Placemaking and Streetscape Design:

Exploring the Impacts of Tram Network Modernisation on Subjective Perception of Place Quality

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Abstract

Place-based research is spread across many different fields of interest, from social psychology to planning and development. This has resulted in an abundance of concepts, such as 'sense of place' and 'placemaking', but scarce agreement on scope and definition. A review of existing research outputs identifies the lack of a comprehensive place quality measurement strategy as a key gap in knowledge. The notion that sustainable transport infrastructure can complement broader improvements to overall place quality is apparent, but there is a lack of consensus regarding application of improvements across unique sites with differing contexts and needs, as well as methods of measuring impacts.

Melbourne's legacy tram network is undergoing a strategic modernisation program involving upgrades to over 1,000 tram stops and changes in the design of the surrounding streetscape. The program represents a significant opportunity to reimagine how tram streetscapes can function as key destinations that provide an enhanced user experience, build upon existing neighbourhood identity, and improve overall place quality.

The Melbourne case study is utilised to investigate the overarching aim of this thesis:

Explore user perception of place quality in the streetscape and enhance understanding of how it may be impacted by various tram infrastructure design schemes.

This aim is addressed through three primary research objectives:

The first objective is to delineate variations in tram streetscape environment characteristics. To accomplish this, the 'Movement and Place' framework is adapted to quantitatively classify tram network segments by roadway infrastructure design and streetscape place context. Deployment of the adapted classification system results in four streetscape categories that enable differences in need to be addressed while maintaining a level of consistency in user experience across the network.

The second objective is to understand user perception of streetscape place quality. Through review of five practice-based assessment toolsets, 36 place quality performance indicators are identified for inclusion in a synthesised measurement approach. Based on this result, a questionnaire is developed to measure user perception of place quality in Melbourne tram streetscapes. The questionnaire utilises Importance Performance Analysis, which asks respondents to rank each indicator twice; once to gauge perception of the indicator's general importance, and again to measure a specific location's performance in regard to the indicator. Twenty-four survey sites are selected based on the 'Movement and Place' classification system to ensure findings are representative of the broader tram network. Video elicitation methodology is incorporated to facilitate an in-person experience through an online questionnaire, allowing each respondent to rank two separate locations on the tram network.

The final objective is to identify impacts of tram modernisation on streetscape place quality. This is accomplished through analysis of the questionnaire results. The research finds that users view modernised tram streetscapes as containing a higher quality design than legacy tram streetscapes. It also finds that modernised tram streetscapes were perceived as higher quality places overall. Priorities for improvement are discussed, such as the user-identified need to improve the provision of shelter from harsh weather across all four 'Movement and Place' tram streetscape categories.

By developing an enhanced understanding of how place quality is impacted by various tram infrastructure design schemes, this thesis makes a number of original contributions to place-based knowledge. These contributions inform suggestions for the future direction of Melbourne's tram network modernisation program, as well as further exploration of the broader topic in academic research. Overall, it is concluded that tram modernisation tends to improve user perception of streetscape place quality, particularly in regard to the performance of design-based indicators. Addressing the suggestions made in this thesis will allow Melbourne to capitalise on a once-in-a-generation opportunity for the dramatic revitalisation of metropolitan, municipal, and neighbourhood streetscapes afforded to the region through the tram network modernisation process.

Declaration

I hereby declare that this thesis contains no material which has been accepted for the award of any other degree or diploma at any university or equivalent institution and that, to the best of my knowledge and belief, this thesis contains no material previously published or written by another person, except where due reference is made in the text of the thesis.

This thesis includes one original paper published in a peer reviewed journal. The core theme of the thesis is to explore the impacts of tram modernisation on streetscape place quality. The ideas, development and writing up of the paper in the thesis were the principal responsibility of myself, the student, working within the Public Transport Research Group under the supervision of Professor Graham Currie, Dr. Chris De Gruyter, Dr. Liton Kamruzzaman, and Mr. Ian Hopkins.

In the case of Chapter 5 my contribution to the work involved the following:

Publication Title	Status	Nature and % of student contribution	Co-author names, Nature and % of contribution	Co-author, Monash Student (Y/N)
Filling the Space Between Trams and Place: Adapting the 'Movement & Place' Framework to Melbourne's Tram Network	Published	Concept development, data collection and analysis, drafting of the manuscript: 70%	**Graham Currie:** Concept development, manuscript editing: 10% **Chris De Gruyter:** Concept development, manuscript editing: 10% **Ian Hopkins:** Concept development, manuscript editing: 10%	N N N

I have not renumbered sections of submitted or published papers in order to generate a consistent presentation within the thesis.

Student name: Matthew J. Diemer

Student signature: Date: 28 August 2020

I hereby certify that the above declaration correctly reflects the nature and extent of the student's and co-authors' contributions to this work. In instances where I am not the responsible author I have consulted with the responsible author to agree on the respective contributions of the authors.

Main Supervisor name: Graham Currie

Main Supervisor signature: Date: 28 August 2020

Acknowledgements

First and foremost, I would like to state that I recognise the people of the Kulin Nations as the traditional owners of the land this research has been conducted upon. I pay my respects to their Elders past, present and future and pledge my full support toward the realisation of a treaty that brings justice to the people whose ancestors have called this land home for over 65,000 years. A primary component of this research project has been to enhance understanding of the characteristics people value most in their communities; and I would be remiss to not acknowledge the immense contributions to collective sense of place that Aboriginal and Torres Straight Islander cultures make across the land we now call Australia.

Second, I would like to thank my academic supervisory team; specifically, Graham Currie, Chris De Gruyter, and Liton Kamruzzaman. This research project addresses a complex, interdisciplinary concept and I'm proud to say that – across two universities and three academic faculties – I genuinely believe we have made a meaningful contribution to knowledge. Thank you for supporting me and helping me grow as a researcher over the past four and a half years.

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Last but most certainly not least, I want to recognise the city and country I have come to call home over these past years, as well as all the personal connections developed along the way. That I was able to spend nearly half a decade dissecting one relatively small aspect of Melbourne, with minimal restlessness, speaks volumes to the rich cultural ethos of this city and Australia as a whole. There is no question in my mind that Melbourne deserves its recognition as one of the world's most liveable cities and, as a foreigner, I am especially thankful to have been welcomed here so openly. The lifelong friendships I have made during my time here showed me that generosity goes hand in hand with the Australian identity and, in both practical and emotional terms, reaching this day would not have been possible without them.

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Southern Cross Station
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To
St Kilda Beach
Stop
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Coaches 200m
Melbourne tram network
service changes

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MYER
DAVID JONES
FREE TRAM ZONE
Elizabeth Street
Bourke Street
NEXT GENERATION TRAM
PT
Bourke Street Mall
Bourke Street
Stop 5
CAUSEWAY
Inn

Section A:

Research Context

1 INTRODUCTION

This thesis identifies and explores potential impacts of tram network modernisation on subjective perception of place quality in the streetscape. The overall thesis topic is introduced in this chapter through the provision of relevant contextual information. The chapter also describes the overarching research aim and objectives developed to address that aim. It concludes with an overview of the thesis structure.

1.1 Background

Researchers based in the fields of sociology and psychology have been exploring various aspects of human-environmental relationships for many decades. A key foundational investigation has emerged from the research encompassing the transition of 'space', as simply a geographically-defined location, to 'place', a location defined by human-assigned perceptions (Harrison and Dourish, 1996; Jamal and Hill, 2004; Portugali, 2006; Tuan, 1977). In recent years, this particular aspect of place-based research has expanded interest from its base in social psychology to fields with a stake in understanding the dynamics of attractive locations. For example, professionals involved in urban planning and design have begun to incorporate place-based principles into their city-shaping strategies, primarily through investigation of 'sense of place' and 'placemaking', to improve perceptions of the built environment.

Recent evolutions in the transport planning field have increased the desire to understand how mobility factors impact perception of place quality in the streetscape. For example, streets that are designed to prioritise the throughput of private, motorised vehicles are generally less safe than those that focus on other transport modes (Ewing and Dumbaugh, 2009), which potentially explains why neighbourhoods surrounding these corridors have been perceived to be unpleasant (Fotel, 2006) and as having a weak sense of community (Mullan, 2003). On the other end of the spectrum, neighbourhoods with active main street spines where design encourages pedestrian and commercial activity are more likely to have an increased sense of community (Pendola and Gen, 2008). Public investment in sustainable transport infrastructure has proven an effective catalyst to draw private investment in historically neglected urban neighbourhoods (Dawkins and Moeckel, 2016; Jackson and Buckman, 2020; Stehlin, 2015) and ease of access to destinations of interest, as well as general ease of mobility as a whole, has been shown to enhance personal well-being (Delbosc, 2012). These factors may help to explain why street-based transport projects are increasingly framed as public realm improvement strategies that are prioritised for their potential place-based outcomes (De Vos and Witlox, 2013; Ferbrache and Knowles, 2017; King and Fischer, 2016). Terms describing aspects of place perception, however, lack clear scope and definition (Esmaeilpoorarabi et al., 2018; Jivén and Larkham, 2003; Jorgensen and Stedman, 2006; Shamai, 1991), thereby making it challenging to include them as key performance indicators in practice-based infrastructure projects.

Current events in Melbourne, Australia offer a unique opportunity to identify and explore potential impacts of sustainable transport infrastructure on perception of place quality. The city is home to the largest tram network in the world (Yarra Trams, 2020), due in part to the fact that the network began development more than one hundred years ago and has since been largely retained in its entirety. In recent decades, streetscapes across the network have undergone dramatic redesign to facilitate the modernisation of tram stops in line with requirements laid out in Australia's Disability Discrimination Act (DDA) and Disability Standards for Accessible Public Transport (DSAPT) (Australian Government, 1992; Australian Government, 2002). Further context behind the network's development over time, as well as the current modernisation process, is provided in Chapter 2.

Through the provision of level-access boarding platforms, among other elements, the main goal of the modernisation process has been to improve the quality of the tram passenger experience. To date the modernisation process has proven a complicated task, as the addition of boarding platforms generally requires major structural change to the entire streetscape (further explained in Chapters 2 and 5). Despite the challenges, these redesigns offer a once in a generation opportunity to improve the experience of all street users. By analysing how tram streetscape infrastructure impacts perception of place quality, tram modernisation can enable tram corridors to function as key destinations that build upon unique neighbourhood identity, sustain local economic activity, and enhance sense of community. Since only about one-quarter of the network's 1,700 stops have been modernised to date, there is an opening to analyse how various streetscape design strategies, and specific design elements associated with modernisation, impact perception of place quality in tram streetscapes. In practice, investigating this topic enables the identification of priorities to ensure tram modernisation projects have a positive impact on the surrounding public realm. It contributes to the broader research field by providing increased definition of place quality performance indicators, as well as measuring them in a practice-based project.

1.2 Research Aim & Objectives

The overarching aim of the research presented in this thesis is to:

Explore user perception of place quality in the streetscape and enhance understanding of how it may be impacted by various tram infrastructure design schemes.

This aim is addressed in stages through the following objectives:

Objective 1 – Delineate Variations in Tram Streetscape Environment Characteristics:

Melbourne's tram network is the largest in the world, consisting of 250 kilometres of double track and over 1,700 stops. A spectrum of track and stop designs are incorporated and the network traverses through various built environment contexts such as the central business district as well as inner, middle and outer suburbs. The goal of Objective 1 is to define the unique qualities of streetscapes across the network, while also catering to the need for some level of contextually-sensitive categorisation. This will help facilitate standardisation in design, enhancing the financial viability of the modernisation process and providing increased consistency in user experience across the network upon implementation.

Objective 2 – Understand User Perception of Streetscape Place Quality:

A barrier hindering the ability to integrate place-based principles into planning and design processes is the subjective nature of place perception. There are different categories of variables involved, each dealt with by various groups of researchers and professionals with insufficient definition of the involved concepts or measurement methodologies. Objective 2 aims to capitalise on the tram streetscape classifications by looking for commonalities in place perception amongst them. It also aims to identify the relative impacts of individual and grouped streetscape elements on perception of place quality, and whether those elements can be attributed to infrastructure associated with tram modernisation.

Objective 3 – Identify Impacts of Tram Modernisation on Streetscape Place Quality:

The desired outcome of this research project is to develop findings that enable Yarra Trams (the private operator of Melbourne's tram network) and the Victorian State Government to merge place management practices into the tram modernisation process. Objective 3 is to utilise the lessons learned from analysis of user perception of tram streetscape place quality to develop policy recommendations on how Melbourne's tram modernisation process can achieve improved outcomes for streetscape place quality.

1.3 Research Questions

The research objectives are addressed by the following three questions. A more detailed discussion of question development, as well as discussion of the gaps in knowledge they are designed to address, is found in Chapter 4.

Research Question 1 – Categorisation of Tram Streetscapes:

- How can the variety of streetscape contexts across the tram network be classified into groups that enable the differences in need between them to be more easily addressed?

Research Question 2 – User Perception of Streetscape Place Quality:

a. Are the differences considered within the tram streetscape categories reflected in average user views of streetscape place quality?

b. Of the three identified thematic groups of place performance indicators, does a particular group have an outsized influence on overall place quality?

c. Which specific place performance indicators (within each of the three thematic groups) are most relevant to overall place quality?

d. Does the change from legacy to modernised tram streetscapes bring elements that are perceived as adding to and/or depleting place quality?

Research Question 3 – Impacts for Policy:

- What changes can be made to the tram infrastructure planning and design process in order to achieve better outcomes for streetscape place quality?

1.4 Thesis Structure

This thesis is structured by nine chapters which are grouped into three sections based on stages of the overall research plan. A brief description of each section and chapter is provided to broadly define the thesis structure as visualised in Figure 1.1. More detail on the methodological tactics applied in specific chapters is provided in Chapter 4.

SECTION A: RESEARCH CONTEXT

The first section of the thesis introduces the research by providing the necessary context to understand its relevance and contributions to knowledge. It includes four chapters as follows:

Chapter 1: Introduction

Chapter 1 provides a brief overview of the purpose and need of the research presented in this thesis. It also outlines the structure of the thesis.

Chapter 2: Tram Modernisation and the Melbourne Context

Melbourne's tram network is used as a case study for the research presented in this thesis. Chapter 2 frames the research by providing context to the Melbourne region and describing the role trams have played in its historic and current development patterns.

Chapter 3: Synthesis of Place-Based Knowledge

Chapter 3 further frames the work presented in this thesis by exploring place-based research. Through synthesis of published works, it identifies key gaps in the existing research base that this thesis has been designed to address.

Chapter 4: Research Approach

With the research purpose and need laid out in the preceding three chapters, Chapter Four concludes Section A of the thesis by defining specific questions the research is designed to answer. It also provides an overview of the methodology incorporated in Section B of the thesis (Chapters 5 – 8) to answer the research questions.

SECTION B: CLASSIFICATION AND MEASUREMENT

The second section documents the primary research conducted based on the knowledge gaps identified in Section A. Over the course of four chapters, it fulfils the research aim by exploring user perception of place quality in streetscape contexts and identifying how that perception is impacted by various tram infrastructure design strategies.

Chapter 5: Tram Streetscape Classification

This chapter documents the methodology applied in classifying Melbourne's tram network by attributes of roadway infrastructure design and streetscape place context. It represents an original contribution to knowledge by developing a transferable methodological approach to tram streetscape classification.

Chapter 6: Synthesis of Assessment Tools

Building on the synthesis of place-based knowledge presented in Chapter 3, a review of practice-based place assessment tools is conducted. This results in the identification of a comprehensive set of place quality performance indicators.

Chapter 7: Streetscape Amenity Survey

This chapter details the process of developing a questionnaire to measure the performance indicators identified in Chapter 6 using methodological strategies identified in Chapter 3. It also documents the methodology applied in administrative tasks such as survey site selection.

Chapter 8: Survey Data Analysis

To conclude the primary research presented throughout Section B of the thesis, Chapter 8 presents a structured analysis of the data gathered through administration of the Streetscape Amenity Survey.

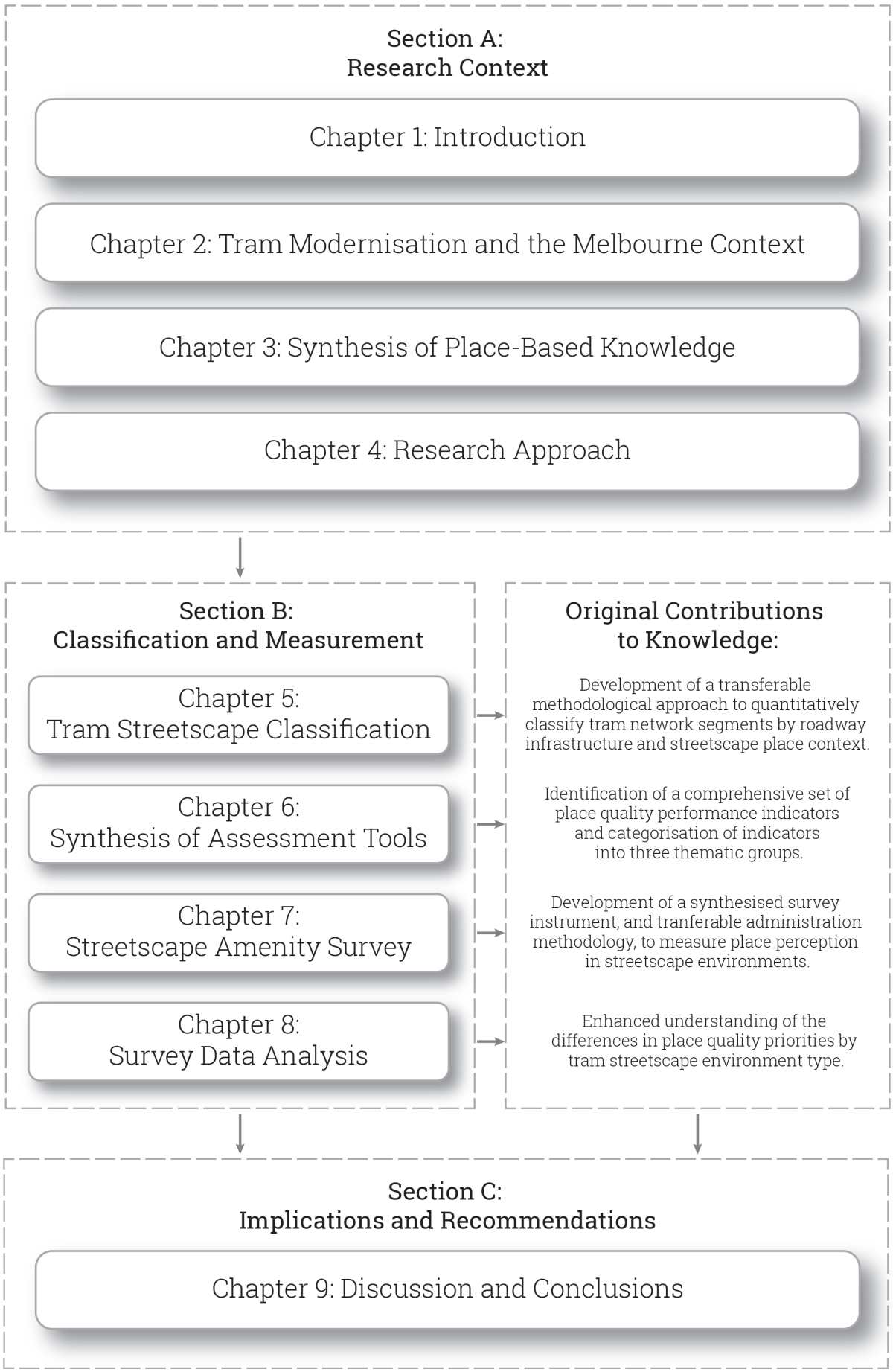

Figure 1.1 – Outline of the Thesis Structure

SECTION C: IMPLICATIONS AND RECOMMENDATIONS

The third, and final, section of the thesis summarises the findings of the primary research conducted in Section B by discussing policy implications for the tram modernisation process. It concludes with a summary of the contributions to knowledge the thesis has produced, and suggests opportunities for further research.

Chapter 9: Discussion and Conclusions

This chapter summarises the findings of all previous chapters by providing policy recommendations on how Melbourne's tram streetscape modernisation process can be utilised as an opportunity to enhance streetscape place quality. It concludes the research by recapping original contributions to knowledge, discussing limitations of the study, and outlining implications for future research directions.

Figures 1.1 and 1.2 visualise the thesis structure detailed above, via the nine chapters grouped into three sections. They also display original contributions to knowledge alongside the corresponding thesis chapters where they are developed. Figure 1.2, specifically, highlights the position of Chapter 1 in the overall thesis structure.

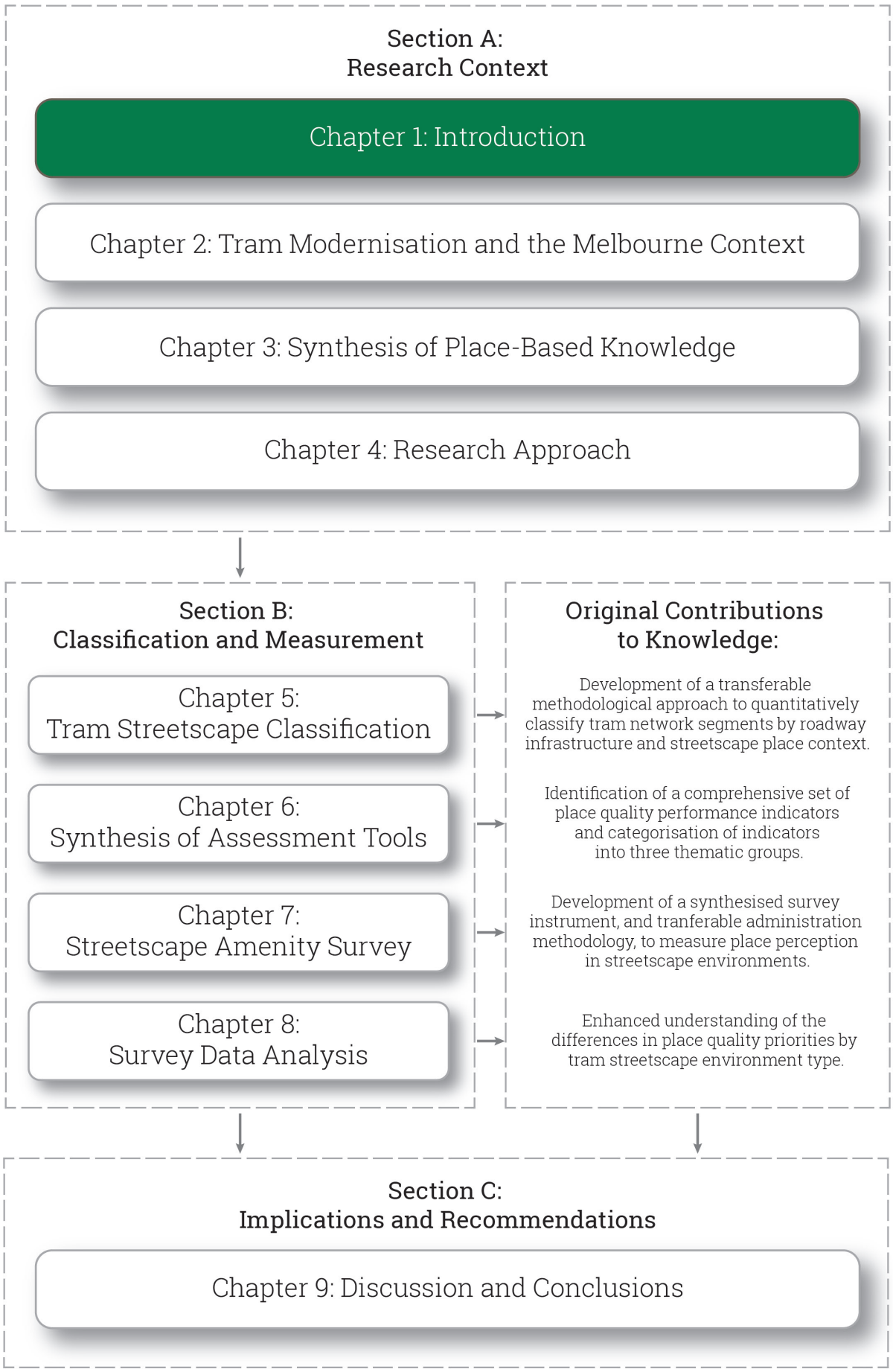

Figure 1.2 – Position of Chapter 1 in the Thesis Structure

1.5 Original Contributions to Knowledge

Each of the four chapters in Section B, where the primary research methodology and results are documented, were designed to produce original contributions to knowledge by filling gaps in existing research identified in Chapters 2 and 3. These contributions are summarised below.

