homebuyers. The ability of past experiences or memories to disproportionately influence our current/future choices is a component of some of the general models of heuristics described by Kahneman (1999) and Gigerenzer & Todd (1999). Findings from this study suggests that such heuristics are at work in housing location choice.

Municipal Policy Considerations

To aid in the establishment of these types of connections that have led these participants to location efficient housing choices, municipalities and post-secondary institutions could work together to foster a location efficient transportation and housing culture amongst students that

facilitates and supports location efficient choices. This culture could be reinforced by using successful tools like subsidized transit passes for student populations a (Bond & Steiner, 2006; Brown, Hess, & Shoup, 2003), as well as innovative interventions like subsidized student housing areas in proximate and TOD developments and integrating active transportation networks like bike paths into municipal and campus plans. The findings above give evidence towards post-secondary institutions and municipalities working together to enhance and promote location efficiency awareness and accessibility in student housing and transportation.

4.8.1.2 Misinterpretation of transportation costs

As shown in the findings, most of the participants asserted they were aware of the household transportation costs associated with their location choice and several considered them negligible. The majority of participants also discussed time costs yet did not apply them to their household transportation costs. When asked outright about transportation costs many said they didn't think about it but went on at length about time, commuting, transit etc. According to White (1988), households choose their home locations by maximizing their utility subject to budget and time constraints and the commute is assumed to cost money and take time. These two costs are considered the combined 'generalized' costs of commuting which individuals are understood to want to minimize (Li, 2003; Ortúzar and Willumsen, 2001).

Levinson and Wu (2005) proposed that individuals develop a 'commuting travel time tolerance' to compensate for trade-offs. They suggest that increasing daily commuting travel times in U.S. cities have occurred because households are willing to trade-off longer commute times for other reasons (e.g. more bedrooms, larger home, cul-de-sac location). This 'travel-time tolerance' trade off may help explain the participants' reduced comprehension of time as costs. This 'maximization of utility' is most likely condensed into heuristic shortcuts (trade-offs) by participants using bounded rationality as shown by Kahneman (1999) and Gigerenzer & Todd (1999). The participants who reported not being concerned about their household transportation costs may be aligned with evidence showing that the true long term costs of inefficient location choices are difficult for households to understand and calculate (Haas, Newmark, and Morrison, 2016).

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Policy Considerations

Municipalities, government and advocacy groups attempting to encourage and promote location efficiency home location choice can utilize this finding to aid in the design and implementation of education and outreach programs. These programs can focus on communicating the long term costs associated with commuting and location inefficiency may assist prospective homebuyers in better calculating the costs and benefits of location choice.

4.8.2   Local Amenities and Neighbourhood Design
4.8.2.1 Past Experiences with Home Attributes

Homeowners' past experiences exert a large influence on their recent home location decisions. Concerns over sharing maintenance and upkeep of their property with others were a motivation to choose single detached over shared wall housing. Their past perceived experiences of limited privacy and the cooking smells and noise of shared wall living could be biased and able to be corrected with education and outreach programs. As seen above Feijten, Hooimeijer and Mulder (2004) have shown that people may choose housing based somewhat on their experiences in younger life (especially when it comes to rural living) and these past negative experiences with certain types of housing could benefit from further investigation.

Negative past experiences of shared-wall living appear to lead to the utility maximization model being put aside in place of bounded rationality and heuristics, as with the past commuting experiences outlined above (Kahneman, 1999; Gigerenzer & Todd, 1999). This decision making based on past experiences can be associated with using bounded rationality and heuristics instead of fully computing all possible costs and benefits. The influence of these heuristics on home location choice is sizable and could be acknowledged by developers and municipalities attempting to influence these choices. These heuristics may be based on rational/irrational past experiences and could present a leverage point for influencing home location choice decision making. These past experience based heuristics may provide homeowners with easily referenced shortcuts when housing choices provide examples that can be quickly discarded or affirmed. If

the establishment of these heuristics can be influenced at their formation or challenged during a homebuyers' home location decision the promotion of location efficient associated shared-wall housing choices could be promoted more effectively.

Municipal Policy Considerations

This theme points towards the types of housing that are commonly associated with infill and TOD development (shared wall, row houses etc) can also be associated with past negative experiences that influence housing choice. If so, municipalities and developers could focus on promoting the updated acoustic shielding properties of modern building codes as well as advertising the international acoustic ratings and vapour barriers of modern infill buildings. The past negative experiences of participants may emanate from living in older housing with older building code. Up to date building and renovation code would most likely not suffer from these same symptoms of noise and odour transference. These interventions may assist in helping dispel some of these participants long held views and allow them to consider housing types that are associated with TOD and infill developments.