- Development of a Transferable Method to Classify Tram Streetscapes

Chapter 2 discusses the need to define exactly how tram infrastructure can help to improve the public realm in a way that can be replicated and measured across unique sites. Chapter 5 begins to address this need by developing a first of its kind classification system to methodically categorise Melbourne's tram corridors by attributes of roadway infrastructure design and streetscape place context. The classification methodology represents transferable knowledge that can be applied to other cities in future studies.

- Inventory of Place Quality Performance Indicators through Synthesis of Tools

Chapter 3 identifies the lack of a strategy to comprehensively measure all aspects of place perception within published research works. Chapter 6 contributes to filling this gap by taking an inventory of performance indicators incorporated within practice-based place assessment tools. A synthesis of the tools is presented by categorising performance indicators into three thematic categories, and identifying those with highest significance based on their incorporation across multiple toolsets. This provides future studies with a comprehensive source of place quality performance indicators.

- Comprehensive Measurement of Place Quality in Tram Streetscapes

The synthesis of practice-based place assessment tools presented in Chapter 6 is applied in Chapter 7, which incorporates the findings in the development of a questionnaire to measure user perception of place quality in Melbourne's tram streetscapes. Together, these two chapters address a knowledge gap identified in Chapter 3 regarding the lack of a comprehensive strategy to measure user perception of place quality. In addition to being the first known study of its kind, the methodology applied in the questionnaire development and administration process is documented to facilitate replicability of the study in future research projects.

- Enhanced Understanding of Tram Infrastructure Impacts on Place Quality

The primary research conducted in Chapters 5, 6, and 7 culminate in the analysis of questionnaire results in Chapter 8. The findings facilitate an enhanced understanding of the impacts various tram infrastructure design strategies have on user perception of place quality, as well as how user priorities vary based on differing streetscape contexts. Both of these are key gaps in existing knowledge as identified in Chapters 2 and 3.

1.6 Chapter Summary

This chapter introduced the thesis and briefly summarised the field of research that explores subjective perception of place quality. It also discussed the increased interest in this topic from the perspective of urban design and transport planning, and presented the opportunity to explore perception of place quality in the context of Melbourne tram streetscape modernisation.

The structure of the thesis was outlined via a chapter by chapter preview, as well as a summary of four original contributions to knowledge the research produces.

The next chapter delves further into the details of the case study incorporated in this thesis by providing historical context to the Melbourne region, as well as describing the role that trams have played in its initial development and current revitalisation.

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2 TRAM MODERNISATION AND THE MELBOURNE CONTEXT

The Melbourne metropolitan region, situated within the State of Victoria in south-eastern Australia is utilised as a case study for the research presented in this thesis. This chapter frames the research by providing historical context to fluctuations seen in the global development of tram networks, as well as the key role tramways have played in the development of the Melbourne region throughout its history. It summarises the built characteristics of Melbourne's tram network that have evolved over time, and the relationship those changes have had with development patterns of surrounding streetscapes and neighbourhoods. As stated in Chapter 1, this thesis aims to explore user perception of place quality in the streetscape and identify how it may be impacted by various tram infrastructure design schemes. This chapter defines the relevance and necessity of the research presented in the broader thesis by providing context to the global experience of tramway development, and their role in both the historic development and modern revitalisation of the Melbourne region.

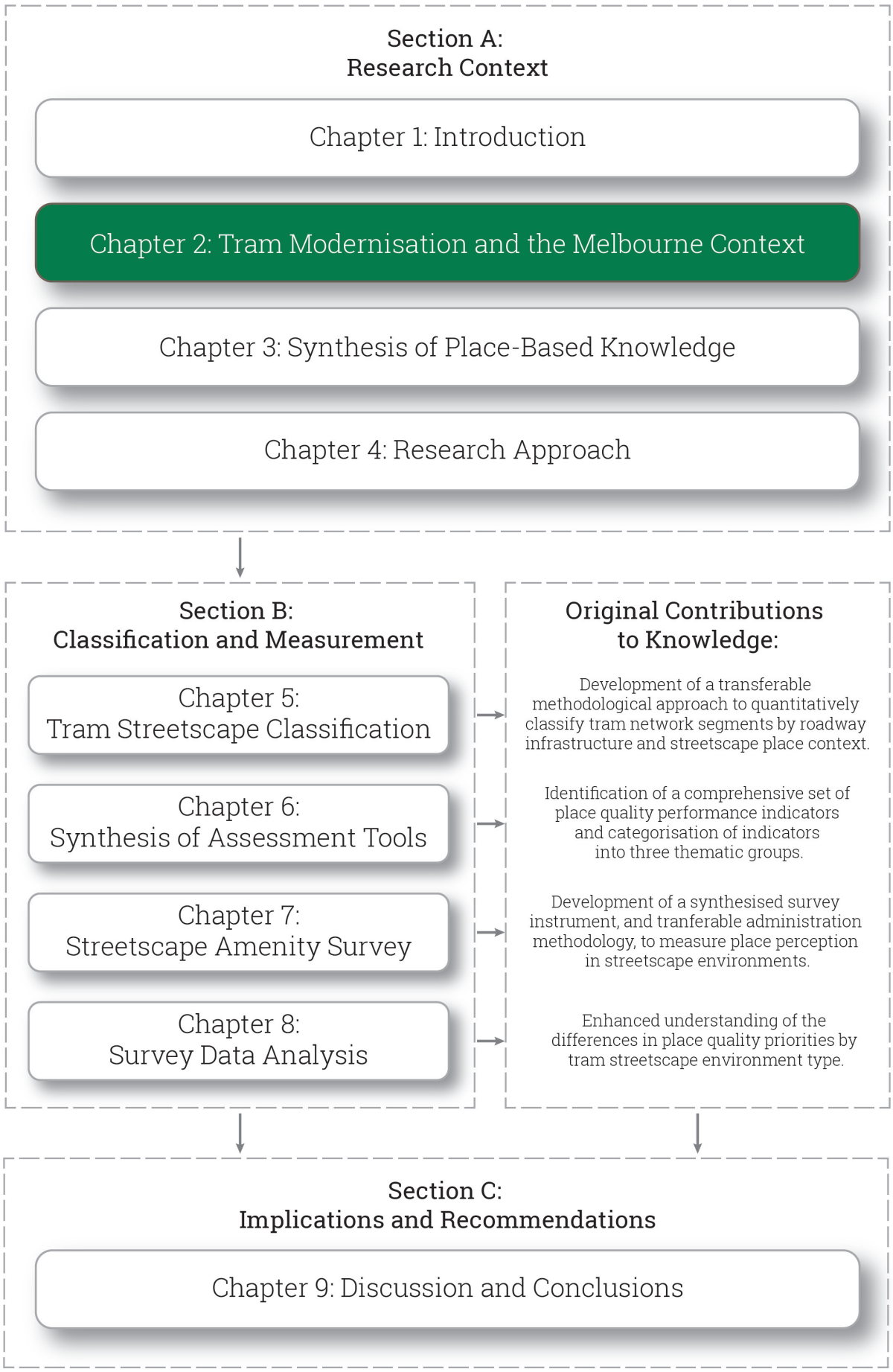

Figure 2.1 – Position of Chapter 2 in the Thesis Structure

2.1 Historic Fluctuations of the Tram as a Globally Prominent Mode of Public Transport

The tram (which in this thesis includes the predominately North American counterparts 'streetcar' and 'trolley') is a unique mode of mass transit; street-based but using rail technologies. As a vehicle of public transport, the tram has had an intriguingly complicated history. Revolutions in energy production changed the way they were powered, beginning with horse-drawn trams in the early nineteenth century, followed by steam and cable propelled trams by the mid-nineteenth century, and finally electric trams at the turn of the twentieth century through to modern times (Levinson et al., 2012). While inter-urban railroads went through the same concurrent transformations, trams can ultimately be acknowledged as the earliest form of mass public transport that specifically facilitated intra-urban mobility.

The extensive history of trams has meant that their prominence as a method of mobility has fluctuated as societal norms evolved over time. The most impactful shift was arguably the rise of the private, motorised vehicle. By the mid-twentieth century, private vehicles became affordable to the middle class and were widely adopted as a primary mode of transport across westernised countries. This personalised, on-demand form of mobility increased the average distance people were willing to travel on a daily basis and resulted in an increasingly sprawling reach of metropolitan regions. The built form of cities changed dramatically to facilitate this shift in mobility patterns and trams increasingly became viewed as "old fashioned, expensive, inefficient, and the cause of traffic congestion" (Pooley et al., 2006). By the 1960's, most street-based tramways across Australasia, Europe, and North America had been dismantled (Levinson et al., 2012; Mirás-Araujo, 2005; Pooley et al., 2006; Spearritt, 2014) to clear road space for private vehicles with motorised buses replacing trams as the dominant form of street-based public transport (Jones, 2008).

Interestingly, many of the circumstances leading to the downfall of trams in the mid-twentieth century are now beleaguering the reputation of the private vehicle. Car ownership is increasingly becoming an economic burden on personal budgets (Klein and Smart, 2017), and the infrastructure required to facilitate current usage levels has been shown to be an inefficient use of public land and monies (Shoup, 2005)

that perpetuates traffic congestion (Cervero, 2003) and has significantly contributed to the deterioration of the public realm (Jacobs, 1961). Additionally, increased acknowledgement of the global climate crisis has pressured public decision makers to shift investment towards sustainable forms of transport and denser built environments that decrease the need for long trips and, therefore, dependence on cars. (Tiwari et al., 2011; Walker, 2012). All of these factors have led to a resurgence in tram network investment throughout all of the regions that abandoned them in the previous century. Modern iterations of trams, however, have attempted to mitigate the issues that plagued their predecessors in what professionals have termed Light Rail Transit (LRT).

Sydney, Australia was one of the many places that had an extensive tram network which it dismantled in the mid-twentieth century, only to begin reconstructing parts of it in the modern era. Figure 2.2 displays a social media graphic from the New South Wales (NSW) government (the Australian State in which Sydney is the capital) displaying some of the differences between trams and LRT.

Figure 2.2 – Advertisement for Sydney's Newly Opened LRT Service

Source: Transport for NSW, New South Wales Government

Figure 2.2 highlights incorporation of enclosed, climate-controlled vehicles as a key difference between tram and LRT services. What may be slightly less noticeable is that the modern tram on the right is traversing exclusive right-of-way on a pedestrianised street, while the historic tram on the left operates in a mixed-traffic environment. Additionally, this segment of Sydney's modernised tram incorporates technology that provides a ground-level power supply and negates the need for the overhead wires shown in the historic picture on the left. This advertisement also does not highlight the incorporation of platform stops to facilitate level access boarding on LRT service.

While the NSW government is building these types of stops as part of a new tram route in Sydney, the Victorian (VIC) State Government, its neighbour to the south, is building them throughout its capital of Melbourne as part of the modernisation process of a 250km network that survived the trend of dismantling in the mid-twentieth century. The addition of these stops within Melbourne, and the concurrent alterations to the design of the broader streetscape that come with them, is utilised as a case study in this thesis. The remainder of this chapter explores the role trams played in the historic development of the Melbourne metropolitan area, as well as the current modernisation process and the opportunity it offers for revitalisation of the city and its inner suburbs.

2.2 The Role of Trams in the Early Development of the Melbourne Region

Modern development within the State of Victoria, as well as all other states and territories in what now forms the Australian Commonwealth, began in the later years of the British Imperial Era. What differentiates Victoria from other Australian states is that it was home to one of the largest gold rushes in world history (Reeves et al., 2010). The extensive amount of gold found within Victoria resulted in its capital, Melbourne, becoming the richest city in the world for the last two decades of the nineteenth century. This era was termed the 'Marvellous Melbourne' period and commenced a dramatic increase in overall population and development of the region (Lloyd, 2012).

The abundance of monetary wealth, combined with soaring population levels, initiated sprawling development of the region beginning in what are now considered inner and middle suburbs. Melbourne's founding in 1835 (City of Melbourne, 1997) meant it was one of the very first cities to be developed following establishment of the world's first passenger railway in 1825 (Casson, 2009). Public modes of transport, specifically tram and railways, played a major role in facilitating Melbourne's growth (Vines, 2011), representing one of the earliest examples of what is now commonly referred to as Transit-Oriented Development (Dittmar and Ohland, 2004). Figure 2.3 displays the extent of Melbourne's tram network at the turn of the twentieth century and Figure 2.4 shows how development of the inner suburb Richmond was heavily concentrated around tram and railways.

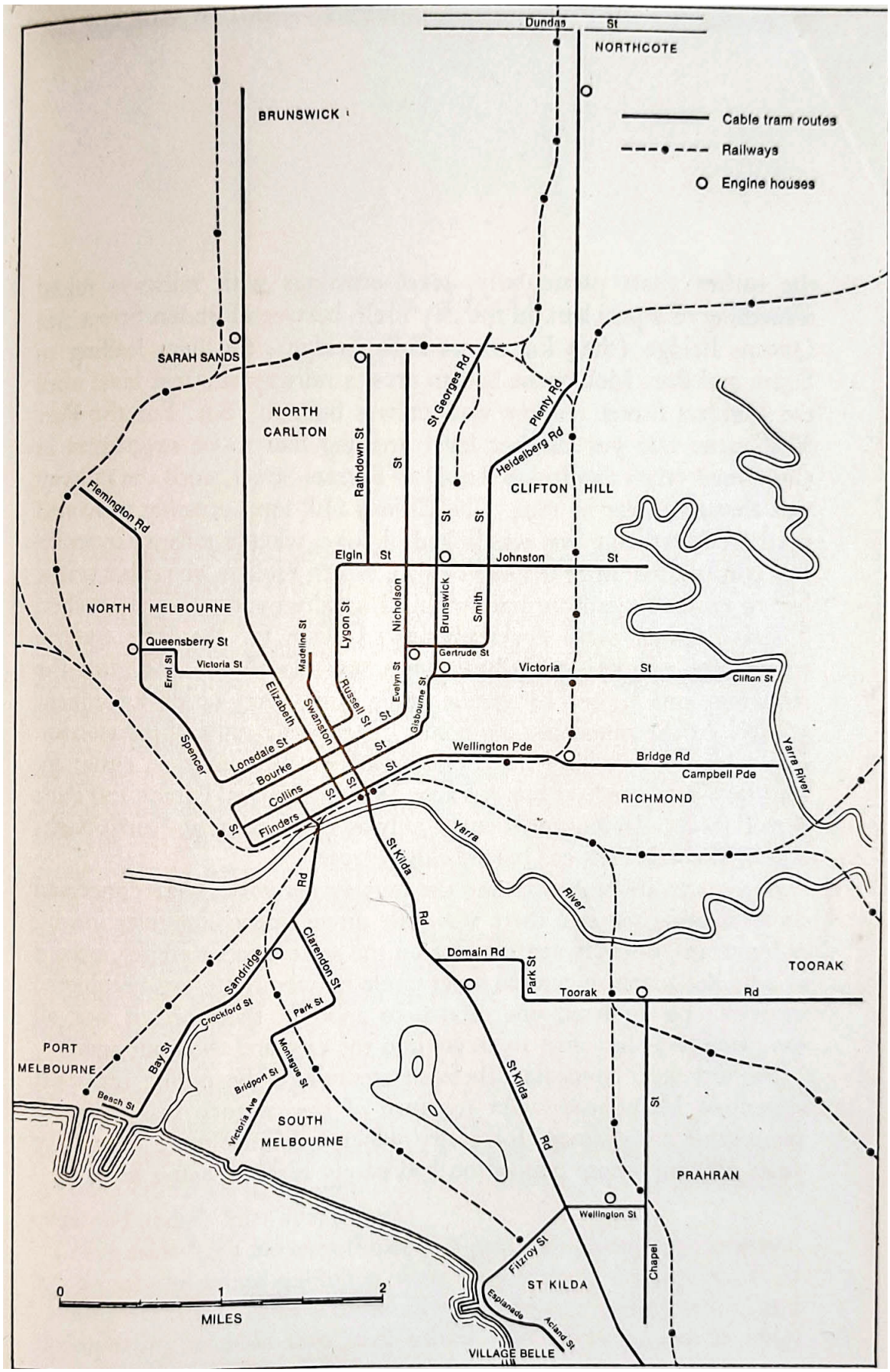

Figure 2.3 – Extent of Melbourne's Tram Network circa 1901

Source: Image scanned from Keating (1970), Page 57

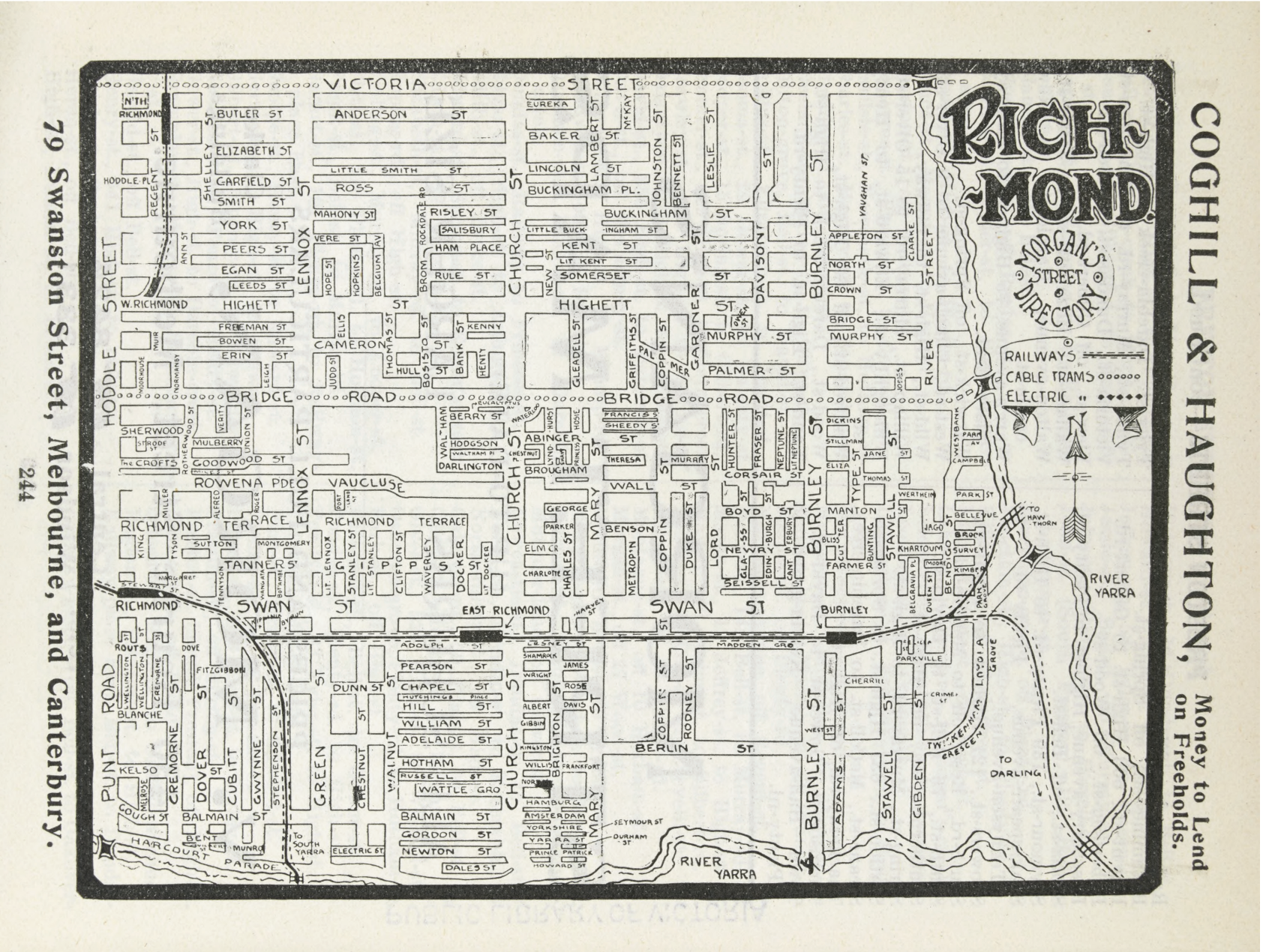

Figure 2.4 – Map of Richmond circa 1916

Source: State Library of Victoria

Figure 2.3 displays the reach of the tram network across Melbourne and its suburbs as early as 1901. The grid layout of Melbourne CBD's street network is also visible, as well as in some inner suburbs, a development pattern that enhances the accessibility and efficiency of street-based public transport services (Mees, 2000; Mees, 2009; Walker, 2012). Figure 2.4 is a map of Richmond, one of the oldest suburbs of the Melbourne metropolitan region, which is immediately east of the City of Melbourne. Trams played a major role in facilitating access to the suburb via direct connections to the CBD on Victoria Street (centre of Figure 2.3 and top of Figure 2.4) and Flinders Street/Wellington Parade (centre of Figure 2.3) which changes name to Bridge Road as it enters Richmond (centre of Figure 2.4). As shown in Figure 2.4, these two corridors housed cable trams in 1916 but they have since been electrified. A third tram service connecting Richmond and the CBD would later be added to Swan Street, as well as an inter-suburban route running on the north/south Church Street.

In Richmond and many other inner and middle suburbs, tram corridors have been a primary venue of access since their founding. As displayed in Figure 2.5, the role of suburban tramways as principal community access points resulted in commercial businesses such as pharmacies, banks, and food markets clustering around them. These types of streets (regardless of the presence of trams) are commonly referred to as 'Main Streets' in American English or 'High Streets' in British English, and many cities that expanded via tramways had similar development patterns (Warner, 1978).

Figure 2.5 – Cable Tram Terminus and Shops at Moreland Road, Brunswick circa 1900

Source: State Library of Victoria

2.3 Changing Patterns of the Post-WWII Population Boom

For many western countries, the decade immediately following World War II was characterised by major population increases in a phenomenon commonly referred to as the 'baby boom'. This was particularly true for Australia, which documented the world's second highest population increase of the post-war era (Van Bavel and Reher, 2013). All of this occurred in a time where the private vehicle was made more widely accessible to a variety of income levels. Due to an increased ability to facilitate longer-range mobility, the Melbourne region primarily accommodated the population growth of the post-war era by building new roads that expanded the reach of the metropolitan region. At the same time, since pre-war development centred around public transport, the CBD and inner suburbs now had an extensive network of electric tramways.

Many other cities across Australia, Europe, and North America also had extensive tram networks in this time period, but nevertheless responded to the post-WWII population boom by dismantling tram tracks to clear road space for private vehicles and facilitate growth through suburban sprawl. Melbourne was one of very few cities worldwide that made the decision to keep its network operational. The full extent of the network shown in Figure 2.6 is largely still intact to this day, and has even seen some minor outward expansions. Despite keeping its tram network, the Melbourne metropolitan region did still follow the global trend of developing new, outer suburbs centred on the private vehicle in the post-war era. The contrasting patterns of development between inner, pre-war suburbs and outer, post-war suburbs has been described as the 'two Melbournes' (Mees, 2000); one characterised by mid-density neighbourhoods easily accessible by public transport, and the other by low-density, American style suburbs that required private vehicle ownership for on-demand mobility.