4.8.2.2 Culs-de-sac as community hubs

This theme dealt with the social connections that participants felt grew out of living in a cul-de-sac compared to past home locations. Participants who had experience living in homes in culs-de-sac discussed their attraction to these areas that have been criticized in contemporary urban planning. Urban planners and academics alike have promoted the (connectivity) benefits of streets on a grid pattern vs the inefficiency of culs-de-sac and curvilinear streets (Cozens and Hillier, 2008; Morrow-Jones et al., 2004). The latter form has been associated with reduced walkability and connectivity that has been linked to increased automobile use and negative health related consequences of reduced active transportation (Cozens and Hillier, 2008; Morrow-Jones et al., 2004). The findings of this research support the limited work done on this topic by Hochschild (2013; 2014), Morrow-Jones et al. (2004), and Southworth and Ben-Joseph (2004) investigating how residents report profound social connections from living in a cul-de-sac home location. The attraction of residents to social amenities like culs-de-sac as gathering spots, reflects the importance of neighbourhood design and the notions put forth initially by Jane

Jacobs (1961) regarding the importance of 'bumping into' one another as an aspect of how communities promote neighbourhood interaction. However, cul-de-sac home locations are currently associated with non-walkable, automobile dependent suburban curvilinear neighbourhood design. In order to attract these homebuyers to more location efficient homes, innovative designs and housing products may be required.

Municipal Policy Considerations

Inventive densification developments like pocket neighbourhoods with a central courtyard could attempt to emulate the shared micro-geographic social cohesion of culs-de-sac. Utilizing development patterns like a fused-grid or pedestrian connected culs-de-sac might give homebuyers the feelings of safety and social connections of a cul-de-sac while also help slow down neighbourhood traffic (Southworth and Ben-Joseph, 2003). A fused-grid or connected pedestrian cul-de-sac development pattern incorporates traditional culs-de-sac in its design but links them with pedestrian greenways to allow walkability and connectivity. If coupled with higher density (smaller homes for affordability), mixed uses and accessible transit options it may be a viable option for attracting homebuyers who desire cul-de-sac amenities. This points to the potential of New Urbanist design. The limitations of curvilinear disconnected neighbourhoods outlined in urban planning research are warranted, yet the social cohesiveness and feelings of safety and trust in culs-de-sac locations that these participants extol warrants a closer look at possible alternatives.

4.9 Future Research Directions

Further research into this area would benefit from a large n quantitative study to ascertain a wider population LE comprehension or to investigate further how the prior experiences of commuting and shared wall living have affected home decision choice. A large scale survey could also be designed to help the design of campaigns and materials to aid in the increase of LE awareness. Further investigation of how home choice is made regarding bounded rationality and heuristics could also provide valuable data on interventions and leverage points for influencing this decision. A Canadian version of the H & T affordability index could also be created with a first step including pilot versions in major Canadian metropolitan areas. Education and

awareness could also be increased through the integration of a location efficiency metric like Walkscore™ being integrated into real estate search software like MLS®. A deeper investigation into homebuyers who choose condo style apartments could also be considered in order to find out more about why these choices are still largely unpopular amongst Edmontonians.

4.9.1   Conclusions

This research has provided a snapshot into how participants consider location efficiency in their home location choice. Home location choice literature has had limited investigation of how and if homeowners regard the concept of location efficiency in their home location choice. This study's findings help to inform this conversation. Past commuting and perceived negative past shared-wall living experiences provide information on how the effects of homebuyers' residential experiences can influence their future home location choices. This points towards our inability as homebuyers to make perfect utility maximizing choices (and instead use heuristics and bounded rationality) and shows a need for education and outreach campaigns that can cut through these (mis)perceptions. The finding of culs-de-sac as community hubs indicates that deep community connections can be influenced by neighbourhood design even when they oppose current progressive directions in urban planning. The finding of homebuyers' perceptions of transportation costs and their connection to time costs gives further evidence towards the limitations of home location choice utility maximization and allows for further investigation into better ways of providing this important information.

These results give evidence for the improved LE (Household and Neighbourhood scale level) prioritization in municipal outreach education and the real estate industry (infographic or related products/resources for municipalities etc). By making homebuyers more aware of the benefits of LE, municipalities, developers, planners can attempt to influence their home location decisions while mitigating issues like declining budgets due to increased municipal sprawl, traffic, GHG emissions, and health issues related to long commutes and walkability. The areas of perception of transportation costs, past commuting and shared wall living experiences influencing home choice and culs-de-sac as community hubs offer some evidence that developers and municipalities could utilize to attract homebuyers to location efficient areas they wish to

prioritize. Post-secondary institutions could aid in the promotion of location efficient transportation and home location choice amongst students by the provision of active transportation infrastructure and subsidized transit in order to foster future location efficient housing choices by alumni. Municipalities could partner with institutions to foster a location efficient culture amongst student populations that enabled and facilitated location efficient living. This culture can be supported by existing tools like subsidized transit passes, as well as novel interventions like integrated active transportation paths and subsidized student housing areas in TOD developments (Bond & Steiner, 2006; Brown, Hess, & Shoup, 2003). Location efficient home developers (shared wall housing types in infill and TOD developments) could build higher acoustic rated units and utilize and promote current building techniques/codes to endorse shared wall living amongst homebuyers who have had negative experiences in the past. Innovative housing like cottage courtyards or pocket neighbourhoods could emulate the cul-de-sac social connections more than traditional grid housing patterns. The high social cohesion reported by participants in culs-de-sac could be emulated with more connected streets in curvilinear neighbourhoods by using the fused-grid system of adding pedestrian and trail connections into culs-de-sac.

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Chapter 5: Conclusion

5.1 Introduction

Location efficiency has become an increasingly prominent term in academia and grey literatures, focusing attention on the costs and benefits of home locations that demand varying transportation modes and use. Sprawling land development, GHG emissions, infrastructure costs to municipalities, rates of active transportation and quality of life have all been linked as costs and benefits of location efficient home choice (City of Edmonton, 2016; Hoehner, Barlow, Allen, & Schootman, 2012; Litman, 2012; Natural Resources Canada [NRCAN], 2009; Rose, 2010). Location affordability of combined housing and transportation costs has also become a significant area of recent research and advocacy groups (Centre for Neighborhood Technology, n.d.; Coulombel, 2018; Tremoulet et al., 2016). Although the housing choice of homebuyers has been extensively studied in the past few decades, how location efficiency affects or factors into that choice has remained practically unexplored. This thesis first clarified and developed a conceptual definition of location efficiency making it more operative for use in literature, municipal policy and urban planning. This thesis set out to investigate how the concept of location efficiency is employed into home location choice. In this work, the analysis of qualitative interviews, segmenting homebuyers though Q-methodology factor analysis, and a consolidated scale based definition of location efficiency and home location choice have been presented and discussed in detail.

This research thesis offers theoretical and methodological contributions. Methodologically, this thesis is innovative in that it provides contributions in the application of Q-methodology to home location choice, and it offers a qualitative analysis of home buying and location efficiency. Both of these contrast with the majority of work on housing choice, which has largely used quantitative survey and statistical, based methodologies. Theoretically, it offers contributions towards a deeper understanding into the existing body of research on home location choice and brings a new perspective of looking at home location decisions through a location efficiency lens. The Q-methodology and qualitative research were conducted in the greater metropolitan region of Edmonton, Alberta, Canada.

The study sought to achieve four objectives:

1.   Examine the origin, evolution, and current usage of location efficiency in academic literature, grey literature, and municipal government and urban planning.
2.   Produce a new consolidated definition of location efficiency.
3.   Investigate and identify groups of homebuyers by their housing location choice preferences through Q-methodology segmentation.
4.   Explore how homebuyers are employing location efficiency in their home location choice through qualitative research and identify themes regarding location efficiency and home choice.

Location efficiency is currently utilized in both academic and grey literatures and has developed two similar yet diverse meanings. This confusion necessitated clarification and the second chapter of this thesis provides a thorough background and evolution of the term location efficiency, before presenting a clear and consolidated definition. Chapter three sought to distinguish segments of homebuyers using a Q-method factor analysis that grouped participants by their home choice with regards to location efficiency. Chapter four qualitatively investigated participants' home location choices with a focus on location efficiency. This segmentation and qualitative investigation provides insights into participants' home location choices through a location efficiency lens. These findings offer theoretical, methodological, and substantive contributions which will be discussed below.

5.2 Study Limitations

As stated in Chapter 1, this study acknowledges the limitations that all research with a defined scope and time constraint are subject to. Case studies have been criticized because they lack the broad generalizability of other methods (Stake, 1995; Creswell, 1998). The goal of this research was not to apply broad generalizability but to gain a deeper understanding of home location choice. As discussed in chapter one, the decision to use the embedded single case study of Edmonton's greater metropolitan region was made due to the representative nature of household location choice in Edmonton. Edmonton was the fastest growing suburban area in Canada (after

Calgary) from 2006-2016. According to Gordon, Hindrichs and Wilms (2018) Edmonton also experienced the most growth in automobile suburbs and exurban areas (33%) amongst all Census Metropolitan Areas (CMA) in Canada. These characteristics added to the reasoning to use Edmonton as an embedded single case study.

Insights from these findings may be applicable to other contexts with comparable urban housing and transportation situations. These types of homebuyers likely exist in the larger population but this study cannot remark on the proportions of such characteristics in general populations. While a large n survey is beyond the scope of this research, it could be a natural follow up as these projects have helped identify foundational evidence needed to inform a large survey. Follow-up research based on a large n quantitative survey addressing location efficiency and home location choice is recommended to realize the further application of this investigation.

5.3 Findings

5.3.1   Establishing and Clarifying Location Efficiency

A narrative literature review was used to introduce the foundations of location efficiency, which were rooted in research looking at the connection between density of cities and associated automobile gasoline consumption. This narrative review revealed how the term 'location efficiency' went through a shift in academic and grey literatures from an early focus on the metrics of an individual household's transportation based efficiency to a more general concept that can be utilized to describe neighbourhood attributes. Confusion regarding the definition of location efficiency can be seen in academic research (Renne, 2016). This thesis provides a new consolidated scale based definition. It connects the two interrelated aspects of household housing and transportation costs with neighbourhood characteristics, allowing location efficiency to be utilized at all levels of research and analysis. This provides a theoretical clarification to the academic and grey literatures regarding location efficiency. The definition provided in chapter two and its positioning to related established terms like TOD and Smart Growth aids in the clarification and consistency of location efficiency as well as its establishment as an important tool in the academic and practical areas of urban planning. The diagram of the scale based levels

of LE (Figure 2.3) provided in chapter two will also help municipalities, planners and non-profit advocacy groups establish a solid foundation for their outreach and education in promoting location efficiency.