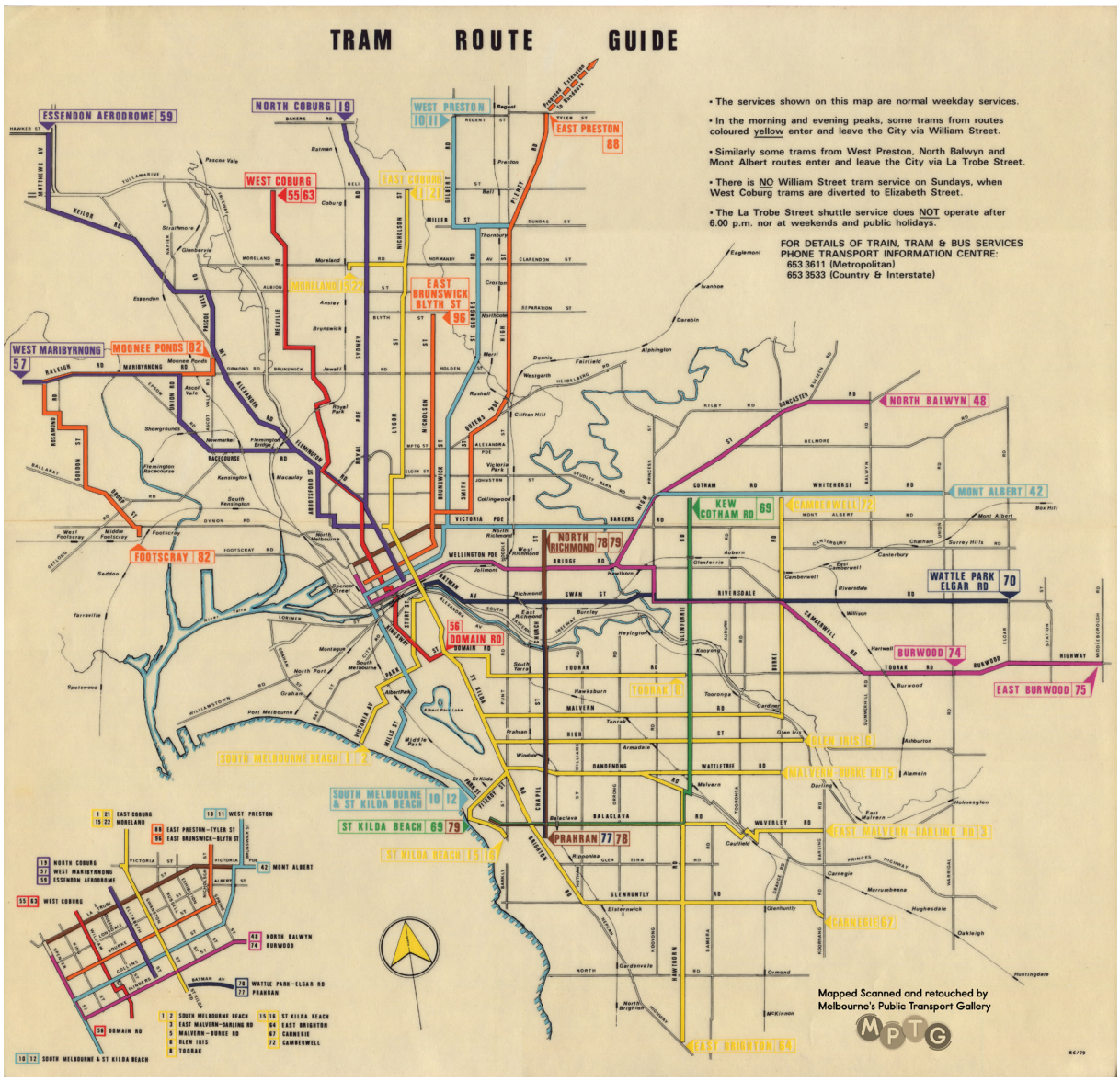

Figure 2.6 – Melbourne Tram Route Guide, 1979

Source: Melbourne's Public Transport Gallery

2.4 Shift to Placemaking in Inner Melbourne

Despite the continued presence of the tram network, Melbourne CBD and inner suburbs did not evade the changes that came along with the rise of the private vehicle. The increase in vehicles congested the city's road network, and significantly impacted tram movement efficiency as 75% of network track is situated in shared roadways (Diemer et al., 2018). At the same time, employment and activity centres became more widely dispersed across the region, with only 35% of all jobs in the metro area located within a 5 km radius of Melbourne CBD by 1981. This represented a major divergence from the historic trend of radial travel to and from the CBD that the region's public transport network was designed to facilitate. These shifting trends dealt a blow to public transport patronage, which declined by 56% between 1950 and 1980 despite the region's population increasing more than two-fold in the same time period (Mees, 2000).

The CBD was arguably the locale most negatively impacted by these changes. Disparaging critiques were common, with Dr. Norman Day, Professor of Architecture at Swinburne University, writing an article in 'The Age' decrying the CBD as an "empty, useless city centre" (Day, 1978). In an attempt to understand strategies that could be developed to revitalise the inner city, Melbourne city planners commissioned acclaimed architect Jan Gehl to conduct a 'Public Space, Public Life' study beginning in 1993. While the study's recommendations focussed on enhancing pedestrianised street life through a human-centred design approach, the city's tram network played a unique role in helping to fulfill these goals. Swanston Street, one of the CBD's main north-south thoroughfares, was closed to most traffic except trams in 1992. This enabled the widening of footpaths, planting of trees, addition of seating and other amenities that made the street a more enjoyable location to spend time. All of this was possible because the presence of trams maintained the ability of the street to facilitate high movement throughput, but in a safer and more space-efficient manner than private vehicles could achieve.

This shift towards human-centred streetscape design, along with other policy outcomes of Gehl's 'Public Space, Public Life' study, represented the birth of the placemaking movement in inner Melbourne planning and design practice. While bringing these dramatic changes to fruition presented immense political challenges,

actual implementation went through with relative ease. This is illustrated by Figure 2.7, displaying the Herald Sun evening edition front page on the day of Swanston Street closure to private vehicles. Rob Adams, Melbourne Council's Director of City Design at the time, recalls being told by a Herald Sun reporter that the paper had pre-written an article with the headline 'TRAFFIC CHAOS' but had to make a last-minute change after seeing the reality of the closure in practice (Salt, 2017).

Herald-Sun

LATE EXTRA

NEWS - PICTORIAL

CAKEWALK

Swanston switch easy — for most!

Di's grief

$65,000 TO WIN SPOT-THE-BALL IS BACK!

TONY LOCKETT SUPER COLORGRAM

● Offshore demand lifts $A ● Zelman Cowen to open new exchange — Business, P43

Figure 2.7 – Herald Sun late extra front page, 30 March 1992

Source: Salt, 2007

2.5 The 'Disability Discrimination Act' and Tram Modernisation

Despite inner Melbourne's shift towards human-centred urban design in the early nineties, the city's hundred-year-old tram network infrastructure had hardly changed. Stops had little-to-no infrastructure with boarding/alighting functioning similar to a typical bus stop except that, since trams operate on rails in the middle of the road, passengers were required to come down from the kerb and walk into the centre of the street before stepping back up again to get into the tram. The uncertainty that comes with walking into the middle of heavily-trafficked corridors, combined with a lack of level-boarding accessibility, clearly represents both an unsafe (Naznin et al., 2016) and unattractive (Diemer et al., 2018) proposition.

A major catalyst towards changing this reality arrived in 1992, when the Australian Parliament passed the federal 'Disability Discrimination Act' (DDA). The act codified a legal right for persons living with disabilities to fully participate in all aspects of public life (Australian Government, 1992). In the context of the tram network, this meant that all stops and vehicles would need to be upgraded to facilitate level-access boarding as well as other criteria such as incorporation of tactile pavers. These standards were defined a decade later in a subsequent legal regulation entitled 'Disability Standards for Accessible Public Transport' (DSAPT) (Australian Government, 2002).

CBD corridors were the first to receive tram boarding platforms that met DSAPT criteria, in what came to be colloquially known as 'super stops', with the Melbourne Town Hall stop opening on Collins Street in 2001 (shown in Figure 2.8). Since construction of the platform required removal of a traffic lane around the stop area, it was used as an opportunity to remove one lane of traffic on the entirety of Collins Street. This enabled the tram to operate in an exclusive right-of-way, in what became one of the first examples of tram separation from, and priority over, general traffic. The Swanston Street corridor also underwent a dramatic redesign to build super stops in 2002, approximately one decade after its original redesign for pedestrianisation. For the first time in the network's more than hundred-year history, these corridors had station-like stop environments and exclusive rights-of-way that brought a more modern, light-rail type of design aesthetic to the CBD portion of the tram network.

Figure 2.8 – Melbourne Town Hall 'Super Stop', Collins Street, CBD

Source: Author

2.6 The 'Most Liveable' Era

By the early 2010's the shift toward a human-centred approach to urban design, accomplished in part through dramatic redesigns of inner-Melbourne tram streetscapes, was showing immense benefits. The Melbourne local government area witnessed a fifty-five fold increase in residents between 1993 and 2013 (McMahon, 2014), and average weeknight pedestrian counts in the CBD rose 136% in the same time period (City of Melbourne, 2016). Melbourne CBD became globally renowned for its pedestrianised nature and alternative culture; thanks in large part to its European-like laneways, now bustling with activity and filled with street art, as well as its leafy tram thoroughfares.

The statistics backing up the region's reputation resulted in The Economist naming Melbourne the world's most liveable city for seven years in a row (The Economist Intelligence Unit Limited, 2017) – the longest any city has ever held the title (Chalkley-Rhoden, 2017). In many ways, the 'most liveable' decade represented the rebirth of a modern, global Melbourne for the first time since the 'Marvellous Melbourne' post-gold rush era. There was a sense of pride in what the city had accomplished over the past few decades and a positive outlook for what the future had in store for the region, with many inner suburbs seeing population growth patterns similar to that of Melbourne.

2.7 Political Sensitivity of Tram Modernisation

Despite the streetscape design advances made in Melbourne CBD and its immediate surrounds, suburbs were struggling to maintain the pace. As overviewed in Subsection 2.5, Collins Street and Swanston Street received tram super stops and dedicated rights-of-way at the very beginning of the new millennium. Most other CBD corridors followed suit within that same decade. But as we begin the second decade of the 21st century, just two years off from the legal requirement that all tram stops comply with DSAPT by 2022, less than a quarter of the network's stops have been modernised (Yarra Trams, 2020) despite nearly three decades having gone by since the passage of DDA.

This is explained in part by the reality that the CBD stops, while still politically challenging, were the easier ones to modernise in the context of the broader network. The installation of boarding platforms in streets where they have never existed before requires a dramatic redesign of not just the roadway, but the broader streetscape environment (Diemer et al., 2018). More than half of all trips to and from the CBD are made by public transport (Victoria State Government, 2013) so it was less difficult to reach political consensus that public transport should be prioritised in this area than outside of the CBD where 72% of all weekday trips are made by private vehicles and only 9% on public transport (Victoria State Government, 2013). Additionally, CBD corridors are amongst the widest in the inner parts of the Melbourne region and so, naturally, it has proven more difficult to modernise suburban tram corridors where total road space is less abundant on average (Currie, 2005). This issue of available space is further complicated by the prioritisation of on-street parking on many suburban tram corridors (Diemer et al., 2018), a space-inefficient amenity that has proven politically challenging to remove (Shoup, 2005).

Figure 2.9 displays the chaotic nature of the inner suburban tram corridors, with car drivers blocking a bike lane as they attempt to secure on-street parking, and tram passengers hidden amongst mixed traffic as they alight a low-floor vehicle at a stop that has yet to receive a boarding platform despite federal accessibility mandates. In addition to the chaos of the roadway, the broader public realm is visually cluttered and the pedestrian environment specifically is hardly visible. Clearly, this would be an intimidating streetscape environment for lesser-experienced users to traverse.

Figure 2.9 – Daily Traffic Chaos, Brunswick Street, Fitzroy

Source: Author

The scene displayed in Figure 2.9 could easily be replicated in many of Melbourne's inner suburban tram streetscapes; Chapter 5 documents that this type of mixed-traffic operating environment is found across 60% of the network. The historic development of inner suburban tramways as main/high street commercial corridors, as discussed in Subsection 2.2, has complicated the modernisation process. A multitude of stakeholder groups exist, including various road user groups, local businesses, and residents, all of whom tend to have conflicting views of what the future of the street should entail (Diemer et al., 2018). Essentially, 'placemaking', typically identified as the most impactful non-transport benefit of tram modernisation, also represents a major obstacle to bringing the projects to fruition in locations where 'place' is already a prominent factor.

Perhaps the strongest example of this dilemma in recent years has been Acland Street, a commercial corridor located 6 km outside of the CBD. The street is a major destination for locals and tourists alike, due to its eclectic shops, eateries, and bars, as well as its proximity to St. Kilda Beach and its reputation as a hub of alternative culture. It also happens to be the southern terminus of Route 96, Melbourne's most patronised tram route. In 2012 the State Government, in conjunction with the Port Phillip local council and Yarra Trams, introduced an ambitious plan that would modernise tram infrastructure in a way that achieved compliance with DSAPT, as well as transform the broader streetscape by closing the corridor to general traffic to create a new pedestrian and transit mall. The plan was met with opposition from local business owners, who argued private vehicle access and on-street parking were crucial to their bottom line.

As State Government attempted to progress the proposed design, business owners staged protests (Carey, 2013) which stalled the project for two years (Carey, 2015). Port Phillip Council eventually took lead of the streetscape project from State Government, and facilitated public input to the design process in a way that emphasised equal participation of all stakeholders, as opposed to ceding control of the conversation to the most vocal group. The broader public was generally supportive of the project, and the community-led design process resulted in a slightly modified version of the original proposal eventually coming to fruition.

The final approved design provided 25% increases to the corridor's total pedestrian space and footpath trading zones, created a new pedestrian plaza, separated tram operations from private vehicle movement, and brought the tram network segment into compliance with DSAPT. The project is now widely viewed as a success, with a post-construction analysis showing 10% increase in visitation as well as higher average growth in retail spending when comparing the corridor to regional benchmarks (City of Port Phillip, 2018). These statistics seem to negate the arguments of the commercial traders that originally opposed the project.

The streetscape design changes realised by the project are displayed in Figure 2.10. Photos A and B show the realisation of tram network benefits such as the addition of a double track terminus, construction of level access boarding platforms, and the removal of general traffic from tram right-of-way. Photos C and D display the creation of a pedestrian plaza behind the new tram terminus. The space needed to construct this plaza was acquired by closing the street to general traffic, removing all on-street parking, and moving the location of the tram terminus slightly forward.

Figure 2.10 – Acland Street, St. Kilda (Pre- and Post-Public Realm Revitalisation Project)

Photos provided by the City of Port Phillip and captured by Misheye Photography

2.8 Growing Pains of the Post-'Most Liveable' Era

The Global Liveability Index of 2018 (The Economist Intelligence Unit, 2019) brought an end to the 'most liveable' era just short of a full decade, with Vienna, Austria replacing Melbourne at the top of the list. At the same time, the Australian Census Bureau has projected that Melbourne will overtake Sydney as Australia's most populated metropolis by 2026 (Megalogenis, 2020) and the Victorian State Government has made policy commitments to accommodate the majority of this growth through urban infill development (Victoria State Government, 2017).

This has given rise to a productive discussion of public realm investments the Melbourne region will need to make in order to maintain its place as one of the world's most liveable cities. Much of this discussion has centred around public transport, particularly Melbourne's radial train network that, while officially called a Metro, currently operates more like a commuter rail network. As this thesis is being drafted, tunnel boring machines are at work digging the path for a train route that will bisect Melbourne CBD for the first time in the region's history. State Government is also in the final planning stages for a second subsurface train line that will link the CBD with the Melbourne Tullamarine International Airport. Early planning has also commenced for a project coined the 'Suburban Rail Loop', a third subsurface train line that will traverse middle suburbs to link the existing radial commuter train network and enhance the public transport network's ability to facilitate inter-suburban trips.

Notably absent from this discussion, however, has been any published plan or strategy to progress the stalled tram network modernisation process. This can most likely be attributed to the politically challenging nature of tram streetscape upgrades as overviewed in this chapter. It is only a matter of time, however, until this subject will be forced upon the government and broader public, as 100% of tram stops are legally required to reach DSAPT compliance by 2022. As demonstrated with the Acland Street modernisation example outlined in Subsection 2.7, the tram network is uniquely positioned to facilitate the Melbourne region's liveability and human-centred urban design aspirations, since the at-grade nature of the network forces a discussion on design changes to the broader streetscape and public realm.

Aside from public realm benefits, tram modernisation is by nature a transport improvement project and therefore facilitates the State Government's urban infill aspirations by enhancing inner-city mobility. The remainder of this thesis helps to advance Melbourne's stalled tram modernisation process by exploring insights that can be drawn from the global placemaking movement. While it is generally accepted that tram infrastructure can enhance the quality of its surrounding environment, defining exactly how it does this in a way that can be replicated across multiple unique sites is something that appears to have eluded policymakers and researchers, a gap that this thesis fills. 'Sense of place', and the broader process of 'placemaking', are explored in the following chapters in an effort to alleviate the politically challenging nature of tram network modernisation in Melbourne by concretely defining the broader public realm benefits it facilitates.

2.9 Chapter Summary and Identification of Gaps

This chapter overviewed various societal trends that caused fluctuations in the development of tramways around the world over the past two centuries. It presented an in-depth analysis of the role tramways played in the historic development of the Melbourne metropolitan region. Finally, it discussed the human-centred urban design strategies that inner Melbourne has put into place from the 1990's through to current times and how the region's tram modernisation process has the potential to further progress these efforts. A gap in existing knowledge was also identified, specifically the need to define exactly how tram infrastructure helps to improve the public realm in a way that can be replicated and measured across unique sites.

The primary takeaway from the chapter is that Melbourne's tram modernisation process has proven politically challenging due to the historic development of inner suburban tramways as main/high street commercial corridors meaning many opposing stakeholder groups are involved. The next chapter begins to fill the knowledge gap identified in this chapter by presenting a synthesis of place-based knowledge. It identifies what current research works have determined about perception of place quality in the streetscape, as well as pinpoints gaps in existing academic research that this thesis fills.

For reference, Figure 2.11 shows the extent of Melbourne's tram network at the publication of this thesis. Comparing it to Figure 2.6 illustrates a key point this chapter has communicated; Melbourne kept the full extent of its legacy tram network in place when most other cities around the globe were dismantling theirs.

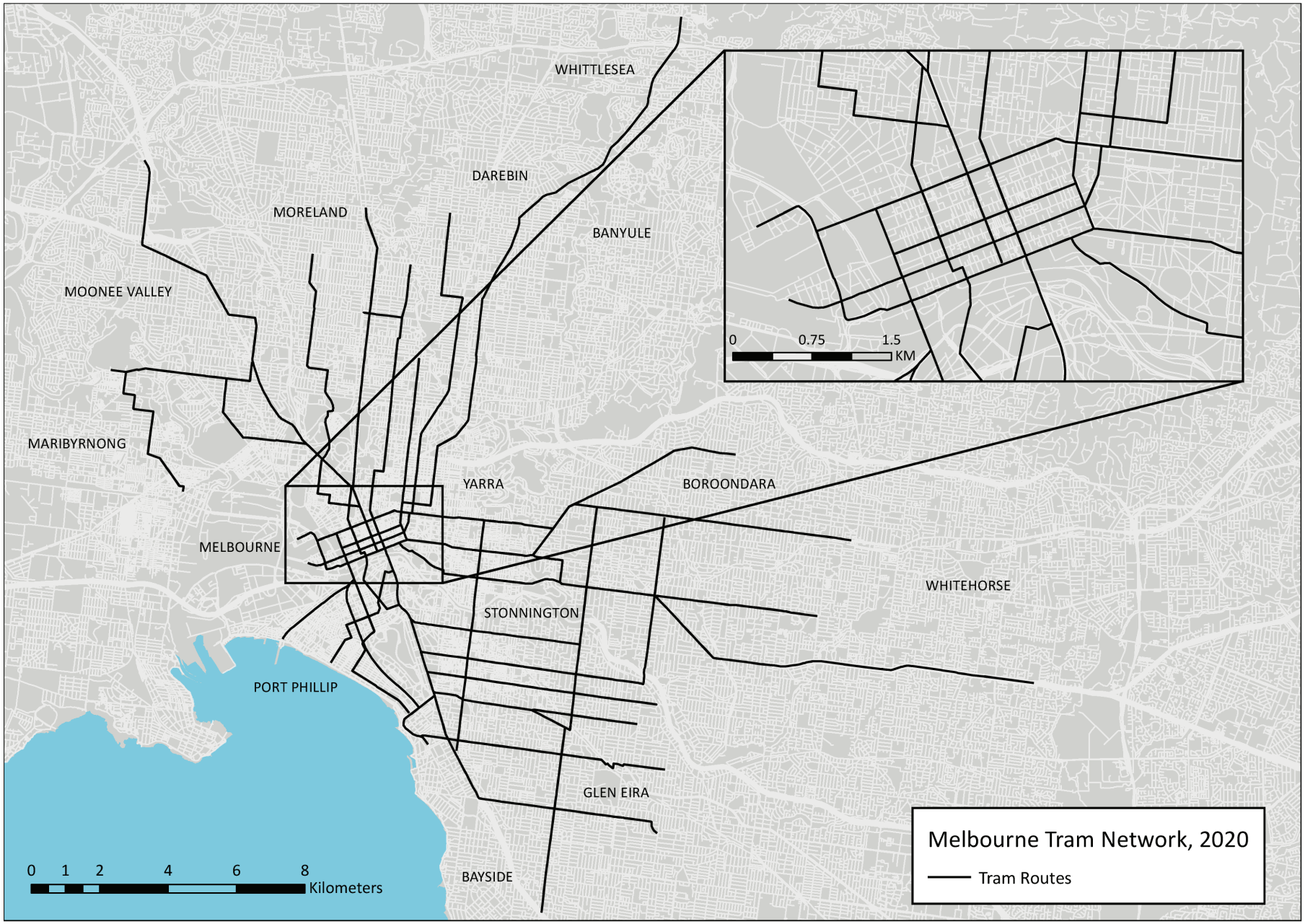

Figure 2.11 – Extent of Melbourne 's Tram Network as of 2020

Source: Author

3 SYNTHESIS OF PLACE-BASED KNOWLEDGE

This chapter further frames the research, beyond just the Melbourne context, by exploring the field of research centred on 'sense of place' and 'placemaking' in the public realm. As outlined in the previous chapter, tram modernisation offers the potential to alter the design of surrounding streetscapes through principles of human-centred design. However, perception of place quality is a highly subjective process involving many different aspects that make it difficult to identify performance indicators that can be replicated across multiple unique sites. To synthesise existing knowledge, this chapter employs a structured review strategy to identify stakeholder groups, define each group's perspective within the field, and discern the terminology utilised to discuss place-based concepts. This is followed up with an overview of the measurement methodologies each perspective incorporates to analyse place. The chapter concludes by outlining gaps in the place-based research field which are then addressed through application of the Research Approach.