5.3.1.1 Segmentation of Homebuyers

The third objective realized in the third chapter, was to identify and investigate groups of homebuyers by utilizing a Q-methodology segmentation. This methodological contribution provided insights into investigating and segmenting homebuyers by their opinions rather than the classic positivistic 'R-method'. R-method factor analysis finds correlations between variables (e.g. age & weight, income & education) across a sample of subjects while a Q-methodology seeks out correlations between subjects across a sample of variables and utilizes quantitative statistical methods and outcomes in the rigorous study of these participants' subjectivity (e.g. opinions, attitudes) (Ellis et al., 2007).

As described in chapter three the participants were asked to sort 31 q-statements that were recorded and entered into the PQ-Method software. This produced three distinct segments according to their shared responses (Schmolck, 2014). These three segments were labeled as 'Location Aware', 'New Suburban', and 'Mature Suburban' and each is summarized below. Each segment represented distinctive interpretations with regards to home location preferences and opinions and provided valuable insight into household location choice amongst the participants. Each of these segments provides a deeper contextual understanding of homebuyers and the opinions provide information on home location choice to the academic areas of housing preference and urban planning as well as to municipalities and developers.

5.3.2   Three Segments

The identification of these segments provides insight into home location choice and location efficiency with each offering unique information. The 'location aware' segment's prioritization of an efficient home location over home attributes gives support for municipalities attempting to encourage citizens to choose infill homes over new suburban. This group also showed flexibility in their preference of home attributes and may be more likely to reside in a wider variety of

housing options. This group's preference for walkable amenities, active transportation and proximity of trails implies their support for municipal investments and development of additional active transportation and walkable infrastructure like dedicated bike lanes, pedestrian prioritization and multi-use trails.

The 'mature suburban' group's preferences point to the need to design densified infill developments with individual green spaces or small yards that provide homebuyers with the perception of spaciousness and privacy. Infill has been identified by municipalities like the City of Edmonton as being an integral part of addressing housing needs while also reducing sprawling suburban development. This group's preferences for spaciousness and resistance to crowded neighbourhoods may align with opposition to lot splitting and densification. The characteristic low density mature neighbourhoods preferred by this segment are a priority for densification and these preferences identified can aid in informing infill housing design and policy.

Both the 'new suburban' and 'mature suburban' segments share a preference for a 'spacious home' but importantly, considerably vary on other neighbourhood preferences. This outlines clear differences amongst homebuyers who are not prioritizing location like the 'location aware' group and offers further information in the conventional suburban-urban discussion. This segment provides valuable preference information for developers and municipalities looking to make inner urban infill developments more attractive to traditional suburban consumers. This group's preference for newly constructed single-detached homes in new neighbourhoods, could point towards innovative infill housing products not currently being offered across all jurisdictions. Smaller groups of homes built on subdivided traditional lots (cottage homes, pocket neighbourhoods) may align with this segment's preferences better than some current infill options of shared-wall row-houses and condominiums. Research by Landis (2017) shows that the reduction of sprawling suburban development may have more to do with housing policies and regulations that permit young diverse households (like those in Edmonton) to achieve their varied housing preferences for walkable, mixed use neighbourhoods than strict urban development containment policies and programs. This could allow also municipalities to incentivize successful models of moderate-density development (missing-middle infill) and

facilitate the relationship between consumers and innovative housing developers (Landis, 2017).

These findings provide novel methodological contributions through the q-method application as well as the theoretical contributions. These three segments revealed by the Q-method factor analysis illustrates the complexity of home location preferences in terms of opinions, rather than the socioeconomic and demographic attributes emphasized in R studies. This study is the first to utilize the Q-method to investigate housing location choice. This identification of groups of homebuyers by their opinions provides organization to the segments of homebuyers which can be utilized by municipalities and developers alike in order to attempt interventions or behavioural nudges towards desired outcomes. This segmentation method can be utilized in a wide range of urban planning applications and could provide insight that classic R-method analysis does not achieve.

5.3.3   Qualitative Investigation of Location Efficiency and Home Buying

The fourth objective was to investigate location efficiency in homebuyers' home location choice through qualitative research. This investigation identified themes regarding location efficiency and home choice. Since Rossi looked at family migration and housing decisions in 1955, home location choice has been studied by numerous diverse disciplines, yet little is known of how location efficiency factors into home location choice.

The semi-structured interviews followed a guide that provided a framework for the questioning while allowing for open-ended answers from the participants. These initial questions (appendix A) reflected areas of investigation of household choice and location efficiency that included home location choice, neighbourhood attributes (design, amenities, services), home attributes, commuting, and transportation costs and habits. The themes of location efficiency and its consideration in home location choice were explored throughout the interviews and participants were encouraged to discuss associated departures from these core areas.

Appeals for a deeper understanding of home location choice in the literature have been provided by both the segmentation and qualitative research chapters of this thesis. This qualitative based

research provides a more nuanced understanding of how homebuyers choose their homes with relation to location efficiency. This investigation of location efficiency and home location choice has provided enlightenment in understanding the motivations of homebuyers that go further than home preference surveys or a housing attribute questionnaires. The themes uncovered demonstrate the nuanced nature of home location choice and illustrate how complex decisions like home choice can be affected by past experience based heuristics (commuting and shared wall living), outdated building codes (shared wall living) and misperceptions (commuting costs).