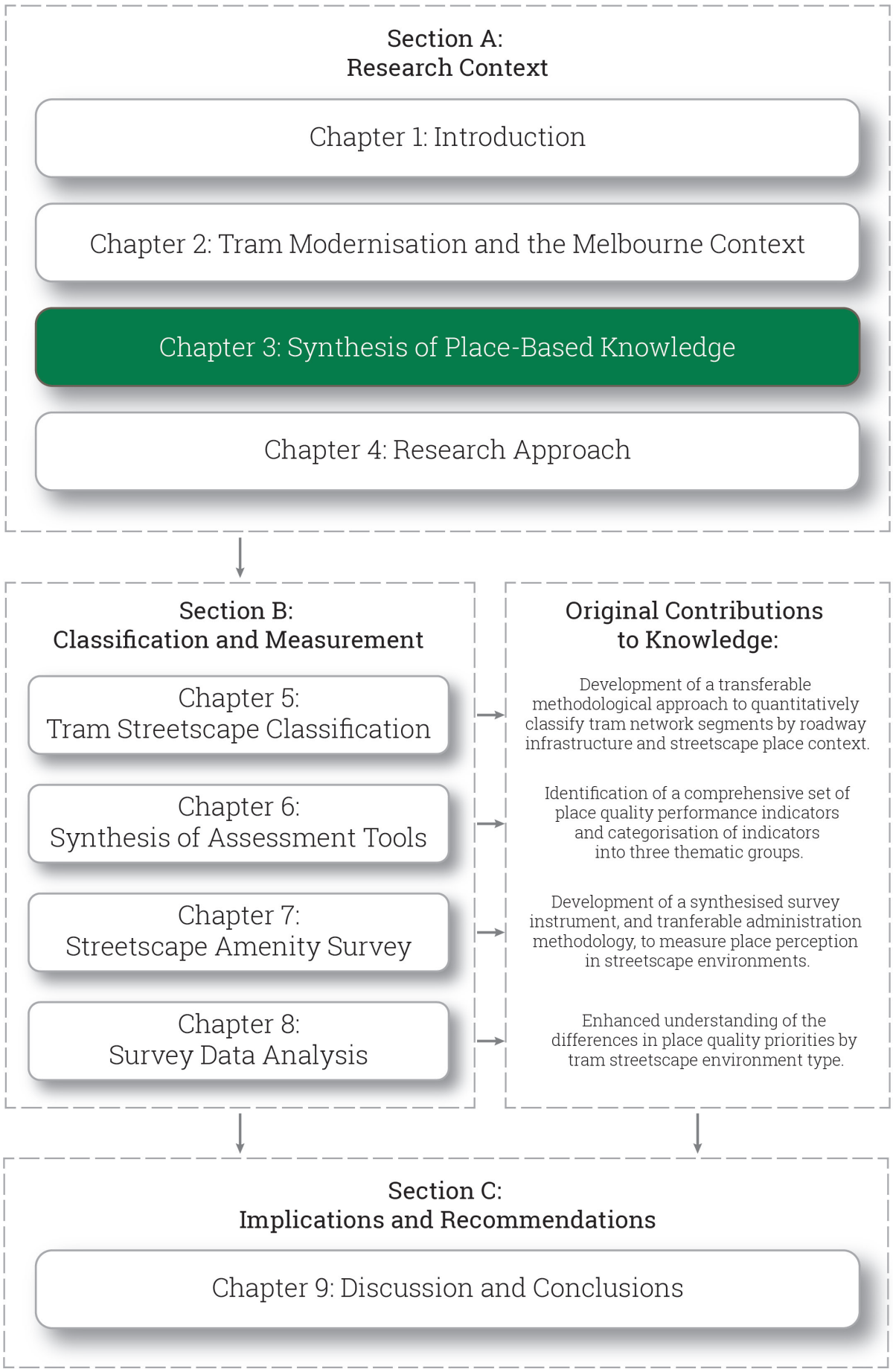

Figure 3.1 – Position of Chapter 3 in the Thesis Structure

3.1 Approach to Review

3.1.1 Search Strategy

Existing published research outputs were identified through Elsevier's research database, Scopus, due to its comprehensive nature and inclusion of peer-reviewed journal articles, conference proceedings, and other types of publications (Levine-Clark and Gil, 2009). The first criteria of the search strategy incorporated two umbrella terms commonly used by practice-based professionals, 'sense of place' and 'placemaking'. Using the document search tool on Scopus, it was required that at least one of these two terms be present in either the title or keywords to be included in the search results. The second criteria for inclusion was the presence of a word that indicated structured exploration of the topic in either the title, abstract or keywords. These words included 'measur*', 'defin*', 'explor*', 'descri*', 'inquir*', and 'interpret*' with asterisks utilised to include all grammatical versions of the word. As new place-related terms were discovered through this search strategy, the process was repeated incorporating those terms in the first criteria. Bibliographic review was also utilised to include other relevant sources discovered in publications that resulted from the above search strategy. Table 3.1 summarises the reviewed publications based on the Scopus-assigned subject area.

Table 3.1 – Reviewed Publications by Scopus-Assigned Subject Area

Journal Subject Area:	Total Publications:
Social Sciences: Geography, Planning and Development	83
Social Sciences: Urban Studies	78
Environmental Science: General Environmental Science	36
Social Sciences: Sociology and Political Science	30
Social Sciences: Development	29
Social Sciences: Other	22
Business, Management and Accounting: Tourism, Leisure and Hospitality Management	20
Environmental Science: Management, Monitoring, Policy and Law	18
Engineering: Other	16
Social Sciences: Transportation	16
Environmental Science: Other	13
Business, Management and Accounting: Marketing	12
Business, Management and Accounting: Strategy and Management	12
Arts and Humanities: Arts and Humanities (miscellaneous)	11
Engineering: Civil and Structural Engineering	11
Environmental Science: Nature and Landscape Conservation	11
Business, Management and Accounting: Other	10
Psychology: Other	10
Psychology: Social Psychology	10

Source: Analysis of Scopus Data

Note: There is crossover in the counts as Scopus can assign multiple subject areas to a journal or conference proceeding. For this reason, Table 3.1 does not show an 'Overall Total'.

3.1.2 Search Outcomes

In total, 194 journal and conference publications, 13 books, and 2 reports were identified and reviewed. Table 3.1 only includes counts of the reviewed journal articles and conference proceedings as these are the types of publications Scopus provides subject area classifications for. There is crossover in the counts as Scopus can assign multiple subject areas to a journal or conference proceeding, and the majority of reviewed publications were assigned multiple subject areas. This demonstrates the multi-disciplinary nature of place-based research. Secondary subject area categories (e.g. 'Social Sciences: Urban Studies') with more than ten reviewed papers are included in Table 3.1. Those with less than ten total reviewed papers are combined together into 'other' categories based on their common primary subject area (e.g. 'Social Sciences: Other', 'Psychology: Other'). Primary subject area categories with less than ten reviewed papers were not included in the table.

In spite of the wide-range of subject areas, the reviewed documents were found to represent three thematic categories emerged that help to define and categorise different points of view within the field. The first were publications that aimed to evaluate subjective perceptions of built and natural environments. Second were publications that dealt with decisions made in the planning and construction of the built environment. Lastly, many publications focused on the ability to access locations within a defined area, and the microscale impacts that prioritisation of active modes of transport (e.g. cycling and walking) has on what was referred to as 'in-between spaces' such as streets, plazas and parks, to function as destinations in their own right.

It is not suggested that these three thematic categories represent concrete boundaries of thinking; there is some overlap between the researchers and methods involved in each. However, defining the variety of perspectives enables enhanced understanding of the various roles present within place-based research and practice. The three thematic categories are adopted to organise the synthesis of knowledge presented in the remainder of this chapter.

3.2. Place Perspectives: Stakeholder Groups and their Primary Interest

The three thematic categories that emerged from the review can arguably be thought of as 'place perspectives', as each has a defined interest in place that is largely based off commonalities between the involved professions. The first category can be viewed as the 'interpreters' perspective as they are primarily interested in understanding the way humans interact with, and are influenced by, their surrounds. The second category, 'shapers' perspective, look for insights into the dynamics of attractive locations to better inform the development and maintenance of built environments. Finally, the third category deals with the accessibility of locations, and play a major role in either enabling or inhibiting the ability of streets to function as places. It can therefore be viewed as the 'connecters' perspective. Figure 3.2 outlines the professions involved in each place perspective, as well as those that hold a role in multiple groups. The remainder of this section discusses each place perspective in detail as well as the place-based terminology they utilise.

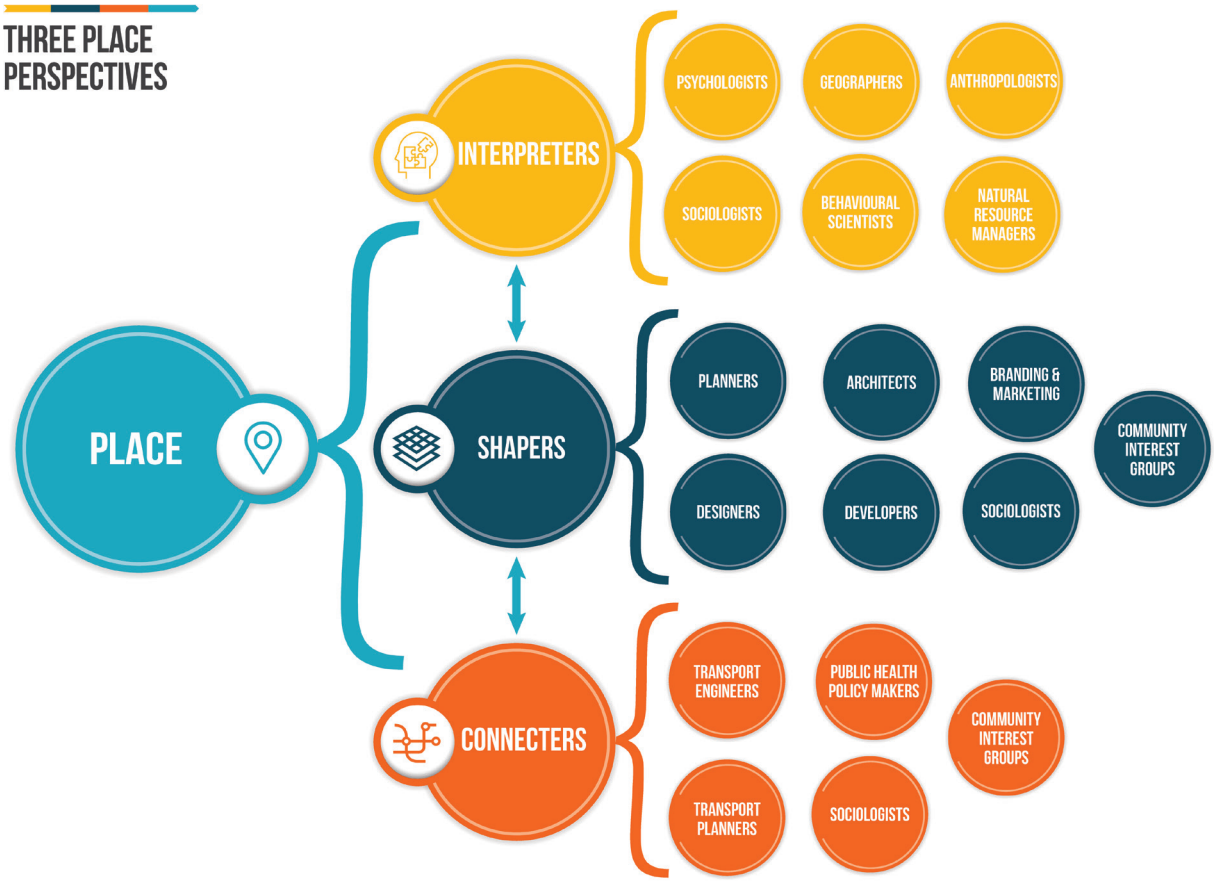

Figure 3.2 – Three Place Perspectives and their Associated Professions

Source: Author's Synthesis of the Literature

3.2.1 Interpreters: Analysing Human Interaction with Place, Land, and Other Inhabitants

The primary foundation of place-based literature is based in the fields of psychology, anthropology and human geography. This perspective is referred to as 'interpreters' because of their efforts to develop an enhanced understanding of human-environmental perception and the cultural relationships between inhabitants of a shared location. 'Interpreters' investigate all possible definitions of place, including those within public and private realms, the built and the natural environment, as well as locational scales ranging from country and region to town and home. They are also interested in all origins of place significance, from group or culturally assigned definitions, to highly individualistic locational perceptions. The researchers and practitioners that apply this perspective are most interested in defining the relationships that people have with the locations they inhabit or visit.

Despite the wide scope of this perspective, there have still been some key themes in the types of human-environmental relationships analysed. Connection to, and appreciation for, the natural environment is a common topic (Brown and Raymond, 2007; Hausmann et al., 2015; Davenport and Anderson, 2005). The feeling of belonging and social connection amongst inhabitants of a location, and how that may be unique to neighbourhood versus larger scale locations, is also explored (Fornara et al., 2010; Lewicka, 2010; Pendola and Gen, 2008; Cuba and Hummon, 1993). And thirdly, the formation of personal identity and how that is influenced by immediate surroundings seems to be of key interest (Jorgensen and Stedman, 2001; Webster, 2002).

In some cases, members of this perspective apply models from their broader fields of thought in an attempt to better understand these relationships. Jorgensen and Stedman (2006) suggested the 'ABC Model of Attitudes', one of the most cited models within the field of psychology (Eagly and Chaiken, 1998), as a possible way to better understand connection to personal property. The model explains attitudes through affective (A), behavioural (B), and cognitive (C) components, which Jorgensen and Stedman (2006) argue can be viewed as extensions of three place-based terms. Lengen and Kistemann (2012) draw connections between place-related concepts and neurology by discussing parts of the human brain that are dedicated to processing specific types of information.

Table 3.2 provides an overview of the terminology utilised by the 'interpreters' perspective and categorises terms into two groups: 'Overarching Themes', which act as broad descriptions for multiple aspects of locational significance; and 'Component Theories' that bring further explanation to the overarching themes by describing more specific aspects of human-environmental interaction.

Table 3.2 – Place-Based Terms Used by 'Interpreters'

	Term:	Discussed In:	Authors' Synthesised Definition:
Overarching Themes	Place Attachment	Amsden et al., 2010; Araújo de Azevedo et al., 2013; Bonaiuto et al., 1999; Brown et al., 2016; Brown and Raymond, 2007; Chapin and Knapp, 2015; Devine-Wright, 2009; Hidalgo and Hernández, 2001; Jorgensen and Stedman, 2001; Jorgensen and Stedman, 2006; Lewicka, 2010; Lewicka, 2011; Moore and Scott, 2003; Rosenbaum et al., 2007; Shamai, 1991; Stedman, 2003; Stedman, 2006	The degree of personal connection to a location. High place attachment indicates strong emotional connection to the location, and low place attachment indicates little to no emotional connection to the location.
	Sense of Community	Cuba and Hummon, 1993; Du Toit et al., 2007; McMillan and Chavis, 1986; Mullan, 2003; Pendola and Gen, 2008; Plas and Lewis, 1996; Talen, 1999; Talen, 2000; Thomas et al., 2015	The sociability and collectiveness of individuals residing in a common location, such as a neighbourhood or apartment complex, that results in a feeling of neighbourliness and belonging.
	Sense of Place	Afonso Dias et al., 2013; Amsden et al., 2010; Beidler and Morrison, 2016; Chapin and Knapp, 2015; Cross, 2001; Deutsch et al., 2013; Hay, 1998; Jivén and Larkham, 2003; Jorgensen and Stedman, 2001; Jorgensen and Stedman, 2006; Jorgensen and Stedman, 2011; Kyle and Chick, 2007; Lewis, 1979; Long, 2013; Relph, 1976; Shamai, 1991; Stedman, 2003; Tuan, 1980	The perceptions that an individual associates with a specific location based on its characteristics and how their individual personality traits interact with them.
Component Theories	Place Authenticity	Assi, 2000; Jamal and Hill, 2004; Jivén and Larkham, 2003; Ramkissoon and Uysal, 2011; Salah Ouf, 2010	A perception of how well historic, cultural and/or natural characteristics have been preserved or maintained in the upkeep or redevelopment of a location over time.
	Place Commitment	Moore and Scott, 2003; Rosenbaum et al., 2007; Shamai, 1991	The degree of dedication or devotion towards a location that often results from a strong sense of community. Most commonly displayed through advocacy and volunteerism. Sometimes described as an intensified version of place attachment.
	Place Dependence	Jorgensen and Stedman, 2001; Jorgensen and Stedman, 2006; Chapin and Knapp, 2015; Rosenbaum et al., 2007	Reliance on a location and its function. Can range from minor (mostly based out of habit and lack of desire for change) to more serious (based out of need for physical health and/or mental well-being).
	Place Identity	Carter et al., 2007; Chapin and Knapp, 2015; Cuba and Hummon, 1993; Devine-Wright, 2009; Jorgensen and Stedman, 2001; Jorgensen and Stedman, 2006; Rosenbaum et al., 2007; Shamai, 1991; Stedman, 2002	Most commonly utilised to decribe the phenomenon of a location and its qualities becoming a major part of an individual's personal identity. This can be displayed through their values and personality traits, as well as how they describe themselves to others. However, this term is also occasionally utilised as a synonym of 'Place Meaning'.
	Place Meaning	Amsden et al., 2010; Kyle and Chick, 2007; Kudryavtsev et al., 2012, Williams, 2014; Stedman, 2008	Symbolic or physical qualities associated to a specific location. Can be related to the current function of the location, a historic event that took place there, a prominent group/cultural identity existing in the location, or a highly unique quality or memory of the location specific to an individual. Place meaning is often described as an intensified sense of place and defines the personal reason for place attachment and/or commitment.
	Place Satisfaction	Bonaiuto, 2004; Deutsch and Goulias, 2010; Insch and Florek, 2008; Stedman, 2002; Stedman, 2003	The performance of a location in fulfilling the needs that drove an individual to visit or inhabit it. Often described as the first step towards place attachment, if satisfaction is high.

Source: Author's Synthesis of the Literature

Sense of Place is arguably the most prominent term 'interpreters' adopt, as it can describe any type of human-given perception associated with a location. It is all encompassing in that it acts as an umbrella term that all other terms from this perspective, including others in the overarching themes group, address more directly (Beidler and Morrison, 2016; Jorgensen and Stedman, 2001; Kyle and Chick, 2007; Shamai, 1991). Place Attachment and Sense of Community are also classified as overarching themes because they both incorporate multiple concepts covered by other terms within the perspective. They differ from Sense of Place however, as they have a specific impact or relationship with the terms they act as an umbrella for. Place Satisfaction, for example precedes attachment because an individual must first be emotionally fulfilled by a location before they can become attached to it. Similarly, Place Commitment is often developed due to an individual's connection to their neighbours and local culture via a strong Sense of Community.

The terms have been further explored in measurement schemes that allow for the identification of specific attributes that result in locational significance, as well as how the importance of those attributes varies between demographic groups (Amsden et al., 2010; Bonaiuto et al., 1999; Stedman, 2006). Measurement has also allowed for analysis of the locational scale to which significance is attributed (Cuba and Hummon, 1993; Hidalgo and Hernández, 2001; Lewicka, 2010; Moore and Scott, 2003), such as attachment or commitment to a specific street or neighbourhood versus the broader city.

This perspective forms the foundation of all place-based knowledge as its primary aim is to develop increased understanding of how humans interact with their surrounds and the people they share them with. The resulting research and terminology serve other place perspectives by offering broadly defined place themes that others can apply to their specific context.

3.2.2 Shapers: Devising Our Neighbourhoods, Towns, and Cities

The majority of places people experience in their daily lives are situated in the neighbourhoods, towns and cities that they live in. While 'Interpreters' attempt to understand individual perceptions of these locations, the way they are developed over time plays a major role in determining the quality and variety of places, as well as the types of people that will interact with them on a routine basis. Both the public and

private sectors have responsibilities in this task, with urban planners and designers playing the major public role of drafting policy on how private land should be developed and designing the public realm spaces that sit between them. Property developers and architects then fill the private role of bringing the policies to fruition parcel by parcel, while branding and marketing professionals frame sense of place in campaigns to attract and maintain economic vibrance.

In this sense the 'shapers' perspective has always played a key role in the transitioning of spaces to places. They have commercial motivations to make sure developed spaces are constructed in such a way that draws people in. On the public side, this can increase sociability (Plas and Lewis, 1996; Lund, 2003) and economic vitality (Long and Huang, 2019) which results in a lasting tax base of content residents and productive businesses. From the perspective of a private developer the ability to create, or be located adjacent to, an attractive space increases land and rental values (Carmona, 2019; Yiu, 2011) and therefore a more significant return on investment. Private businesses can also influence the design of their surrounding public realm, through the provision of footpath-based seating and shelter or increased permeability to the public realm via shop windows or an open plan design. Incorporation of these qualities have been shown to make local businesses stand out as positive community assets to local residents (Mehta and Bosson, 2010).

Despite these incentives, a key theme of the mid-to-late twentieth century is the decline of many cities in western society caused by rapid suburbanisation and deindustrialisation (Martinez-Fernandez et al., 2012; Rieniets, 2009), as well as neoliberal policies that brought increased privatisation and homogenisation of built environments (Clarke, 2004; Long, 2013). These trends resulted in historic shifts in public planning policy that, while challenged by some visionaries of the time (Jacobs, 1961), transformed inner cities in a way that has only recently been broadly accepted as misguided. Over the last few decades, however, improvements to the built environment and public realm took on a new role as an economic development catalyst and attractor of social capital (Gospodini, 2002; Ferbrache and Knowles, 2017). This has resulted in 'shapers' becoming increasingly interested in, and involved with, place-based research and practice. Table 3.3 outlines the terminology 'shapers' utilise to describe existing conditions of an area, with either neutral or negative connotations, as well as potential strategies for improvement.

Table 3.3a – Place-Based Terms Used by 'Shapers' (Part A: Existing Conditions)

	Term:	Discussed In:	Authors' Synthesised Definition:
Existing Conditions	Activity Centre	Casello and Smith, 2006; Cervero et al., 2010; Curtis and Tiwari, 2008; Karndacharuk et al., 2014; Newton, 2010; Pendola and Gen, 2008; Sarkar, 2003; Zakaria and Ujang, 2015	A hub of commerce and social activity that can range in scale from a commercial shopping strip, neighbourhood/town centre, or central business district. Acts as a central gathering area for the communities that surround it and is typically also of a higher density.
	Built / Urban Environment / Form	Carmona, 2019; Cervero, 2002; Cervero et al., 2009; Ewing and Cervero, 2010; Ewing and Handy, 2009; Handy, 1996; Handy et al., 2002; Harvey and Aultman-Hall, 2015; Hutton, 2006; Lawrence and Low, 1990; Leyden et al., 2011; Park et al., 2014; Pendola and Gen, 2008; Talen, 1999	An umbrella term to describe material characteristics of a human constructed location. This includes the shape, size and look of buildings, streets, and public spaces.
	Gentrification	Anguelovski, 2015; Blokland, 2009; Butler, 2007; Butler and Robson, 2001; Dawkins and Moeckel, 2016; Grodach et al., 2014; Hankins and Walter, 2011; Madden, 2014; Redfern, 2003; Shaw and Hagemans, 2015; Slater, 2006; Stabrowski, 2014; Stehlin, 2015; Zukin et al., 2009	A phenomenon describing higher-income residents moving into a historically lower-income, often ethnic, neighbourhood. This trend is typically catalysed by a major public infrastructure investment that makes the neighbourhood a more appealing place to live. Over time the new residents attract further public and private investments that increase the cost of living in the neighbourhood and pushes out the majority of the original population as well as the businesses that catered to them.
	Greenfield Development	Adams et al., 2001; Berke et al., 2003; Dorsey, 2003; Greenberg et al., 2001; Madden and Spikowski, 2006; McCarthy, 2002; Newton, 2010	The development of 'virgin' land that has never before been developed, involving removal of natural habitat. This also requires installation of new public utilities (water, gas, sewage and electricity) and services (roads, schools, etc.). Most typically occurs at the furthest reaches of a metropolitan area and is the result of sprawl pushing development further and further away from the central city.
	Liveability / Quality of Life / Well-Being	Anciaes and Jones, 2020; Araújo de Azevedo et al., 2013; Balsas, 2004; Beck, 2009; Cervero, 2009; Costanza et al., 2007; Delbosc, 2012; Gehl, 2010; Gidlöf-Gunnarsson and Öhrström, 2007; Godschalk, 2004; Harvey and Aultman-Hall, 2015; Insch and Florek, 2008; Jones and Lucas, 2012; Mullan, 2003; Sampson and Gifford, 2010; Stehlin, 2015; The Economist Intelligence Unit, 2019; van Kamp et al., 2003	An assessment of a location's ability to provide a comfortable, healthy, safe and affordable environment to live.
	LULU	Anguelovski, 2015; Armour, 1991; Greenberg, 1993; Mannarini et al., 2009; Schively, 2007	Acronym for 'locally unwanted land use'. A land use that is undesired by the local community due to negative environmental factors such as pollution and/or noise. LULUs typically end up being placed in lower-income communities due to a perceived lack of the necessary social capital and political power to block it.
	NIMBY / NIMBYism	Armour, 1991; Dear, 1992; Devine-Wright, 2009; Lake, 1993; Mannarini et al., 2009; Oakley, 2002; Schively, 2007	Acronym for 'not in my backyard'. Refers to a person / philosophy that is against developments or planning strategies that are perceived as changing the character of the local area.
	Public Realm / Space / Sphere	Beck, 2009; Carmona, 2014; Clarke, 2004; Gehl, 2010; Gehl, 2011; Jacobs, 1961; Leyden et al., 2011; Talen, 2000; Webster, 2002	Any location that is freely open and accessible to all members of the public. This includes parks, plazas/squares, sidewalks/footpaths, and other similar locations.
	Social / Human Capital	Butler and Robson, 2001; Costanza et al., 2007; Hanna et al., 2009; Hoyman and Faricy, 2009; Jorgensen, 2010; Kamruzzaman et al., 2014; Lewicka, 2011; Thomas et al., 2015	A network of interpersonal relationships, both formal and informal, within a community. This network can enable community members to access assistance, knowledge, services, resources, and other methods of empowerment simply by tapping into the interconnectedness of their community.
	Sprawl	Berke et al., 2003; De Vos and Witlox, 2013; Dorsey, 2003; Downs, 2005; Ewing and Dumbaugh, 2009; Farris, 2001; Godschalk, 2004; Greenberg et al., 2001; Handy, 2005; Jun, 2004; Marshall, 2000; McCarthy, 2002; Newton, 2010; Talen, 2013	The phenomenon of a metropolitan area continuously expanding into the surrounding region to accomodate growth, as opposed to increased densification of the inner-suburbs and city. This expansion is often characterized by a lack of clear planning objectives.
	Third Place	Mehta and Bosson, 2010; Oldenburg, 1999; Oldenburg, 2001; Oldenburg and Brissett, 1982; Rosenbaum et al., 2007	Locations people visit other than their home and place of work. Typically of a social or recreational nature including locations such as cafés/restaurants, libraries, places of worship and parks.