5.4 Thematic Findings

5.4.1 Commuting Transportation

The theme of commuting transportation was a central discussion topic for the majority of participants. This theme exemplifies the misperceptions of commuting related costs amongst homebuyers.

5.4.1.1 Past commuting experiences

It was found that participants' home location decisions were strongly influenced by prior (positive and negative) commuting experiences. The ability of past experiences to disproportionately influence our future choices is a component of the models of decision making heuristics described by Kahneman (1999) and Gigerenzer & Todd (1999). These heuristics can provide opportunities for leveraging messaging and information campaigns to take advantage of decision making patterns. Municipalities and developers alike can draw upon these heuristics to promote location efficient home choices.

Municipalities and institutions can use these findings to promote a location efficient housing and transportation culture amongst post-secondary students that informs, facilitates and supports location efficient choices. This location efficient student culture could be reinforced by using established tools like subsidized transit passes for more student populations as shown by Bond & Steiner (2006) and Brown, Hess, & Shoup, (2003). Other interventions like subsidized student housing in proximate areas and TOD developments, as well as integrating active transportation

networks like bike paths into municipal and campus plans would also help establish location efficient housing and transportation norms amongst student populations. These results provide evidence for post-secondary institutions and municipalities enhancing and promoting location efficiency awareness and accessibility which may strongly influence future home location choice amongst students.

5.4.1.2 Misinterpretation of Transportation Cost

These findings showed that numerous participants asserted they were aware of their household transportation costs associated with their location choice with several considering them insignificant. When participants were asked outright about transportation costs many reported their insignificance yet went on at length about commuting, traffic, transit etc. Aligning with the participants' accounts, Levinson and Wu (2005) suggest that the ever increasing daily commuting travel times in U.S. cities have occurred because households are willing to trade-off longer commute times for housing attributes (e.g. more bedrooms, larger home, cul-de-sac location) (Levinson & Wu, 2005). This 'travel-time tolerance' trade off may help illuminate the participants' limited comprehension of time as cost. Kahneman (1999) and Gigerenzer & Todd (1999) have shown this supposed 'maximization of utility' is most likely abbreviated into heuristic shortcuts (trade-offs) by our participants utilizing bounded rationality. The participants who reported their household transportation costs as insignificant align with evidence showing that the actual long term costs of inefficient location choice are problematic for households to understand and calculate (Haas, Newmark, and Morrison, 2016).

These widespread misperceptions of transportation costs amongst participants may indicate that this confusion is contributing to greater inefficient home location choice and the related proliferation of suburban sprawl. Homebuyers/renters need access to information and tools that make it easier for them to calculate long term transportation (and other) costs associated with home location choice. Municipalities, government and advocacy groups attempting to encourage and promote location efficient home choice can use these findings in the creation of education and outreach programs. These strategies and programs could focus on communicating the actual long term costs associated with commuting and location inefficiency and may help homebuyers

improve their costs and benefits calculation of location choice which could lead to better informed decisions.

5.4.2   Local Amenities and Neighbourhood Design

5.4.2.1 Past Experiences with Home Attributes

This theme reinforces the influence of heuristics and the past experiences on the decision making process related to home location choice. Some participants perceived concern over sharing maintenance and upkeep of their property with a shared-wall neighbour was used as a motivation to choose single detached over shared wall housing. As well, their past perceived experiences of reduced privacy through examples of cooking smells, and the noise of shared wall living could be based on exceptional circumstances and may be able to be corrected with education and outreach programs. Feijten, Hooimeijer and Mulder (2008) have shown that residential housing choice is based somewhat on experiences in earlier life (though primarily with regard to rural homes). Homebuyers seem to be disregarding the utility maximization model of home choice in favour of bounded rationality and heuristics in this theme. Like the past commuting experiences discussed earlier, the use of 'utility-maximization' and fully working out every option of utility is being abbreviated into shortcuts (heuristics) based on past experiences (Kahneman , 1999; Gigerenzer & Todd, 1999). Like other examples of decision making these experience based heuristics are providing homeowners with easily referenced shortcuts when housing choices provide examples that can be easily rejected or confirmed.

The recommendations from this theme can aid municipalities and developers alike. Housing types that are commonly associated with infill and TOD development (apartment style, shared wall, row houses etc) may also be associated with past negative experiences that can strongly influence housing choice. Municipalities and developers could choose to focus on promoting the modern acoustic shielding properties of current building codes and updated technologies as well as advertising the acoustic ratings and vapour barriers of modern shared-wall buildings. Participants past negative experiences could originate from experiences with older non-renovated housing. Municipalities providing assistance to retrofit these buildings would most likely assist in helping dispel some of these views.

5.4.2.2 Culs-de-sac as Community Hubs

This theme dealt with the social connections that participants felt developed out of residing in a cul-de-sac compared to other home locations. Participants who lived in culs-de-sac locations discussed their attraction to these areas that have come under criticism by contemporary urban planning. Academics and urban planners have promoted the benefits of grid pattern street design vs the inefficiency of cul-de-sacs and curvilinear streets (Cozens and Hillier, 2008; Morrow-Jones et al., 2004). The findings of this research support the work done on this topic by Hochschild (2013; 2014), Morrow-Jones et al. (2004), and Southworth and Ben-Joseph (2004), who investigated how residents report deeper social connections from living in a cul-de-sac home location. This reported

Recommendations include municipalities and developers promoting innovative densification developments like pocket neighbourhoods or cottage courtyards with a central courtyard that could endeavour to reproduce the shared micro-geographic social cohesion of culs-de-sac. Employing development patterns that use fused-grids or culs-de-sac with pedestrian connections could give homebuyers the sense of safety and social connections of a cul-de-sac while also helping to slow down neighbourhood traffic (Southworth and Ben-Joseph, 2003). If new design options like fused grids and connected pedestrian culs-de-sac are coupled with higher density (smaller homes with higher affordability) and accessible transit options this may provide a viable option for attracting homebuyers to infill developments who desire cul-de-sac type social amenities previously associated with suburban neighbourhoods.

The current aversion to traditional unconnected culs-de-sac and their association with curvilinear sprawling suburban design amongst municipal urban planning departments and academic programs may benefit from the findings of this study and integrate the homebuyer's evident attraction to some benefits of this type of housing location. The perceptions of safety and security as well as the 'quiet' of cul-de-sac living can be emulated in non curvilinear urban development in the form of cottage courtyards and pocket neighbourhoods.

5.5 Conclusion

The overarching goal of this thesis was to investigate how location efficiency is incorporated into home location choice. Due to confusion in academic and grey literatures, before this investigation could begin the term itself necessitated clarification and a new scale based definition. Once this definition and a thorough literature review was achieved, the subsequent objectives of segmenting homebuyers with regards to their preferences on location efficiency and looking into how these homeowners integrated location efficiency into their home location choice were undertaken. The provision of a consolidated geographical based definition allows research and grey literatures related to or focused on location efficiency to advance with a clarified understanding of the term. This will allow both research and urban planning applications to follow a unified path when referring to this concept and end the confusion that has been associated with the term thus far.

The concept of location efficiency was clarified and a new definition was established in chapter two. In chapter two the segmentation findings offer municipalities and developers alike an indication of the need for the provision of diverse housing and design options to promote desired development. The qualitative findings in chapter four then offer insights into how people choose their home locations with regards to location efficiency, basing choices on heuristics and past experiences, urban design elements and misperceptions of costs.

This thesis provides valuable information for municipalities to aid in the policy implications and future design of the urban built environment. These findings can inform decision making regarding municipalities desires to reduce the unsustainable financial model of suburban expansion. Some municipalities have set density and infill targets in an attempt to reduce their sprawl development and having a clearer understanding of homebuyers' home and location choices can aid in their attempt to attract citizens to desired locations/areas. These findings can also inform the types of development that municipalities choose to allow and encourage apart from the current offerings of costly infill homes and more affordable suburban homes that are low in location efficiency. Several findings in this research also point to increasing homebuyers' consideration and knowledge of location efficiency in their home buying decision. As discussed

earlier, this could be achieved by the integration of a location efficiency tool or metric like Walkscore^{TM} and modelled after the U.S. based Centre for Neighbourhood Technology's Housing and Transportation index. Providing prospective homeowners and renters more accessible information on their transportation and implicated housing costs would allow for more informed decisions for what is usually considered the largest purchase people ever make.

5.6 Future Research

As discussed in the studies limitations section, the scope of this research did not allow for a large n survey as it was beyond the scope of this research. This type of study would be a natural follow up as the findings have helped identify foundational evidence needed to inform such a survey. Follow-up research based on a large n quantitative survey addressing location efficiency and home location choice is recommended to realize the further application of this investigation. This type of study could look at representational populations of homebuyers and further investigate their willingness and motives for choosing their home with regards to location efficiency. Looking into the comparative low rates of apartment style condominium buyers in Edmonton could also garner interesting information regarding home location choice. Although developers are constructing increased apartment style housing they are the last choice amongst homebuyers. Further investigation of housing norms and homebuyers' reluctance to purchase these units could provide valuable data towards attracting people to location efficient housing. The application of CNT's H+T index (Poticha & Haas et al. 2006) to a Canadian context would also provide Canadian homebuyers with a tool to envision location efficiency when making housing location decisions.

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Appendices

6.1 Interview Guide – Location Efficiency and Home Location Choice

These questions were used as a general starting point for all participants, with many discussions branching off from these original topics.

If you agree that your home decision was a kind of compromise, for example, housing features vs neighbourhood features versus location all within your financial affordability. What types of things do you think you compromised or didn't compromise in choosing this home?

When you made your home location choice, how were transportation and commuting a factor in your decision? Did you calculate the costs (time etc) of your new home location? Did you travel habits change when you moved into this location?

Did you decide on the home first or did you decide on the location and then try and find the home within that location?

In general, did the market provide enough choices for what you were looking for? For example, was your preferred home type – in your preferred location/neighbourhood?

Would you do anything differently if you could choose your home again, location-wise (not the logistics of home buying)?

If you are aware of the new urban Blatchford airport development (City of Edmonton is proposing to build denser urban sustainable housing with retail, LRT etc in the community), would you consider living in such a development? Why or why not?

If I could wave a magic wand and make your location better for you in any way, what types of things would be different, if any?

6.2 Sample email/letter to potential participants

Hello, my name is Kurt Borth and I'm a graduate student from the University of Alberta. I'm performing some research on household location choice and associated energy use among homeowners in Edmonton.