Table 3.3b – Place-Based Terms Used by 'Shapers' (Part B: Strategies for Improvement)

	Term:	Discussed In:	Authors' Synthesised Definition:
Strategies for Improvement	Adaptive Reuse	Bullen and Love, 2010; Hutton, 2006; Langston et al., 2008	The repurposing of a building that maintains the exterior built form but changes the interior use; such as turning a former church into a restaurant, or subdividing the interior of a warehouse into individual apartments. Can also refer to the repurposing of a segregated corridor, such as the creation of New York's famed 'High Line' via conversion of an abandoned elevated rail line.
	Brownfield Redevelopment	Adams et al., 2001; Berke et al., 2003; Dorsey, 2003; Greenberg et al., 2001; McCarthy, 2002; Newton, 2010	The redevelopment of land that became contaminated from a previous industrial use. Involves remediation strategies such as soil replacement.
	Form-Based Code	Hansen, 2014; Madden and Spikowski, 2006; Talen, 2013	An alternative to conventional zoning code that sets standards for the size, placement, and visual appearance of buildings. These standards are typically developed with the specific aim of achieving higher quality public realm outcomes.
	Inclusionary Zoning	Dawkins and Moeckel, 2016; Kontokosta, 2014; Schuetz et al., 2011; Williams, 2000; Zukin et al., 2009	Policy requiring developments to provide a specific percentage of affordable housing units. Often incorporated in an effort to protect long-time residents of a gentrifying neighbourhood as investment increases and it becomes a more expensive place to live.
	Infill/Greyfield Development	Berke et al., 2003; Dorsey, 2003; Farris, 2001; Foo et al., 2013; Godschalk, 2004; Greenberg et al., 2001; Jun, 2004; Madden and Spikowski, 2006; Newton, 2010	The redevelopment of vacant or underutilised land, often at a higher density than a majority of surrounding lots (such as an apartment complex in a neighbourhood of single-family homes). Essentially a middle term between greenfield development and brownfield redevelopment.
	Mixed-Use Development / Zoning	Cervero, 1996; Cervero and Kockelman, 1997; Cervero et al., 2010; Grant, 2002; Hoppenbrouwer and Louw, 2005	A building, group of buildings, or zone with a mixture of land uses designed to lessen the need for travel. Most commonly this takes the form of an apartment complex or office building with a convenience store, restaurant/café, day care, doctor's office or other use at the street level.
	New Urbanism	Berke et al., 2003; Deitrick and Ellis, 2004; Ellis, 2010; Fulton, 1996; Godschalk, 2004; Grant, 2002; Handy, 1996; Handy and Clifton, 2001; Katz, 1994; Lund, 2003; Marshall, 2000; Newman and Kenworthy, 1996; Plas and Lewis, 1996; Podobnik, 2011; Talen, 1999; Talen, 2013	A neighbourhood development strategy incorporating design principles aimed to increase interaction between neighbours and therefore help to foster a sense of community.
	Place Branding / Marketing	Braun et al., 2013; Campelo et al., 2013; Ferbrache and Knowles, 2017; Gnoth, 2007; Hankinson, 2007; Hanna and Rowley, 2012; Hernandez-Garcia, 2013; Lucarelli and Berg, 2011; Kalandides, 2011; Mayes, 2008; Zenker and Beckmann, 2013	Emphasising existing natural, built, cultural and/or social capital within a location as part of a strategy designed to increase economic activity such as tourism and local business patronage or home ownership.
	Placemaking	Blokland, 2009; Cilliers and Timmermans, 2014; Dorsey and Mulder, 2013; Duff, 2010; Ferbrache and Knowles, 2017; Foo et al., 2013; Friedmann, 2007; Friedmann, 2010; Horvath, 2013; Jones and Evans, 2012; Lepofsky and Fraser, 2003; Madden and Spikowski, 2006; Martin, 2003; Pierce et al., 2011; Poppe and Young, 2015; Project for Public Spaces, 2007; Røe, 2014; Sampson and Gifford, 2010; Schneekloth and Shibley, 1995; Stehlin, 2015	The social and political process of collectively constructing sense of place. Often refers to a specific set of material initiatives aimed to improve a location, ideally with community input and visioning processes given the highest priority in determining the strategy.
	Smart Growth	Cervero, 2006; Danielsen et al., 1999; Dorsey, 2003; Downs, 2005; Farris, 2001; Godschalk, 2004; Greenberg et al., 2001; Handy, 2005; Talen, 2003	A policy that promotes compact, mixed-use communities with access to all basic needs within short distances in order to decrease sprawl and make walking, cycling, and public transport more convenient ways of getting around.
	Tactical/Guerrilla/Pop-Up/DIY Urbanism	Finn, 2014; Lydon, 2015; Mould, 2014	Temporary or low-cost projects designed to address specific deficiencies in a location. Often citizen-identified projects, sometimes implemented without governmental approval, that act as a trial before a more permanent solution is installed.

Source: Author's Synthesis of the Literature

Some of the 'existing conditions' terms, such as Activity Centre or Human Capital, simply provide ways to discuss either a specific characteristic of the built environment or aspects of the population that lives there. They either describe human-given definitions of place or the social factors that influence that definition. Others, such as Sprawl and Gentrification, deal with phenomena occurring that pose problems for the local population and their surrounding environment. The 'strategies for improvement' terms then offer solutions for those phenomena, such as Smart Growth as a way to combat Sprawl, or Inclusionary Zoning to prevent redevelopment from causing Gentrification.

All of the terms, however, have different aspects that relate to terms from the 'interpreters' perspective (Table 3.2). The phenomenon of NIMBYism, for example, can be better understood by investigating feelings of place attachment to a particular location (Devine-Wright, 2009). Concepts like Adaptive Reuse may be able to alleviate NIMBY concerns of neighbourhood change by preserving and enhancing the existing built character of a location. Additionally, Tactical Urbanism projects might be carried out by individuals that have a low level of place satisfaction, but high level of place commitment.

It is not suggested that the built characteristics 'shapers' deal with create human-environmental significance by themselves. However, the decisions they make in shaping space offers key insights into the ability of people inhabiting the spaces to form places of significance within them. The terminology they utilise also describes potential inhibitors of that formation due to choices made in the shaping of a location, and potential remedies to fix them.

3.2.3 Connecters: Place Accessibility and 'Street Life'

Since people bring meaning and purpose to places, the transformation of space to place is highly dependent upon the ease of accessibility to the location at hand. Built environment design choices that impact accessibility also play a role in quality of life (Handy and Clifton, 2001; Anciaes and Jones, 2020), the physical activity of inhabitants (Cervero et al., 2009; Ewing et al., 2006; Handy et al., 2002; Hoehner et al., 2005) and the ability for streets to function as quality public realm spaces (Anciaes and Jones, 2016; Carmona, 2014; Carmona, 2019). The 'connecters' perspective historically only included

transport planners and engineers, but recent evolutions in thought have brought in public health professionals and community interest groups that helped shift focus toward more place-based outcomes.

As the 'shapers' perspective aims to restore vibrancy within human built environments, an often vicious circle between transport infrastructure decisions and surrounding land use patterns has been identified as a major obstacle to revitalisation. This phenomenon is most commonly referred to as the transport-land use connection (Cervero and Kockelman, 1997; Handy, 2005; Newman and Kenworthy, 1996). Private vehicles are less space efficient than other forms of transport and so as infrastructure is built to accommodate them, destinations become more spread out. This increases dependence on private vehicles which then in turn further intensifies urban sprawl through lower density development and segregated land uses; and the cycle continues on from there. In Los Angeles, a metropolis globally recognized as the capital of car culture, this cycle has resulted in 26% of all land within the urbanised area being occupied by corridors for private vehicle movement; but even outside the capital of car culture, the global average is only 5% less (Atlas of Urban Expansion, 2016).

However, the research also shows that alternative transport infrastructure (for pedestrians, cyclists, and public transport) and more compact communities with a higher diversity of destinations can be mutually supportive (Cervero, 2009; Handy, 2005). The transport-land use connection, therefore, has the potential to be a virtuous circle with positive outcomes for place quality depending on the policy decisions a location pursues. The place-based literature can arguably be thought of as the next evolution in the discussion, as it builds upon the transport-land use connection by examining how mobility factors impact the way people perceive and make use of a location, instead of just what types of land uses occupy it.

While streets themselves are not necessarily inhibitors to the formation of place, those that are designed to prioritise throughput of private vehicles are less safe (Ewing and Dumbaugh, 2009) and the neighbourhoods around them are perceived as having a weaker sense of community (Mullan, 2003). On the other hand, neighbourhoods with active main street spines that encourage pedestrian and commercial activity are more likely to have an increased sense of community (Pendola and Gen, 2008). Ease of

access to destinations, and general ease of mobility as a whole, has also been shown to enhance personal well-being (Delbosc, 2012). This may help to explain why transport projects are increasingly prioritised for their place-based outcomes (Anciaes and Jones, 2020; De Vos and Witlox, 2013; Ferbrache and Knowles, 2017; King and Fischer, 2016).

Table 3.4 categorises the place-related terminology used within the 'connecters' perspective in two groups. The first group is made up of terms that deal with the safe accessibility of locations by all modes of transport. The second group outlines strategies that help generate street life, which enhances the ability of streets and their immediately surrounding environments to become places.

Table 3.4 – Place-Related Terms Used by 'Connecters'

	Term:	Discussed In:	Authors' Synthesised Definition:
Accessibility	Automobile Dependence / Forced Car Ownership	Currie and Senbergs, 2007; Handy, 2002; Handy and Clifton, 2001; Handy et al., 2005; Newman and Kenworthy, 1999	A phenomenon where access to a car is essentially required to obtain basic human needs. Caused by a location's built environment being inconducive to alternative modes of transport, and often cited as the result of suburban sprawl.
	Bikeability / Bike Score	Cervero et al., 2009; McNeil, 2011; Stehlin, 2015; Wahlgren and Schantz, 2012; Winters et al., 2013	A quality assessment of an area's cycling infrastructure and the number and diversity of locations accessible by bike.
	Complete Street	Hui et al., 2018; Karndacharuk et al., 2014; Laplante and McCann, 2008; McCann, 2013	A policy framework guiding roadway design towards allocation of a comfortable amount of space to all modes of transport - including walking, cycling and public transport - not just private vehicles.
	Movement and Place / Link and Place	Diemer et al., 2018; Jones et al., 2007; Jones et al., 2008; Jones and Boujenko, 2009	A street network classification methodology made up of two rankings; one for a street's significance as a through-movement route, and one for its significance as a destination. Allows for the development of design guidelines that take both contextual factors into account, as well as identification of streets that were not designed to accommodate the function they currently serve.
	Road Diet / Traffic Calming	Karndacharuk et al., 2014; Pendola and Gen, 2008; Stehlin, 2015	Physical design changes packaged together along a corridor that are designed to slow general traffic and provide increased safety, comfort, and priority for pedestrians, cyclists, and public transport.
	Transit-Oriented Development	Calthorpe, 1993; Cervero, 2004; Dawkins and Moeckel, 2016; Dorsey and Mulder, 2013; Dittmar and Ohland, 2004; Kamruzzaman et al., 2014; Park et al., 2014; Ratner and Goetz, 2013; Schlossberg and Brown, 2004	An area designed for walkability and mixed-use development immediately adjacent to a high-quality public transport (typically metro/subway, light-rail or bus rapid transit) station.
	Walkability / Walk Score	Anciaes and Jones, 2016; Cervero et al., 2009; Ewing et al., 2006; Ewing and Handy, 2009; Hansen, 2014; Hoehner et al., 2005; Lee and Talen, 2014; Lo, 2009; Mehta, 2008; Park et al., 2014; Sarkar, 2003; Schlossberg and Brown, 2004; Southworth, 2005; Zakaria and Ujang, 2015	A quality assessment of an area's pedestrian environment and the number and diversity of locations accessible by foot.
Street Life	Ciclovia / Open Streets / Streets Alive Event	Cervero et al., 2009; Hipp et al., 2016; Lydon, 2015	A temporary, possibly recurring, event where a street is closed to vehicular traffic so that the entire roadway can be used for walking, cycling and other physical activities. Commonly also includes other elements such as yoga classes, community group information stalls, and market/vendor areas. Aims to promote alternative modes of transport, increase physical activity and enhance sense of community.
	Pedestrian-Oriented Design / Pedestrianisation	Handy and Niemeier, 1997; Handy and Clifton, 2001; Handy, 2002; Isaacs, 2000; Southworth, 2005; Yiu, 2011	A design standard that emphasises the pedestrian environment through elements such as wide footpaths, increased tree canopy, street furniture, and frequent road crossings in order to prioritise walking as a primary mode of transport in a location. 'Pedestrianisation' specifically is also sometimes utilized to refer to the full-closure of a roadway to all motorised vehicles.
	Shared Street/Zone/Space	Anciaes and Jones, 2016; Hamilton-Baillie, 2008; Karndacharuk et al., 2014	A street, or segment of a street, shared by all modes and uses with little to no designation of space. Vehicular traffic is typically limited to 10 kph or less to facilitate high levels of pedestrian permeability.
	Street/Public Life	Jacobs, 1961; Gehl, 2010; Gehl, 2011	A general term to describe cultural activities that take place outdoors along a street (on the footpath or kerbside, and potentially in the street itself if that street is closed to traffic) or other public realm spaces (parks, plazas, etc.). Includes street performances, people-watching, outdoor dining, sunbathing, markets, food trucks and more.
	Streetscape	Elsheshtawy, 1997; Ewing et al., 2006; Ewing and Handy, 2009; Harvey and Aultman-Hall, 2015; Harvey et al., 2015	A term that encompasses the roadway as well as its immediate surroundings (i.e. footpaths, tree canopy, street furniture, building façades, etc.) and how they blend together to create a sense of place for the street.

Source: Author's Synthesis of the Literature

Bikeability and Walkability are the clearest examples of safe accessibility, with both representing quality assessments for their respective travel mode. Transit-Oriented Developments aim to concentrate development along key nodes of public transport networks to facilitate ease of access and lessen dependence on private vehicles. Movement and Place offers a framework to classify a street's context as both a travel route and a destination, and Road Diets present a method to adjust design to better facilitate sustainable modes of transport as well as place function.

The Street Life category of terminology deals more specifically with streets, and their immediately surrounding environments, to become destinations in their own right. Street Life and Streetscape are the most encompassing terms within the category. They describe the liveliness of streets, and the environment where street-based activities could occur. The other terms offer design solutions and temporary events that enable a revisioning of how a street could function.

Place-related terminology based in the 'connecters' perspective offers key insights into locational accessibility, as well as methods for capitalising on limited public realm space available in the rapidly growing metropolitan areas of the twenty-first century.

3.3 Difference in Measurement Strategies Between the Place Perspectives

Each of the three outlined place perspectives plays a key role in understanding the formation and quality of public realm space. 'Shapers' form the built environment through the identification of community needs, public policies that can address them on a large scale, and physical features that can enhance attractiveness of specific sites. 'Connecters' make decisions about ease of access to those sites. In-between spaces such as streets, plazas, and parks, are more likely to function as places in their own right when they are easily accessible by active modes of transport (e.g. cycling and walking). The clear distinctions between each perspective's motivation to analyse place-based concepts result in differentiated methods of measurement. These are outlined in the following text.

3.3.1: 'Interpreters': Direct Investigation of Perceptions

Since 'Interpreters' are primarily interested in analysing how aspects of place are subjectively perceived by individuals, their measurement tactics involve direct inquiries to place users, primarily through scale-based surveys. Jorgensen and Stedman (2006) attempted to measure multiple place-based terms, as well as connect them to perceived environmental values, through a survey of homeowners around a lake in Wisconsin. The survey takers ranked their level of agreement to personal statements such as "I feel happiest when I'm at my lake property", and "My lake property reflects the type of person I am", as well as environmental statements such as "I like to have a lot of natural vegetation on my lake property" and "Being near the water is the best thing about my lake property". These statements aimed to analyse place attachment to property, as well as examine place identity traits and environmentally-based reasons that connection may have developed.

Shamai (1991) also measured 'sense of place' via a scale-based survey, but utilised the scale to define three distinct categories that incorporated other place-based terms. The first is 'belonging to place', followed by 'attachment to place', and finally 'commitment to place'. In order to measure movement between the three phases, he established a sense of place scale made up of seven degrees, as visualised in Figure 3.3.

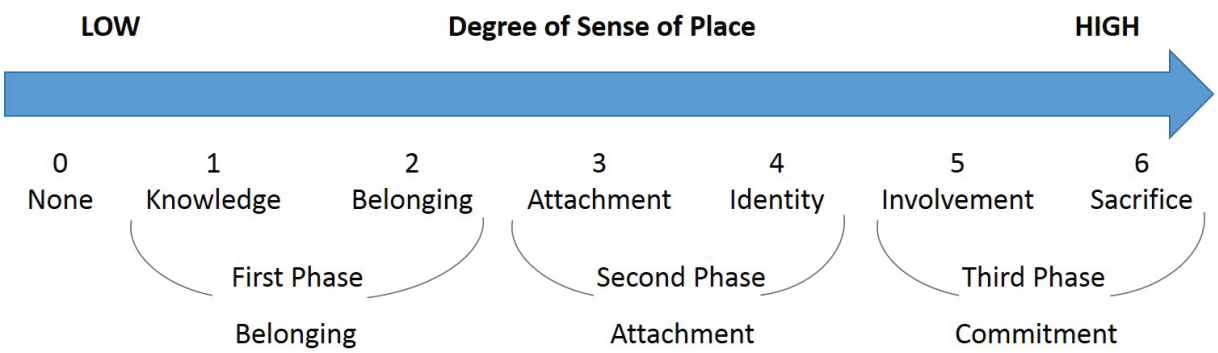

Figure 3.3 – 'Sense of Place' Scale

Source: Author's Interpretation of Shamai (1991)

Each phase along Shamai's scale includes two degrees to signify whether it is at the lower or higher end of the phase. The scale also includes a degree used to indicate the respondent has no sense of place, with Shamai (1991) specifically indicating this potential outcome is often neglected in the literature. The degrees and phases along the scale utilise some of the other place-related terms found in Table 3.2, such as degrees 3 and 4 in the second phase utilising the phrases 'attachment' and 'identity'. This emphasises the point that 'sense of place' can be viewed as the most prominent umbrella term the 'interpreters' perspective utilises, which the 'component theories' terms (see Table 3.2) then bring further explanation to.

To a lesser extent, 'interpreters' also incorporate structured interviews to understand and measure place perception. This methodology is most commonly utilised when the researcher explores a very specific place-based theme that is difficult to measure through ranked survey statements. Hay (1998), for example, used interviews to further explore the typically positive relationship between sense of place and length of residence, by exploring themes such as home, family, community, and culture. All of these themes are aspects of spending time in a place, but are difficult to capture through scale-based surveys.

In summary, 'Interpreters' measure and explore aspects of place by directly asking place users about their perception. This is primarily accomplished through scale-based surveys, but interviews are also used to the extent that deeper, qualitative explanations are required. These methods position 'Interpreters' to understand the process of locational significance and how it is developed in the human mind. Their interpretations, and the methods by which their interpretations are derived, can enhance the ability for 'shapers' and 'connecters' to use their decision-making processes as exercises in placemaking.

3.3.2: 'Shapers': Needs and Performance Analyses

'Shapers' form the built environment through the identification of community needs, public policies that can address them on a large scale, and physical features that can enhance the attractiveness of specific sites. It is perhaps the most comprehensive perspective in regard to measurement strategies because it represents a middle ground between 'interpreters' and 'connecters'. A research project documented over multiple publications (Ewing et al., 2005; Ewing et al., 2006; Ewing and Handy, 2009) provides an example of this by attempting to measure subjective perceptions of objective physical features in the pedestrian environment. Figure 3.4 displays how these concepts interact with each other to explain walking behaviour. It also displays 'Urban Design Qualities' as middle-ground concepts professionals have developed to communicate the relationships between these objective features and subjective reactions.

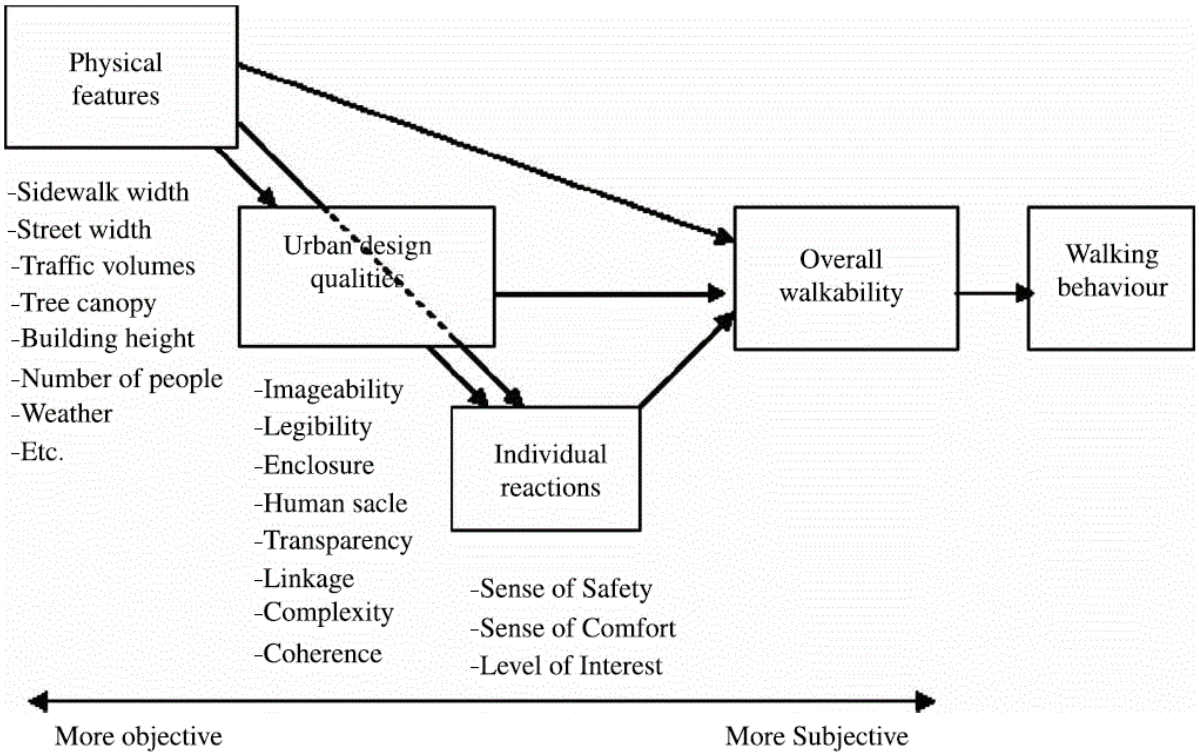

Figure 3.4 – Walking Behaviour Explained through Subjective Reactions to Objective Features, and Practice-Based Terminology that Describes Elements of the Relationship

Source: Ewing and Handy (2009)

Figure 3.4 draws linkages between the three place-based perspectives identified in this review. It explains that 'Physical Features' regarding streetscape design may be able to provide a conceptual rating of a location's walkability, but an understanding of 'Individual Reactions' to the design features is needed to comprehensively understand impacts on walking behaviour. As one part of the study's measurement process, Ewing et al. (2005) used a structured filming protocol to document the pedestrian experience of 48 streetscapes on video. This was utilised to facilitate an in-person experience for a survey where participants ranked streetscape performance of each of the 'Urban Design Qualities' listed in Figure 3.4. This type of methodological approach is commonly referred to as 'Video Elicitation', and stood out as one of the more unique measurement tactics in review of research outputs from the 'shapers' perspective.