This project will focus on homeowners in the greater metropolitan region of Edmonton, Alberta, who have purchased a home within the last five years. The project deals with investigating peoples motivations for choosing homes in different locations of Edmonton. These locations usually have varying levels of energy use associated with driving, walking and transit use and it's the reasons behind your housing choice and decision making that this study is most interested in. If you agree to participate, I'll be showing you about 30 statements on cards dealing with themes like home energy use, commuting, transit use, and you'll be asked to sort the statements based on if you agree or disagree with them (called a Q-sort). The Q-sorts will be approximately 30 minutes in length, and will be video recorded (only the table with the cards). After the sorting you'll be asked a few questions regarding your home buying decisions which will be audio recorded. The whole process should take about one hour.

If it's convenient for you we can do the sorting procedure at your home or if you're available to come in, at the University of Alberta. The study is completely voluntary and you can stop at any time during the process. If you decide you don't want to participate afterwards you'll have some time to withdraw completely. All identifying references to you will be removed for any publications or presentations, only myself and my supervisor will have access to any identifying or personal information (address, interview data, name) which will be kept in a secure location at the University of Alberta.

If you're still interested in participating I can send you the consent form so you can read about any risks or benefits of the study (if applicable a map to get to the Tory building and office at the University).

If you have any questions about the study and would like further clarification or information regarding any aspect of the research study please contact me at (780) 619-3478 or borth@ualberta.ca

Thank you very much for your time,

Research Investigator:
Kurt Borth (Tory 3-101)
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The plan for this study has been reviewed for its adherence to ethical guidelines by a Research Ethics Board at the University of Alberta. For questions regarding participant rights and ethical conduct of research, contact the Research Ethics Office at (780) 492-2615.

6.3 Consent Form for participants

Household Location and Energy Use Study

Research Investigator:
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Background

You are invited to take part in a study of motivations and decision making with relation to your household location and its associated energy use. The research is being conducted by Kurt Borth, a graduate student at the University of Alberta in fulfillment of the requirements for the degree of Doctor of Philosophy. The data gathered will be anonymous and used in the publication of research papers and presentations towards the completion of a doctoral thesis.

Purpose

The purpose of this study is to investigate varying levels and motivations for household location choice and associated energy use in Edmonton (location efficiency).

Study Procedures

If you agree to be in this research, and sign this consent form, I ask that you participate in an individual statement sorting procedure that will last less than 30 minutes along with a 30 minute discussion about the sorting and interview questions afterwards. In total, I will be conducting about thirty-forty individual sorting procedures with residents of varying neighbourhoods in Edmonton from August-November, 2012. After the sorting I'll ask you a few questions about the procedure and allow you to comment about your experience. The sorting procedures will be audio and video recorded and transcribed afterwards. *We will only video record the tabletop showing the sorting cards, at no time will your face or identifying features be revealed*. The audio and video recordings will be kept on a protected computer in the researcher's secured office and all identifying information will be kept in a locked cabinet within the secured office. The short interviews will be transcribed and all identifying information will be removed from the transcripts. You will be able to view the completed transcripts and any clips of the sorting procedure by contacting the researcher before November 30th, 2012.

Video Presentation

We may wish to present short video clips of the sorting procedure from this study at academic conferences. Please initial below if you are willing to allow us to do so with the video of your sorting procedure. The video will only show the tabletop where the sorting is taking place, any identifying personal information will be edited out. You are free to participate in the study without video recording if you desire.

Benefits

You may not benefit directly from being involved in this project yet the results may help municipalities understand why different housing locations are more attractive than others and could lead to changes in

planning for future and existing communities. The researcher and the University of Alberta are grateful to you for participating in this project.

Risk
The researcher may ask questions about your household energy use and your motivations for choosing your residential location. Your personal household energy use may be discussed, as well as driving habits and ways in which your household thinks about where you live and why you like there. Some of the statements you will be asked to sort may be personal, but the information will not be shared with anyone else. You are free to *not* answer any questions asked or stop the sorting procedure at any time.

Voluntary Participation
You are under no obligation to participate in this study. Your decision whether or not to participate in this research will not affect your current or future relations with the University of Alberta or the researcher. You are free to participate in the study without video recording if you so desire. Even if you sign the consent form, you are free to stop the interview at any time. You do not need to complete the interview if you feel uncomfortable doing so. If you chose to opt out of the study all collected data will destroyed and will be excluded from the research findings, PhD thesis and any further reports generated by the study. The deadline for withdrawal will be November 30th, 2012. Once results are publicly presented or published, it is not possible to withdraw consent.

Confidentiality & Anonymity
The records of this study will be kept private. Anything you tell the researcher will remain confidential. In any sort of report or presentation of the study, the researcher will not include any information that will make it possible to identify you; any identifying information will be removed from the transcript and video clips. Your name and other identifying information will be kept separate from any transcripts or notes. The researcher will use the anonymous data in research papers, presentations and his PhD thesis. All data will be kept in a locked file and secure computer; only the researcher for this study and his supervisor will have access to the records. Electronic records (audio/video) will be stored on a secure password protected computer and external hard drive. All paper files and electronic media will be destroyed after five years in a way that ensures your privacy and confidentiality are maintained in accordance to University of Alberta privacy policies.