The use of 'Importance Performance Analysis' was also documented as a unique measurement strategy applied by the 'shapers' perspective. It measures individual perceptions of a location by asking users to rank the importance of specific items, as well as the performance of a specific location in meeting the standard of those items. Riviezzo et al. (2009) applied this method in an effort to understand community perceptions of town centre place quality. A survey was developed based on four categories of place quality aspects ('Ambient Conditions', 'External Layout and Design', 'Internal Design' and 'Social Factors'), with each category asking respondents to rank the importance and performance of 4 to 6 individual items. After administration of the survey, the matrix shown in Figure 3.5 was developed to document town centre improvement priorities.

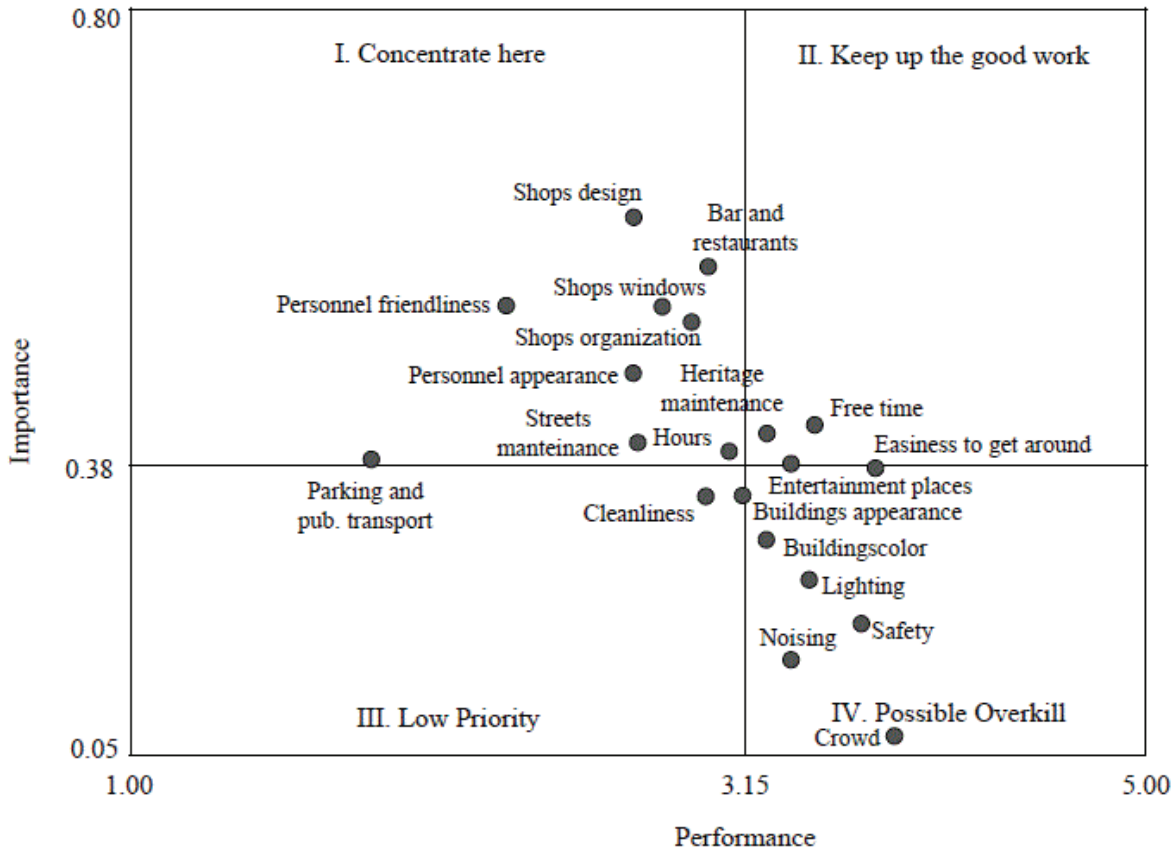

Figure 3.5 – 'Importance-Performance Analysis Matrix' and 'Priority Quadrants'
Source: Riviezzo et al. (2009)

As displayed in Figure 3.5, individual place quality aspects were plotted into four 'Priority Quadrants' based on their importance and performance scores. While 'Importance Performance Analysis' and 'Video Elicitation' stood out as unique methodologies to gather subjective locational insights, a significant amount of research outputs from the 'shapers' perspective examines existing data from secondary sources to provide more objective observations of place quality. As a whole, the measurement strategies employed by 'shapers' display their interest in both subjective and objective locational insights, and positions the perspective as a middle ground between 'interpreters' and 'connecters'.

3.3.3: 'Connecters': Accessibility and Significance Classifications

The policy decisions made by 'connecters' based in practice can either enhance or inhibit the ability to access a location via active modes of transport (e.g. cycling and walking). In-between spaces, such as streets, plazas, and parks, are much more likely to function as places in their own right when they are easily accessible by active modes of transport. In this sense, the main form of place-based measurement conducted by 'connecters' are those that analyse accessibility. A 'complete street' for example, is an analysis of accessibility at the most localised scale by ensuring that a corridor has dedicated space for all modes of transport, active, motorised and public. More complicated analyses of accessibility are conducted at the regional scale. Winters et al. (2013), for example, measured the bikeability of the Vancouver metropolitan area through the lens of five specific components; density of bike routes, presence of bike route separation infrastructure, connectivity between bike routes, density of available destinations, and local topography. Each of these five components contributed to an overall score of bikeability, as displayed in Figure 3.6.

After calculating the bikeability scores displayed in Figure 3.6, an average score was determined for each of the region's local government areas to identify where improvements should be prioritised. This was paired with average scores for each of the five components to identify the types of improvements that were most needed in each area. In the case of the Winters et al. (2013) study, this data was readily available through other sources and their analysis contributed by compiling it into a score. However, 'connecters' also utilise structured audits to collect primary data on the functioning of 'in-between spaces'. Gehl (2013), for example lays out a comprehensive methodology for measuring what it terms 'Public Life'. This involves structured documentation and counts of the activities taking place in a streetscape such as vendors and general commercial activity, people sitting in the location, cycling through it, or waiting on public transport.

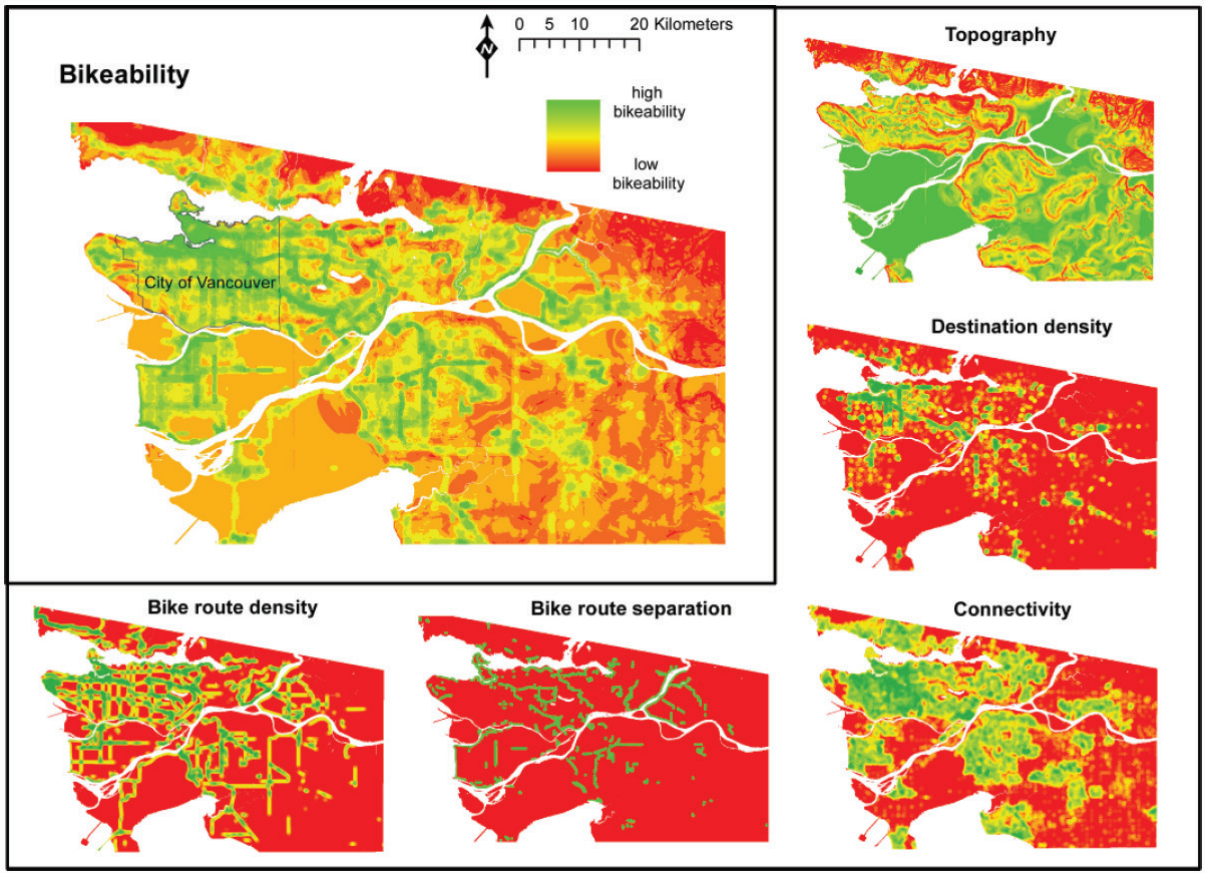

Figure 3.6 – Bikeability of the Vancouver Metropolitan Region

Source: Winters et al. (2013)

A newer form of place measurement amongst the 'connecters' perspectives aims to combine all of their place-based perspectives into a 'place ranking' that classifies corridors based on their relative significance as an end-of-trip destination. This is combined with a 'movement ranking' that classifies corridors based on their significance as a through-movement route in the broader street network. The two scores allow for the positioning of corridors on a matrix and the development of 'street types' to address contextualised design needs. The concept was first developed by Jones et al. (2007) as 'Link and Place' but is now more commonly referred to as 'Movement and Place' (Transport for London, 2016; Victoria State Government, 2019). An example of Transport for London's application of this framework is displayed in Figure 3.7.

The particular version of the 'Movement and Place' matrix shown in Figure 3.7 allows for corridors to be classified based on three ranks of movement significance and three ranks of place significance. The result is four primary street types with distinct purposes:

- A 'Local Street' is not very significant for either movement or place;
- A 'City Place' has little significance for movement but high significance for place;
- A 'Core Road' has high significance for movement but little significance for place;
- And a 'City Hub' has high significance for both movement and place.

The five remaining street types fall in between these major ones and have more blended movement and place contexts. Since its development by Jones et al. (2007) the tool has been incorporated into planning strategies by a number of cities in the United Kingdom, Australia, and New Zealand (Transport for London, 2011; Adelaide City Council, 2012; Victoria State Government, 2019; Transport for New South Wales, 2018; Auckland Transport, 2018).

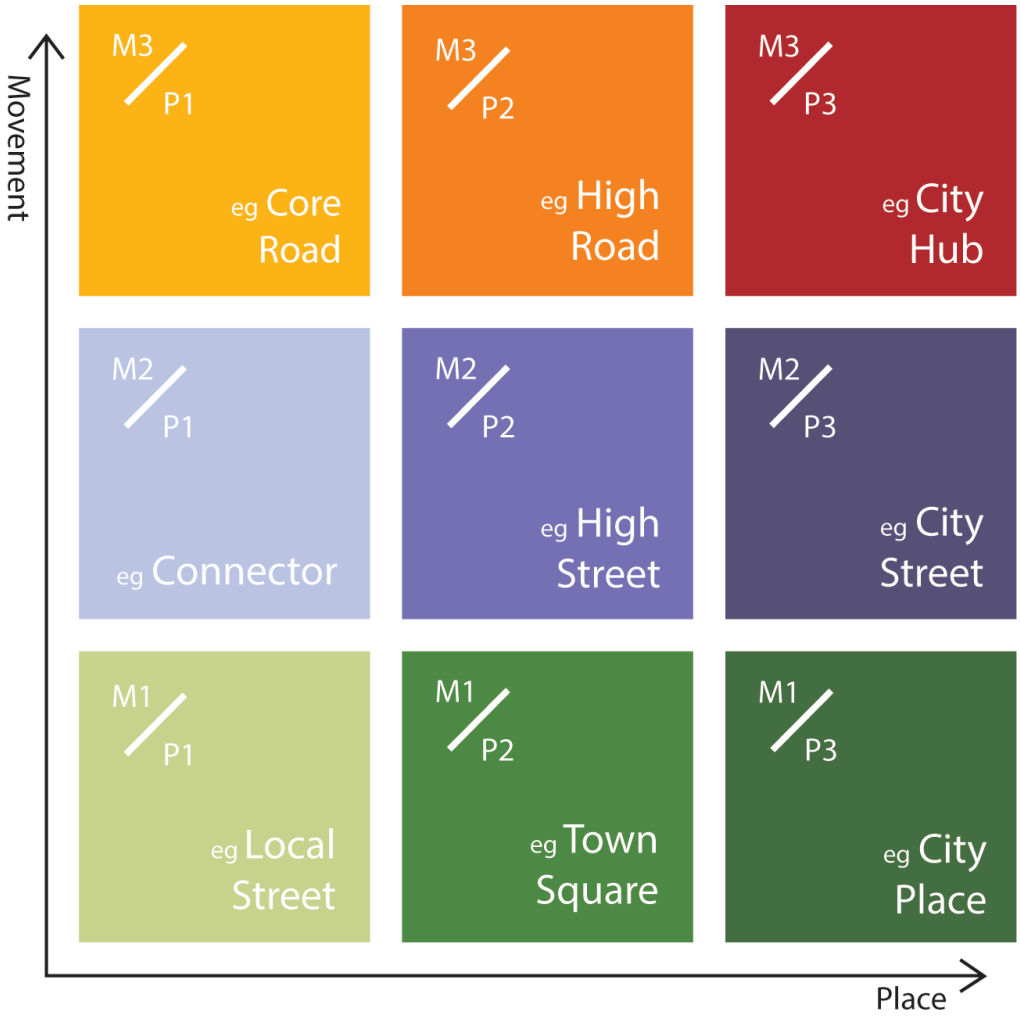

Figure 3.7 – Transport for London's Movement and Place Matrix and 'Street Types'

Source: Transport for London (2016)

3.4 The Spectrum of Place Comprehension Methods

As can be observed by their differences in measurement strategies, there is a broad spectrum of how the three place perspectives comprehend place-based themes. Figure 3.8 situates each of the perspectives on a spectrum of 'place comprehension' based on tendencies in the type of information utilised to understand a location, as well as tendencies in applied measurement strategies to gather that information. It also communicates the development of relationships amongst each of the perspectives, as visualised by arrows indicating the direction and density of cross-perspective citations. Finally, the respective representation of each perspective amongst the reviewed papers is visualised by the size of each circle. They are scaled based on the volume of reviewed papers originating from each group.

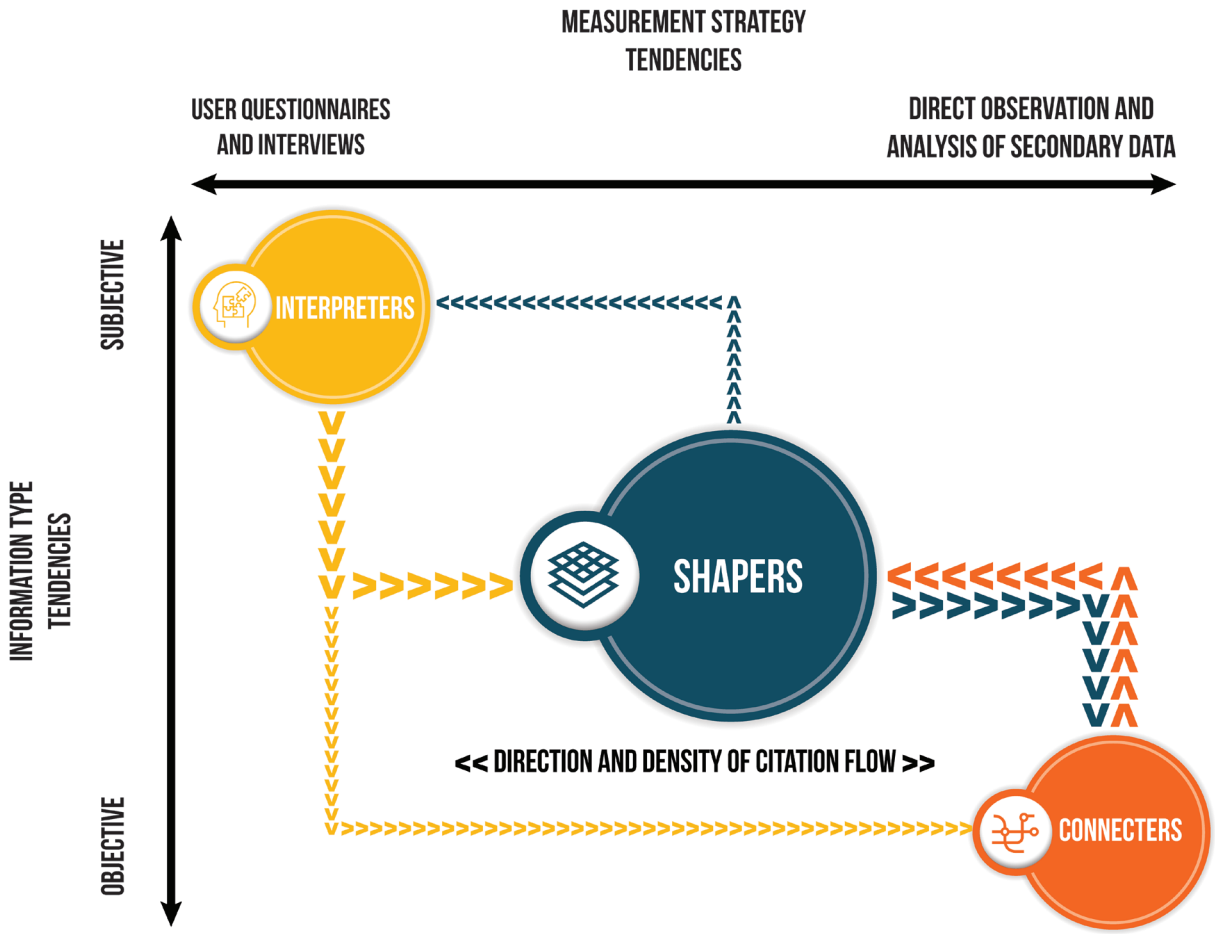

Figure 3.8 – Place Comprehension Spectrum and Citation Flow Between Perspectives

Source: Author's Synthesis of the Literature

About twenty-five percent of the reviewed publications were classified as originating from the 'interpreters' perspective. Due to a primary focus of enhancing general comprehension of human-assigned locational significance, the place-based knowledge generated by 'interpreters' tends to be both subjective and conceptual. This is carried out through inquiring directly to the individual about their subjective locational perception either qualitatively through interviews (Davenport and Anderson, 2005; Hay, 1998; Mannarini et al., 2009; Rosenbaum et al., 2007), or quantitatively through scale-based surveys (Araújo de Azevedo et al., 2013; Bonaiuto et al., 1999; Brown and Raymond, 2007; Carter et al., 2007; Fornara et al., 2010; Hidalgo and Hernández, 2001; Jorgensen and Stedman, 2001; Jorgensen and Stedman, 2006; Lewicka, 2010; Moore and Scott, 2003; Shamai, 1991; Stedman, 2003; Stedman, 2006; Stedman, 2002). The highly subjective nature of the terms 'interpreters' are most interested in (e.g. Place Attachment or Sense of Community) necessitates that they inquire directly to the population within the particular location of interest. Therefore, the perspective is placed in the top left of the place comprehension spectrum displayed in Figure 3.8.

By contrast, the majority of knowledge generated by 'connecters' trends toward objective interpretations through physical observation of the location or analysis of secondary data. For example, measurement of bikeability or walkability is most commonly determined through quantitative analysis of the physical features within a location (Cervero et al., 2009; Lee and Talen, 2014; Winters et al., 2013). Similarly, street life is analysed by the observation of activities taking place within the streetscape and counts to document the fluctuation of how many people partake in each of them at various times of day (Gehl, 2011). The success of open streets programs is measured in a similar way, primarily through attendance and participation counts (Hipp et al., 2016). Due to their primary method of making objective conclusions from observable data, 'connecters' have been placed in the bottom right of the place comprehension spectrum displayed in Figure 3.8. There are cases where 'connecters' receive objective information on a location directly from users, primarily through the form of travel surveys or diaries (Park et al., 2014). However, this data is mainly incorporated to better understand the impacts of objectively measured built factors that make up a majority of the broader analysis. To summarise, 'connecters' primarily utilise various forms of spatial analysis to develop their place comprehension through objective observations. Publications classified into this perspective represented twenty-three percent of all publications in the review.

The 'shapers' perspective is more complicated in that their knowledge base is evenly obtained from both sides of the spectrum shown in Figure 3.8. Determining whether a development is occurring on a greenfield, greyfield, or brownfield site is entirely objective as each type of development has clear definitions (Newton, 2010). But NIMBYism, on the other hand, is a complex phenomenon that can only be fully comprehended by gauging the feelings and opinions of specific individuals in regard to specific projects and areas (Dear, 1992; Devine-Wright, 2009; Schively, 2007). 'Shapers' also deal with terms and concepts that benefit from analysis methods from both sides of the spectrum. For example, liveability is most commonly measured entirely by indicators such as crime rates, employment levels and average pay, and the affordability of various human needs like housing, food, and education (Balsas, 2004; The Economist Intelligence Unit, 2019) since the data for these indicators is relatively easy to obtain. These indicators tend to apply broadly to large areas of land, however, and even studies that have employed them argue there is a need to better understand the individuality of the concept through more subjective analyses (Balsas, 2004). The broad range of place comprehension methods displayed by 'shapers' may also help to explain why this perspective represented a majority of publications, fifty-two percent in total, included in this review.