Further Information
If you have any further questions regarding this study or would like to obtain a copy of your transcripts and/or the final report, please do not hesitate to contact the primary researcher, Kurt Borth by calling (780)619-3478 or e-mailing borth@ualberta.ca. If you have any questions or concerns regarding this study please contact the researcher's supervisor: Dr. Robert Summers, (780) 492-0342 or emailing Robert.summers@ualberta.ca

The personal information requested on this form is collected under the authority of Section 33 (c) of the Alberta Freedom of Information and Protection of Privacy Act and will be protected under Part 2 of that Act. The plan for this study has been reviewed for its adherence to ethical guidelines by a Research Ethics Board at the University of Alberta. For questions regarding participant rights and ethical conduct of research, contact the Research Ethics Office at (780) 492-2615.

Consent Form for Household Location and Energy Use Study

_____ *I understand that participation in this study is completely voluntary.*

_____ *I understand that I can withdraw my consent at any time during the data collection process without consequence. I understand that if I withdraw my consent by Nov 30th, 2012, all collected data will be destroyed and excluded from research findings any other materials generated by this study.*

_____ *I understand that I cannot withdraw my consent once results have been publicly presented.*

_____ *I understand that while personally identifying information will be collected, it will be excluded from interview transcripts, video and research findings and kept separate in a locked cabinet from all transcripts and research findings.*

_____ *I understand that I may obtain a copy of the research findings by contacting the researcher or study supervisor.*

_____ *I acknowledge that I have been provided with two copies of this form, one signed and returned to the researcher and one for my own records*

_____*I hereby give permission for the video recording of the sorting procedure made for this research study to be also used for educational purposes and conference presentations.*

_____ *I have read the above information and have had all questions answered to my satisfaction. I consent to participate in this study.*

_____
Name of participant

_____
Signature of participant

_____
Date

_____
Signature of researcher

_____
Date

□   Participant received a copy.
□   Video consent

The plan for this study has been reviewed for its adherence to ethical guidelines by a Research Ethics Board at the University of Alberta. For questions regarding participant rights and ethical conduct of research, contact the Research Ethics Office at (780) 492-2615.

6.4 HERO Research Ethics Consent

Kurt Borth <borth@ualberta.ca>

HERO: Amendment/Renewal has been Approved Pro00020634_AME3
1 message

hero@ualberta.ca <hero@ualberta.ca>   Wed, Jul 4, 2012 at 9:19 PM
Reply-To: hero@ualberta.ca
To: borth@ualberta.ca

Amendment/Renewal to Study has been Approved

Amendment/Renewal ID:	Pro00020634_AME3
Study ID:	MS3_Pro00020634
Study Title:	A Q-Method Investigation into Rationale and Motivation for Varying Levels of Household Location Efficiency in Edmonton, Alberta.
Study Investigator:	Kurtis Borth
Description:	The amendment/renewal to the above study has been approved.
	Click on the link(s) above to navigate to the HERO workspace.
	Please do not reply to this message. This is a system-generated email that cannot receive replies.

University of Alberta
Edmonton Alberta
Canada T6G 2E1

6.5 Q Sort Answer Sheet for University of Alberta - Home Buying Location Study

#_____

After you're completely finished sorting, please record the numbers of each card in the grid below. Please note that if you are performing the sort on behalf of your household, try to represent the home buying decisions that were made 'as a household' (if you made them that way) and not just your personal opinion. As you perform the sorting, please consider this statement:

Please rank these items according to their importance to your home buying decision.

Most Disagree -4	(3 cards) -3	(4 cards) -2	(4 cards) -1	(5 cards) 0	(4 cards) +1	(4 cards) +2	(3 cards) -3	Most Agree +4

Demographic Information: Please fill out this section to the best of your ability, all information is anonymous and will remain secured and be destroyed in accordance with U of A privacy measures.

Postal Code _____

Year of Birth A) _____   B) _____

Household Income Range (before taxes)
$20,000-49,999 ___ $90,000–109,000 ___
$50,000-69,999 ___ $100,000–129,000 ___
$70,000–89,000 ___ $130,000+   ___

Level of Education
A) Junior High ___ High School ___ College ___ University Degree ___ Graduate Degree ___
B) Junior High ___ High School ___ College ___ University Degree ___ Graduate Degree ___

Family Status
Married ___ Widow/Widower ___ Single ___ No Children ___ Planning on having children ___   Have Children ___

How many children (at home)? _____ under 15 _____

221

How do you primarily get to your frequent destinations? (work, kids school, etc)
A) Car ___ Transit ___ Combo car/transit (park and ride) ___ Walk/Bike ___ Other_____
B) Car ___ Transit ___ Combo car/transit (park and ride) ___ Walk/Bike ___ Other_____

Car Ownership
None ___ One ___ Two ___ Three ___ Four ___ More than Four ___

How often do you use transit?
A) Do not ___ Once/month or less ___ Once/week or less ___ Regularly (twice/week or more) ___
   Frequently (five/week or more, commute) ___

Would you say that financial affordability affected your home buying decision and location:
A lot ___ Somewhat ___ A little ___ Not at all ___

How long have you lived in this home? _____

Please write down your main reason(s) for moving (new job, family, marriage, bigger home etc…)?