The positioning of each perspective on the spectrum also helps to understand the nature of their relationship with the other groups. These relationships are communicated by the directional arrows shown between groups in Figure 3.8. 'Interpreters' act as place translators for the 'shapers' and 'connecters' groups, both of whom are relative newcomers to place-based research in comparison. This is shown through the application of concepts developed by 'interpreters' to better understand phenomena originating from other perspectives. Some examples are sense of place being used to inform individual travel patterns (Deutsch et al., 2013), or feelings of place attachment and identity helping to explain NIMBYism (Devine-Wright, 2009). 'Shapers' and 'connecters' have a symbiotic relationship with each other. Depending on the choices practitioners from each group make, that symbiotic relationship can be either mutually beneficial or disadvantageous (Diemer et al., 2018; Ewing and Cervero, 2010; Newman and Kenworthy, 1996). Researchers from within these two perspectives consistently cite each other's work because they have identified the potential of this relationship to advance shared goals. Completing the cycle, the way 'shapers' and 'connecters' have influenced the built environment has given 'interpreters' new

concepts to explore. 'Third places' are possibly the clearest example of this, as they describe a physical place that is arguably better defined by its social constructs than its built characteristics (Oldenburg and Brissett, 1982; Rosenbaum et al., 2007). However, most exploration of the concepts dealt with by 'shapers' and 'connecters' through an 'interpreters' point of view has typically been conducted internally to that perspective, not cycled back through to 'interpreters' via inclusion in their own research efforts. This is documented in that there was no citation flow from 'connecters' to 'interpreters' and only a small density of citations from 'shapers'. All of the above relationships between perspectives have primarily been explored in academic inquiries, with relatively few examples translating into commonalities in practice. The categorisation of perspectives, and definitions of relationships between them, as presented in this inquiry helps to identify this gap, and the research presented in the remaining chapters of this thesis seeks to fill it.

3.5 Chapter Summary and Identification of Gaps

The synthesis of place-based research works presented in this chapter was accomplished by the categorisation of place perspectives into three specific roles. Structured review enabled identification and synthesised definitions of each group's respective sets of terminology, bringing enhanced clarity to terms that have often been used interchangeably or in a conflicting manner. A discussion on the measurement strategies employed by each perspective, as well as the role each plays in the broader field and functional relationships displayed between them, helped to define the way place-based theories are developed and decisions are made.

The synthesis has also facilitated the discovery of three significant gaps in existing knowledge that will be addressed in the remainder of this thesis:

1. Three primary place perspectives were identified, but even within the perspective groups, researchers tend to focus on particular topics of interest. **A comprehensive methodology measuring all place-based aspects is needed.**

2. There is a limited amount of research addressing linkages between the place-based concepts of 'interpreters' and 'connecters' that defines 'place' as more than just quantitative analysis of land use categories or design characteristics. **More insight regarding how the concepts of 'connecters' impact subjective perceptions of place quality would greatly benefit the research field.**

3. Measurements of place-based aspects employed by 'connecters' centred on accessibility, and **no measure was identified that analyses impacts of tram infrastructure on the perceived quality of streetscape design.**

The next chapter, Chapter 4, outlines the overall research approach, as well as the specific methodology employed within each chapter, designed to fill these gaps.

4 RESEARCH APPROACH

The previous chapters have framed the need for a better understanding of perception of place quality in streetscape environments to maximise the potential of Melbourne's tram modernisation process. In order to address that need, this thesis measures place perception along Melbourne's tram corridors to investigate the influence of various streetscape infrastructure and design elements on place quality. The overall approach taken to accomplish that is discussed in this chapter by outlining specific research questions. A detailed description of the research design is also provided by previewing the purpose of, and methods utilised in, each of the remaining thesis chapters. This chapter concludes Section A of the thesis and prepares the reader for Sections B and C by providing an enhanced understanding of the applied methodological framework as well as the overall structure of the document.

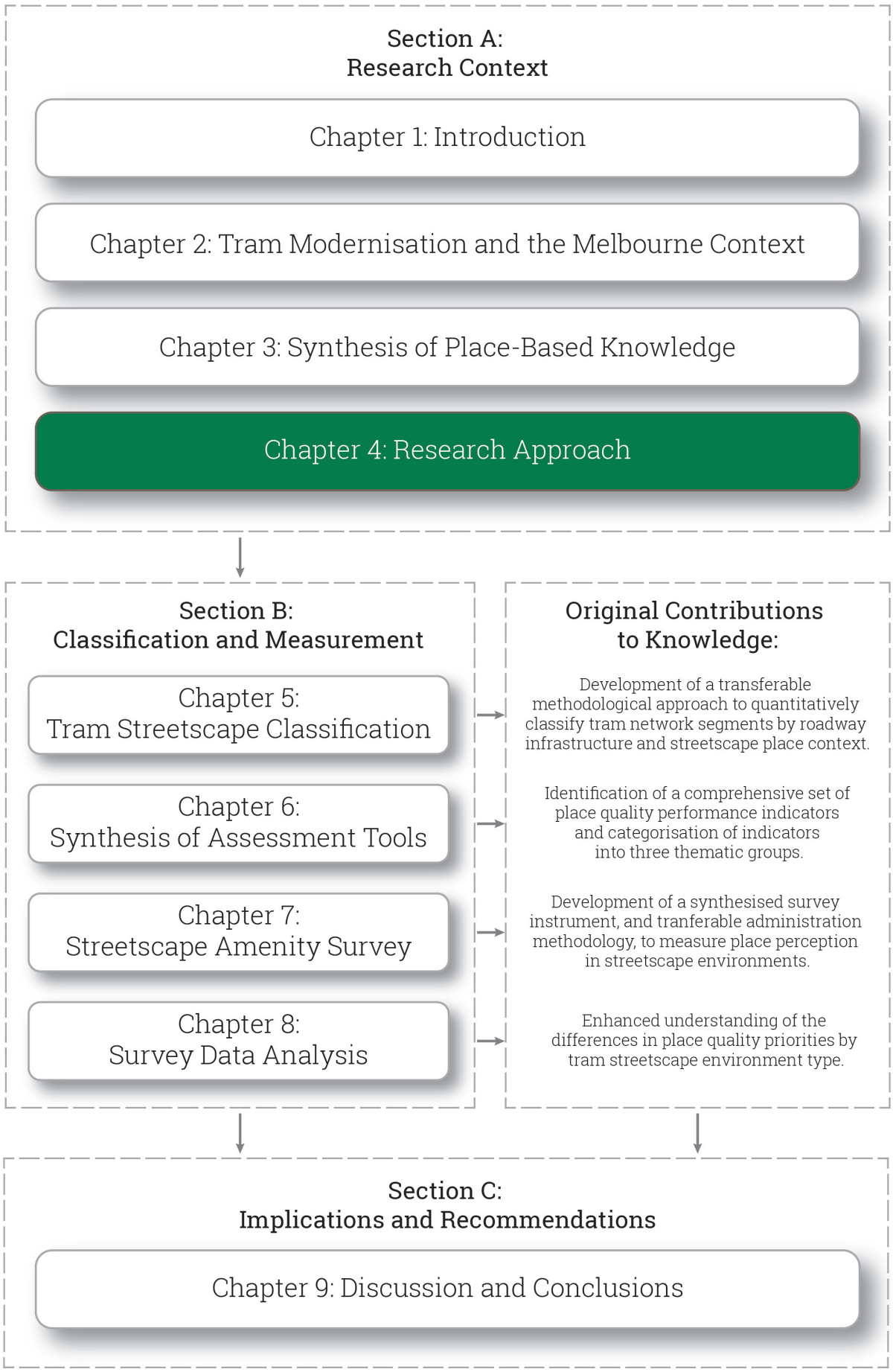

Figure 4.1 – Position of Chapter 4 in the Thesis Structure

4.1 Definition of Research Questions

To reiterate, the overarching aim of this research project is to:

Explore user perception of place quality in the streetscape to enhance understanding of how it may be impacted by various tram infrastructure design schemes.

Achieving this aim also fills a number of knowledge gaps that have been identified.

In a review of the motivations behind tram network development in Melbourne and around the world, Chapter 2 identified the following gap:

A. There is a lack of definition surrounding exactly how tram infrastructure helps improve the public realm in a way that can be replicated and measured across unique sites with differing contexts and needs.

Chapter 3 synthesised place-based research outputs to collect insights for tram network development. It found the following gaps in existing academic research works:

B. Three primary place perspectives were identified, but even within the perspective groups, researchers tend to focus on particular topics of interest. A comprehensive methodology measuring all place-based aspects is needed.

C. There is a limited amount of research addressing linkages between the place-based concepts of 'interpreters' and 'connecters' that defines 'place' as more than just quantitative analysis of land use categories or design characteristics. More insight to how the concepts of 'connecters' impact subjective perceptions of place quality would greatly benefit the research field.

D. Measurements of place-based aspects employed by 'connecters' centred on accessibility, and no measure was identified that analyses impacts of tram infrastructure on the perceived quality of streetscape design.

These gaps, and the broader research aim, will be addressed through the following set of three research questions:

Research Question 1 – Categorisation of Tram Streetscapes:

- How can the variety of streetscape contexts across the tram network be classified into groups that enable the differences in need between them to be more easily addressed?

Research Question 2 – User Perception of Streetscape Place Quality:

a. Are the differences considered within the tram streetscape categories reflected in average user views of streetscape place quality?

b. Of the three identified thematic groups of place performance indicators, does a particular group have an outsized influence on overall place quality?

c. Which specific place performance indicators (within each of the three thematic groups) are most relevant to overall place quality?

d. Does the change from legacy to modernised tram streetscapes bring elements that are perceived as adding to and/or depleting place quality?

Research Question 3 – Impacts for Policy:

- What changes can be made to the tram infrastructure planning and design process in order to achieve better outcomes for streetscape place quality?

The research design, as outlined below, has been configured with the specific intent of determining answers to these questions.

4.2 Research Design and Applied Methodology

Comprehensively addressing the research aim, knowledge gaps, and questions detailed above required a mix of methodological strategies. These strategies were developed through comprehensive review of the existing academic literature and practice-based toolsets. A summary of the methodology applied for each chapter within Section B of this thesis, where the primary research is documented, is now provided:

4.2.1 Chapter 5: Classification of Melbourne Tram Streetscapes

In order to categorise differences in tram streetscape environmental characteristics, this chapter adapts the 'Movement and Place' classification system (Jones et al. 2007) identified in Chapter 3. Through combined analysis of an existing roadway infrastructure dataset and primary data on surrounding built environment characteristics, tram network segments are assigned 'Movement' and 'Place' significance rankings. The result is a new classification of Melbourne tram streetscapes by aspects of roadway infrastructure and surrounding place context. It resolves Research Question 1 by providing the first classification system of this nature, and begins to fill Knowledge Gap A by grouping corridors into categories based on their differing contexts and needs.

4.2.2 Chapter 6: Synthesis of Assessment Tools

As documented in Chapter 3, academic research has not produced a comprehensive, broadly applicable methodology for measuring perception of place quality. Since placemaking projects are based in practice, however, there are a number of governmental and private organisations that have developed toolsets to assess locations and identify priorities to improve them. Chapter 6 conducts a structured review of these practice-based place assessment tools, in order to ensure the approach to measurement applied by the research conducted as part of this thesis is comprehensive in nature. The review results in the identification of sixty-five place quality performance indicators that are grouped into three thematic categories. The results contribute to filling Knowledge Gap B, identified in Chapter 3, by establishing a comprehensive set of measurable place quality performance indicators.

4.2.3 Chapter 7: Streetscape Amenity Survey

With a set of performance indicators identified, Chapter 7 documents the development of a questionnaire to measure them in the context of Melbourne tram streetscapes. A questionnaire was chosen as the best measurement method since it facilitates direct investigation of subjective viewpoints (Schensul, 1999). The questionnaire incorporates two methodologies identified in Chapter 3, 'Video Elicitation' (Ewing et al., 2005) and 'Importance Performance Analysis' question structure (Hernandez et al., 2016; Riviezzo et al., 2009), to facilitate streetscape comparisons in an online questionnaire. The work presented in this chapter fills Knowledge Gaps B and C, identified in Chapter 3, by developing a comprehensive measurement methodology designed to identify connections between tram infrastructure and subjectively perceived notions of place.

4.2.4 Chapter 8: Survey Data Analysis

An analysis of the Streetscape Amenity Survey results is presented in Chapter 8. The analysis of results is structured around the four sub-queries of Research Question 2, and 'Importance Performance Analysis' (Hernandez et al., 2016; Riviezzo et al., 2009) enables the identification of strategies which answer Research Question 3. Overall, the findings of the primary research presented in Chapters 5 through 8 help to fill the four identified gaps in existing research outputs, and answer the three research questions designed to meet the overarching thesis aim.

4.3 Chapter Summary

This chapter has summarised all of the information presented in Section A of the thesis by presenting the determined gaps in knowledge. A set of three research questions were developed to fill these gaps, as well as carry out the overall aim of the thesis research topic. Finally, it provided a chapter-by-chapter summary of the methodology employed in Section B of the thesis, where the primary research is presented.

This chapter concludes Section A of the thesis. Section B begins with Chapter 5, which documents the development of a new classification of Melbourne's tram network corridors. The first of its kind classification system accounts for aspects of tram infrastructure and surrounding streetscape place context. It facilitates the ability to measure differences in how tram infrastructure can improve the public realm across sites with differing contexts and needs.

Section B:

Classification and Measurement

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5 TRAM STREETSCAPE CLASSIFICATION

This chapter is the first within Section B of the thesis. Section B defines the various approaches employed in this thesis to analyse perceptions of place quality along Melbourne's tram network. In order to measure place quality in a way that accounts for the diversity of built environment contexts across Melbourne's tram network, classification of corridor streetscape environments into homogeneous groups was necessary. This specific chapter, Chapter 5, outlines the applied methodology and results of the tram streetscape classification system developed as part of this thesis. The chapter is presented via a publication in the peer-reviewed 'Journal of Transport Geography'.
The publication describes the process of adapting the Movement and Place framework (Jones et al., 2007) to Melbourne's tram network. Different types of infrastructure separating trams and general traffic are classified into five levels based on their effectiveness in providing through-movement priority to tram services. Additionally, a detailed land use analysis is applied to classify tram streetscape segments into five levels based on their significance as a destination. These two sets of classifications enable the identification of 'Streetscape Types' through categorisation of segments with similar classifications. The methodology and results are presented in the following publication, and the chapter concludes with a summary of key takeaways relevant to this thesis.

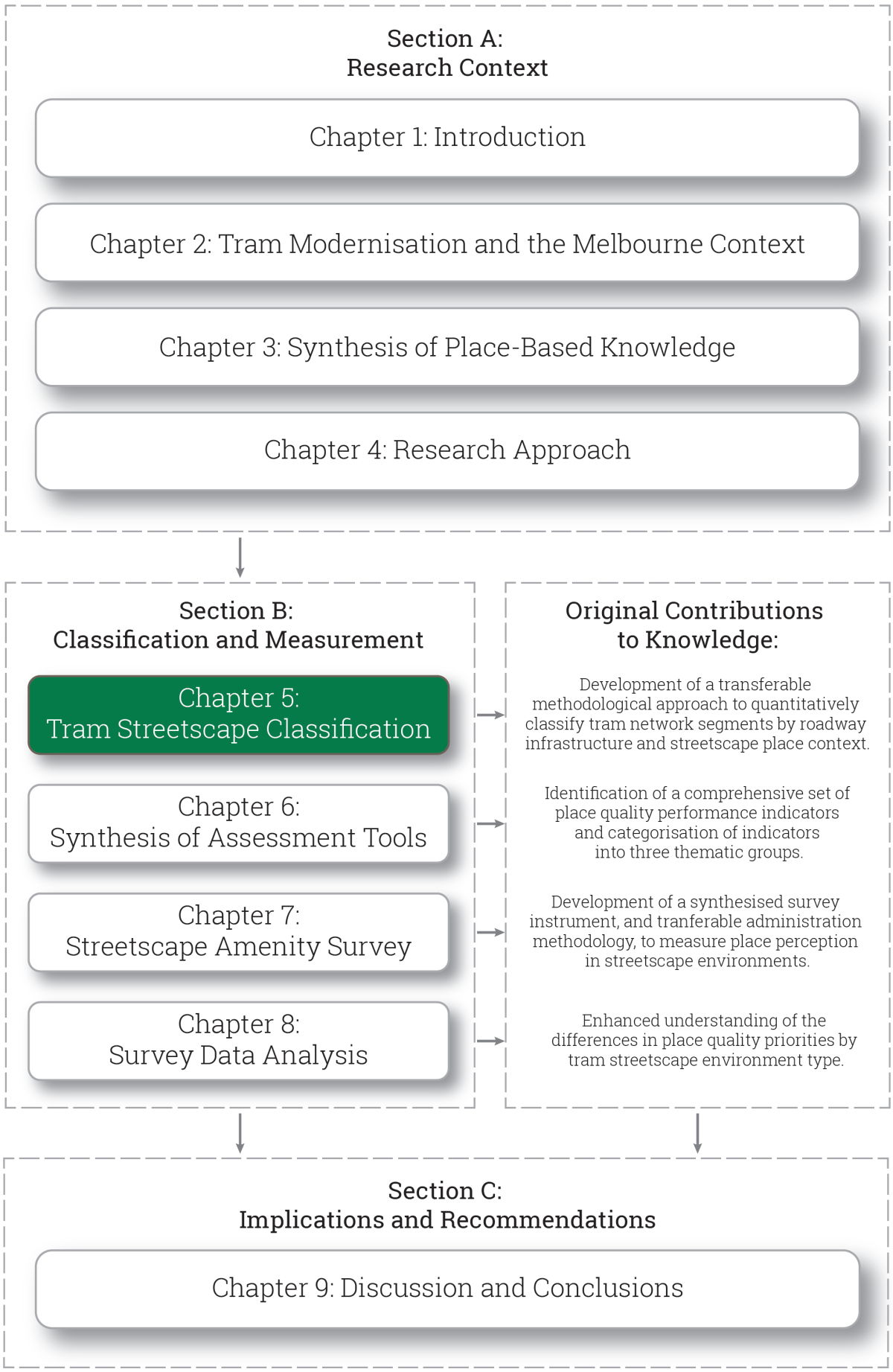

Figure 5.1 – Position of Chapter 5 in the Thesis Structure

5.1 'Journal of Transport Geography' Publication

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Filling the space between trams and place: Adapting the 'Movement & Place' framework to Melbourne's tram network

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ABSTRACT

Melbourne's legacy tram network is being modernised including redesign of over 1700 tram stops to provide level access boarding to comply with Australia's Disability Discrimination Act. This presents a significant opportunity to reimagine how tram corridor streetscapes can function as places that build upon neighbourhood identity and sustain local economic activity. However, the literature on the connection between transport infrastructure and place quality is small and relatively new. This is particularly true for street-running light rail (also referred to as 'tram' or 'streetcar') infrastructure. Based on the 'movement and place' model, this research presents a new framework to define place types served by Melbourne trams, as well as the different tram link types relating to tram infrastructure used to get people to/from those destinations. It implements the framework to the network and explores variation in movement and place framework links including categorisation of links into four tram streetscape groups. Implications of the framework for policy and future research are discussed.

1. Introduction

The connection between transport infrastructure and land use patterns has become an increasingly important subject over the past few decades, transforming the way we plan for and design the built environment of both cities and suburbs alike (Newman and Kenworthy, 1996; Cervero and Kockelman, 1997). City planners and engineers across the globe have begun reconsidering the prioritisation of space within and around the streetscape, particularly in urbanised areas that were developed using design patterns that prioritised the movement of private vehicles. This has resulted in a transition towards integrated transport and land use plans by government agencies worldwide (Suzuki et al., 2013). While this integration represents a major step forward, the approach mainly focuses on large scale urban development patterns and does not necessarily take into account the more localised effects of streetscape design strategies on individual perception of place quality. Incorporating principles of placemaking and place management into integrated transport and land use plans has the potential to better understand how an individual's travel patterns are affected by the type of urban design that is prevalent in their local metropolitan region.

A main reason that integrated planning strategies have stopped short of including placemaking and place management principles is that this much more fine grain view of a location requires vast amounts of data gathering and public input. Since each individual location is unique, community outreach processes are a common way planners and designers attempt to understand how various streetscape design strategies could encourage or discourage specific activities from taking place in a specific area. In Melbourne, Australia, rapidly growing urban population levels have fuelled a conversation around space prioritisation in an effort to maintain the city's recognition as 'most liveable in the world' (The Economist Intelligence Unit Limited, 2017) while also managing the ability to accommodate a projected influx of new residents in a more sustainable, healthy, and pleasant urban environment. The city presents a unique case study in that it is home to one of the few legacy tram (or 'streetcar') networks outside of Europe that was not dismantled during the rise of private vehicle ownership throughout the mid to late twentieth century. The network is also the world's largest, with 24 routes and just over 250 km of double track (Yarra Trams, 2017). An overview of the network, and its reach within the metropolitan area, is provided in Fig. 1.

This paper adapts a framework known as 'Movement & Place' (also referred to as 'Link & Place'; Jones et al., 2008) to categorise the various types of streetscapes served by Melbourne's tram network – taking a framework that has typically been utilised in roadway operations

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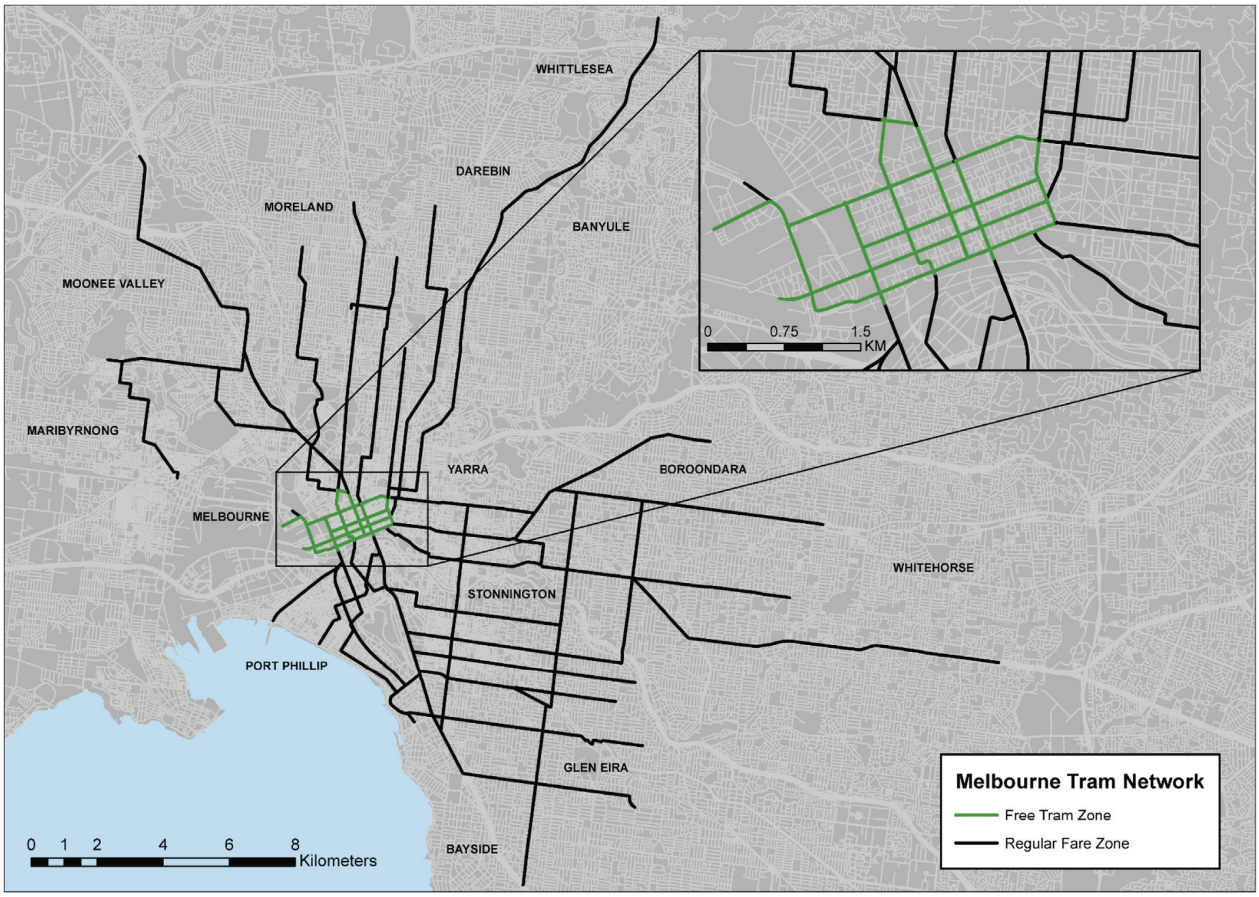

Fig. 1. Overview of Melbourne's Tram Network.

planning and applying it to a public transport network for the first time. It also analyses the resulting framework to identify opportunity and challenge locations for improvement in movement and place quality. An overview of the process and findings of applying the framework aids in developing a stronger understanding of each corridor's unique characteristics and connections between tram network planning and place quality, using Melbourne, Australia as a case study.

This paper is structured as follows: first, a background on the research context is provided, followed by the methodology used to adapt the 'Movement & Place' framework to Melbourne's tram network. The second half describes the results, presents an analysis of network links on the Movement & Place matrix, categorises links into four conceptual streetscape types, and discusses the implications of the results for policymaking, infrastructure design, and future research.

2. Research context

While Melbourne's tram network is the largest in the world, it is also one of the oldest still in operation. The network began development in the late nineteenth century, predating the private vehicle but has since evolved to operate among them. The result is that about three-quarters of Melbourne's tram network now operates in roadways that are shared with other vehicles. Likewise, three-quarters of tram stops are kerbside stops (Yarra Trams, 2017) with boarding and alighting functioning similar to a bus stop except that trams operate in the middle of the road so access involves walking to the centre of busy streets; clearly an unsafe and unattractive proposition (Naznin et al., 2016).

Australia's 'Disability Discrimination Act' (DDA) has mandated that the > 1700 total tram stops across the network be upgraded to provide level boarding access, which has the potential to result in a dramatic reshaping of tram streetscapes across the metropolitan area over the next decade. Due to this commitment, it is important to investigate how tram streetscape design acts to influence place quality in order to develop an integrated policy framework that connects tram network planning and design with place management practices. The vast diversity of operating environments and place types served complicates the process of network modernisation because many locations on the network have unique factors that require context-specific design treatments. A process of categorising place types will aid in the formulation of standards for infrastructure modernisation and street redesign, as well as identifying priorities for investment.

Redesigning a tram stop to provide level boarding access requires major changes to the entire streetscape due to the addition of boarding platforms. Since a majority of tram routes operate in a shared environment with limited road space, the change is complicated by competing priorities between different road user groups as well as opinions of business owners, residents and other groups with a vested interest in the future direction of a location. Therefore, determining the strategy for increased accessibility requires reaching a consensus between all of the involved stakeholder groups, as well as collaboration between Yarra Trams (the tram network's private operator), Transport for Victoria (the State's transport authority), Public Transport Victoria (the State's public transport authority), VicRoads (the State's roads authority) and Local Government Area Councils. In some street contexts, particularly where commercial and retail activities are prevalent, the prioritisation of road space for parking makes achieving consensus

difficult. Being able to better identify these locations, and target specific design strategies for them, would assist authorities in planning for better road space allocation outcomes.

While engaging with such a large number of involved stakeholders groups can make the process involved in network modernisation complex, and rarely involves consensus between all parties, it also presents a major opportunity to change the face of Melbourne. Transport corridors often function as 'non-places' (Augé, 1995) because they are locations that people travel through, instead of destinations that people spend time in. However, recent strategies such as 'Complete Streets' (Laplante and McCann, 2008), 'New Urbanism' (Katz, 1994), 'Smart Growth' (Handy, 2005) and 'Transit-Oriented Development' (Dittmar and Ohland, 2004) incorporate design principles that alter transport corridors to function for multiple purposes. Street-running light rail projects in particular have exemplified a shift towards transport infrastructure projects being prioritised for their anticipated benefits to the broader public realm (King and Fischer, 2016).

Additionally, an increased interest in 'placemaking', a multifaceted process that attempts to improve place quality in a particular location (Wyckoff, 2014), has enabled local residents' to be more involved in local urban planning and design processes (Friedmann, 2010; Cilliers and Timmermans, 2014). Some have even involved themselves without participating directly in the formal processes through 'Do-It-Yourself Urbanism'; a process where simple infrastructure is installed spontaneously by members of the public (Finn, 2014), often bypassing the typical permitting and approval process and unbeknownst to the relevant governmental bodies until after the fact (Smith, 2018). This shift towards prioritising effects on the surrounding environment in the transport planning process, combined with increased public interest in the urban design process, presents an opportunity to address some of the complications in modernising Melbourne's tram network. However, researchers and practitioners alike have struggled to identify practical ways of measuring place quality (Esmaeilpoorarabi et al., 2018) let alone understand how it is effected by transport infrastructure.

'Movement & Place', also referred to as 'Link & Place', stands out as a unique example of a solution for measuring this connection. It is a framework developed by Jones et al. (2008) that categorises street segments based on a rating of their relative importance for through movement across the transport network, as well as a rating for the surrounding streetscape's significance as a destination. The combination of these two ratings allows for the arrangement of each segment along a Movement & Place matrix (Fig. 2) which enables comparison between the two often competing, yet symbiotic, priorities of getting people to and through locations. This categorisation also makes practical application of transport placemaking strategies much easier for governmental bodies and other public decision makers through the identification of areas that are not designed to perform for the conditions in which they are being used.

The matrix displayed in Fig. 2 uses a three-by-three framework. Street segments are rated for their significance to transport through movement (y-axis) on a scale of one to three, followed by a rating for the streetscape's significance as a destination (x-axis) also on a scale of one to three. Side-by-side comparison of the two scores via the matrix allows for the categorisation of segments into street types such as the ones shown in Fig. 2. A 'Core Road', for example, has a pivotal role in through traffic movement but has little to no significance as a destination. A 'City Place' plays a very minor role in the overall movement of through traffic, but has a highly significant status as a destination. These two street type categories, among others, allow for easy definition of a street's purpose, but the framework is also useful in identifying streets that have competing priorities. A 'City Hub', for example, is a street that plays a pivotal role in through traffic movement but also contains a vibrant streetscape that functions as a citywide destination. The framework's ability to define street types, and create varying sets of design treatments catered to each one, has resulted in emergence from its roots in academia to incorporation by governmental bodies across

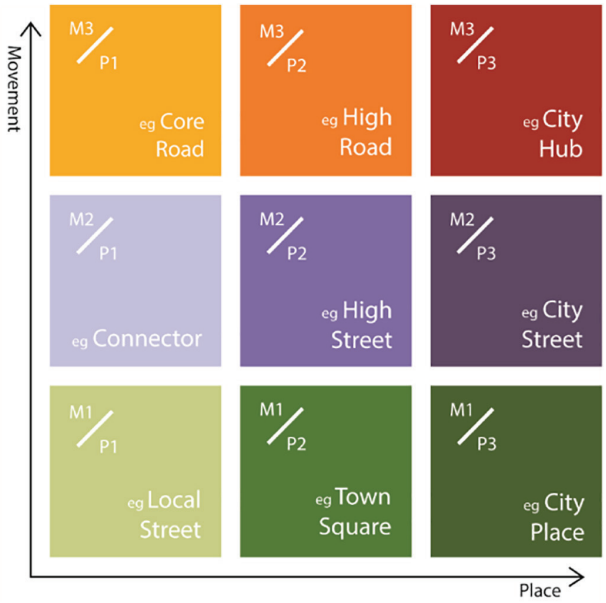

Fig. 2. 'Street Types for London' – Transport for London's Movement & Place Matrix.
Source: Transport for London (2016).

the United Kingdom, Australia and New Zealand with a desire to incorporate concepts of streetscape placemaking into their roadway network operations plans (Department for Transport, 2010, Adelaide City Council, 2012, Roads Task Force, 2013, VicRoads, 2016, Auckland Transport, 2018). Some of the most innovative outcomes of these plans include methods for calculating pedestrian crossing times based on street type (Roads Task Force, 2013) as well as street space reallocation designs with the aim of increasing a place's significance as a destination (Adelaide City Council, 2012).

Despite the potential wide-ranging benefits of applying Movement & Place within integrated transport and land use strategies, the framework as of yet has only been used in roadway network operations planning and has not been explicitly utilised in the planning and design of a light rail network. The research presented in this paper fills this gap by adapting the framework to Melbourne's tram network in order to categorise street types by place and movement dimensions.

3. Methodology

The following explains how both movement and place were defined, measured and ranked in this adaption of the Movement & Place framework:

3.1. Movement classification

In developing a set of classifications for movement, previous applications of the framework (such as the Transport for London example shown in Fig. 2) have focused on the varying levels of importance for through movement on each link within the overall network. This has typically involved grouping corridors by their existing street hierarchy (i.e. arterials, collectors, locals, etc.) as well as incorporating traffic counts when available. In the specific context of Melbourne's tram network, comparing the relative importance of tram through movement is not necessarily as relevant due to the fact that the entirety of all tram routes have been classified as part of the State's Principal Public Transport Network where providing a quality public transport service is of highest priority (Victoria State Government, 2018). Therefore,

Fig. 3. Movement Classifications.
Source: Author's Classification based on Yarra Trams Data. Photo Examples from Melbourne, Australia

assessing the existing quality of tram through movement provides a more contextually relevant assessment than comparing the relative importance of through movement on each tram corridor. This structure enables the framework to provide an explanatory analysis of existing conditions, and then utilise the findings to provide a normative assessment of priorities for network modernisation.

For trams, and streetcars in particular, movement quality is typically defined by the degree of separation from other traffic (Vuchic, 1981; Currie and Shalaby, 2007). Melbourne's trams provide service in a variety of different operating environments, with segments falling in each of the three right-of-way (ROW) categories outlined in Vuchic (2005). These include Type A 'Fully Separated' ROW, Type B 'Longitudinally Separated (with at grade crossings)' ROW and Type C 'Mixed Traffic' ROW. The degree of separation a tram receives results in varying levels of movement quality and more or less acts as a statement of how important tram movement is viewed versus the movement of other traffic in the corridor. In the Melbourne context, this provides an assessment of how well each corridor is performing in regards to the

Table 1
Place Type Definition Criteria.

Place type	Definition criteria	Estimated average travel distance
P1 – Local	• 100% low to medium density residential	< 2 km
P2 – Neighbourhood	• ≥ 50% low to medium density residential AND • Presence of small to medium public, semi-public, or commercial space • Also used for inner city blocks that are majority high density residential/office space but are not lined with commercial use at the street level	2 to 4 km
P3 – Municipal	• ≤ 50% low to medium density residential AND • Presence of medium to large public, semi-public or commercial space • Also used for inner city blocks that are majority high density residential/office space but are lined with commercial use at the street level	4 to 10 km
P4 – Regional	• ≥ 50% non-residential AND • Presence of large public, semi-public, or commercial space	10 to 20 km
P5 – State	• 100% semi-public or commercial space (high density residential can be present but not at the street level) AND • Presence of pedestrianised public or semi-public space on the street frontage	> 20 km

Table 2
Land use examples.

	Low/Small		Medium		High/Large	
	Examples	Footprint Size	Examples	Footprint size	Examples	Footprint size
Residential	• Detached Homes • Attached Town Homes	≈ 350 m^2	• Multi-Unit Buildings (≤ 5 floors)	≈ 2500 m^2	• Multi-Unit Buildings (> 5 floors)	≈ 4000 m^2
Commercial	• Café • Boutique Shop • Convenience Store	≈ 250 m^2	• Restaurant/Bar • Grocery Store • Cinema • Gym	≈ 1000 m^2	• Mall/Market • Hospital • Hotel	≈ 12,000 m^2
Public	• Parklet • Community Garden • Neighbourhood park	≈ 1000 m^2	• Plaza/Square • Pedestrianised Laneway • Community Park	≈ 3000 m^2	• Pedestrian Mall • Metropolitan Park	≈ 10,000 m^2
Semi-Public	• Primary School • Community Centre • Post Office	≈ 1500 m^2	• Secondary School • Town Hall • Library • Municipal Train Station	≈ 4500 m^2	• University • Museum • Theatre/Event Centre • Major Train Station • Zoo/Aquarium	≈ 80,000 m^2

goal of Principal Public Transport Network corridors prioritising the delivery of a high quality public transport service.

With the above reasoning in mind, the adaption of the Movement & Place framework presented in this research has utilised the various separation design strategies present within Melbourne's tram network to develop five distinct classifications of movement quality as outlined in Fig. 3. The classifications incorporate the three Vuchic ROW types, but have been further refined to cater to the unique design strategies present in the Melbourne context. Final definition of the categories involved liaison with Yarra Trams as they have the most familiarity with the network and will be adopting the final framework for future planning.

3.2. Place classification

In order to define how place types would be classified, a structure in development by VicRoads (2016) was adapted so that the findings of this research would have applicability to other upcoming versions of the framework in the Melbourne area. VicRoads (2016) defines place on a five point scale based on its significance as a destination. The five categories are local, neighbourhood, municipal, regional and state. A placed rated as 'local' is exclusively residential and would only attract people that lived on the immediate block. A 'neighbourhood' place attracts people from the immediate and surrounding blocks likely due to a corner store or café mixed in with residential or office space. 'Municipal' places are high street type environments with mostly shops, or other commercial space, and attract visitors from across the local municipality. 'Regional' places attract people from the local and adjacent municipalities and are culturally significant entertainment centres with many restaurants, bars, cafes, night clubs, and popular markets. Finally, 'state' places have everything a 'regional' place has, plus some sort of highly significant public space such as a major train station, museum, theatre, event centre, or other attraction that would draw visitors from across the state, country, and internationally.

While the primary criteria for place type ranking is a detailed analysis of land use types to gain insight into place function, previous applications of the Movement & Place framework have incorporated an analysis of urban design elements as well. These include presence of public and café seating, street art, trees and other landscaping, among other criteria such as a judgement of building frontage activation and footpath pavement type and quality (Adelaide City Council, 2012; VicRoads, 2016; Auckland Transport, 2018). However, the policy documents outlining these previous applications lack a detailed description of exactly how these elements were analysed and in what way they may be viewed as significant. For example, should all trees be counted equally or should a weighting based on canopy coverage be incorporated? How is street art defined and its quality judged? Does public seating at a kerbside transit stop contribute to place quality as much as public seating in a parklet? While it would have been ideal to fill these gaps in this research project, the necessary data collection required to do so for the entirety of Melbourne's tram network would have required a very resource intensive process. Therefore, the

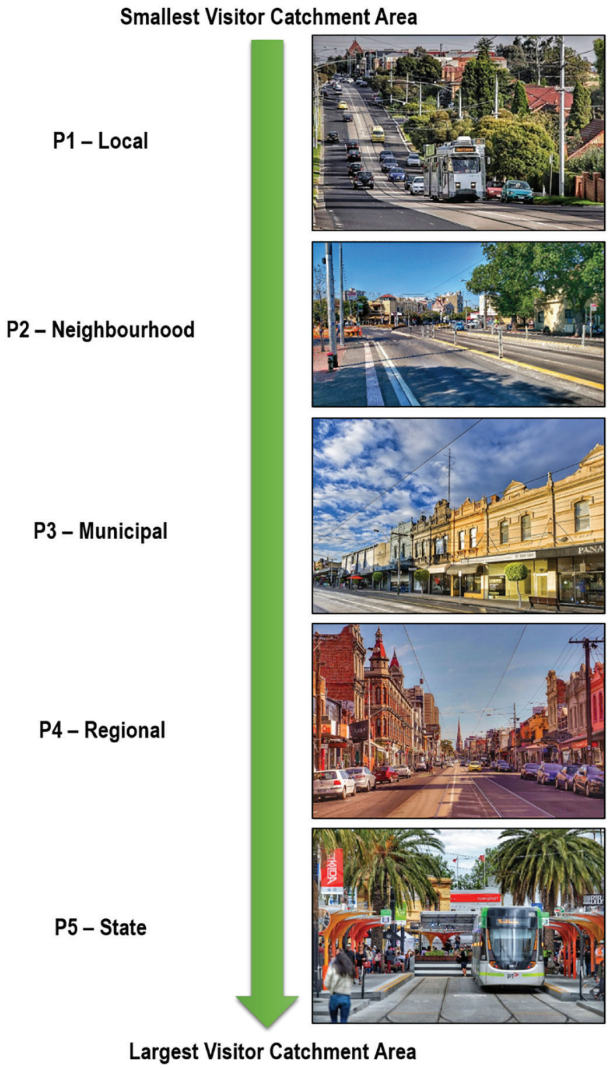

Fig. 4. Place Classifications.
Source: Author's Classification based on VicRoads (2016). Photo Examples from Melbourne, Australia

adaption of the Movement & Place framework presented in this research focuses on the main criteria from previous adaptions; analysing land use types to gain insight into place function and estimate the average distance people travel to reach the location. The criteria for categorising the streetscapes surrounding tram links into place classifications are further outlined in Table 1 and Table 2. Additionally, a visualisation is provided in Fig. 4.

3.3. Data gathering process

With the classifications defined, the next step in the research was to set up a database that would enable record keeping during data collection. This was completed in ArcGIS, a mapping and spatial analysis program, in order to easily visualise the data once classification was completed. No data collection was necessary for the movement classifications, as Yarra Trams provided a network shapefile that included the separation design types. For place classification, data was collected in August and September of 2017 through a combination of site visits and Google Street View Analysis. During the data entry process, the original tram network shapefile was split where either movement classification or place classification changed. This enabled the placement of network links within a twenty-five cell Movement & Place matrix, based on the five classifications of movement and five classifications of place.

4. Results

4.1. Network representation of movement classifications

The first group of squares in Fig. 5 (top) are scaled to visualise the five movement classification types by percentage of total network track kilometres covered. More than half of the network is classified as M1 (No Separation), meaning more track kilometres fall within this classification than the total of all other movement classifications combined. This shows that a significant majority of Melbourne's tram network operates in a mixed-traffic environment, where trams share their lanes with general traffic.

4.2. Network representation of place classifications

The second group of squares in Fig. 5 (bottom) are scaled to visualise the five place classification types by percentage of total network track kilometres covered. Unlike the movement classifications, no one place type dominates the others. About 88% of the network is distributed relatively evenly between the P1 (Local), P2 (Neighbourhood), or P3 (Municipal) categories. P4 (Regional) and P5 (State) place types are rarer, totalling about 12% of all network kilometres, but still represent four times the amount of the bottom two movement classifications. This is further evidence that movement is heavily dominated by one classification, while place types are much more evenly distributed across the five classifications.

4.3. Spatial distribution of the classifications

Fig. 6 visualises the spatial distribution of the movement classifications across the network. M1 (No Separation) is heavily represented in suburban contexts within the middle and outer parts of the network. M4 (Visible Separation) and M5 (Physical Separation) are prevalent mainly in inner and outer locations. In the inner network, this is due to the high prevalence of mountable plastic roadway separation strips used within the Central Business District (CBD) which would fall under the M4 (Visible Separation) category. In the outer network it is due to the prevalence of a few highway corridors where the tram operates in a segregated right of way in the middle of the road, classified as M5 (Physical Separation). The vast majority of the M3 (Shared Separation) classification is within two CBD corridors, Swanston Street and Bourke Street pedestrian and transit malls. But the classification is also represented at a few terminus locations in the middle and outer parts of the network.

Fig. 7 visualises the spatial distribution of the place classifications and shows a much more scattered pattern than the movement classifications. Since place rating is not infrastructure based it changes much more frequently, sometimes on a block by block basis. One clear pattern, however, is that most of the P4 (Regional) and P5 (State) segments are located within the CBD and inner suburbs. This is because those parts of the metropolitan area contain the destination types that are most likely to attract visitors from a large catchment area. There are many P1 (Local) and P2 (Neighbourhood) segments on the outer part of the network, but there is also a significant amount of P3 (Municipal) segments scattered even on some of the furthest parts of the network's reach. This is largely due to the fact that many tram routes are situated on high/main street strips where shops, grocers, restaurants and other businesses line the streets and attract a significant amount of activity.

When comparing the patterns of movement and place across the network, the main takeaway is that movement is heavily dominated by one classification type, while place is much more broadly spread out

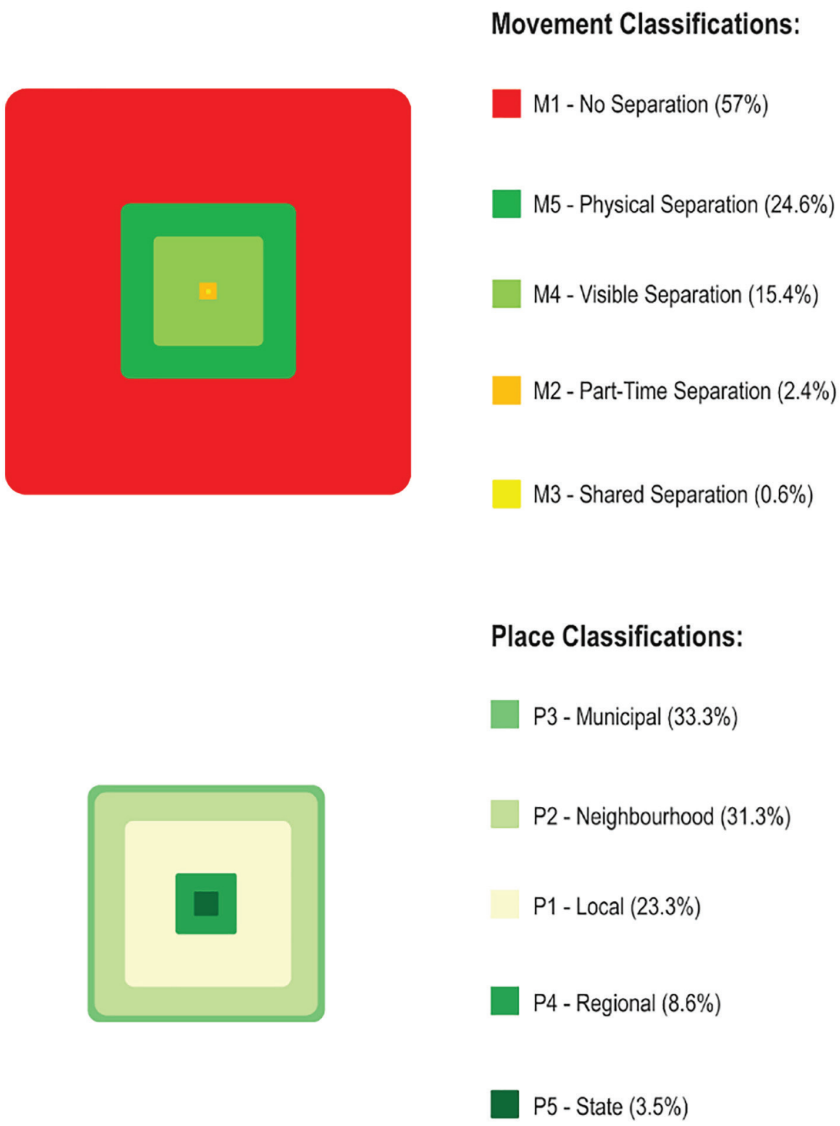

Fig. 5. Network Representation of Movement and Place Classifications.
Note: The size of each square is proportional to the percentage of network kilometres covered; each square is overlayed on top of others by order of total network representation. The five squares displaying the place classifications have a total area equal to the five squares representing the movement classifications, but have a smaller average size due to their representation on the network being more evenly distributed. The colours adopted to display each link type are also used in the maps displaying their spatial distribution (Fig. 6 and Fig. 7).

among three main classification types. This is made visible by the size of the groups of squares in Fig. 5 which have been scaled to represent the percentage total network track kilometres falling within each classification type. The five squares displaying the place classifications (bottom group) have a total area equal to the five squares representing the movement classifications (top group), but have a smaller average size due to their representation on the network being more evenly distributed across the five possible classifications.

5. Arrangement of segments along the movement & place matrix

Fig. 8 presents the resulting twenty-five cell Movement & Place matrix based on the five possible classifications for both movement and place. It includes a conceptualisation of potential implications for various matrix cells in regards to tram network modernisation and place management objectives.

Similar to the 'Street Types' that were displayed in the Transport for London (2016) example in Fig. 2, four groups of tram streetscape environment types are identified based on their placement within the twenty-five cell matrix shown in Fig. 8.

5.1. Opportunity for movement improvement

The first category includes segments rated as M1P1, M1P2, M2P1 or M2P2 and was defined as 'Opportunity for Movement Improvement'. Streetscapes within this group have a small visitor catchment area and low movement quality for trams. Provision of tram separation requires the dedication of one lane on each side of the road for exclusive tram use and is typically accomplished by removing on-street parking. Therefore, segments with a low place rating can be the easiest segments

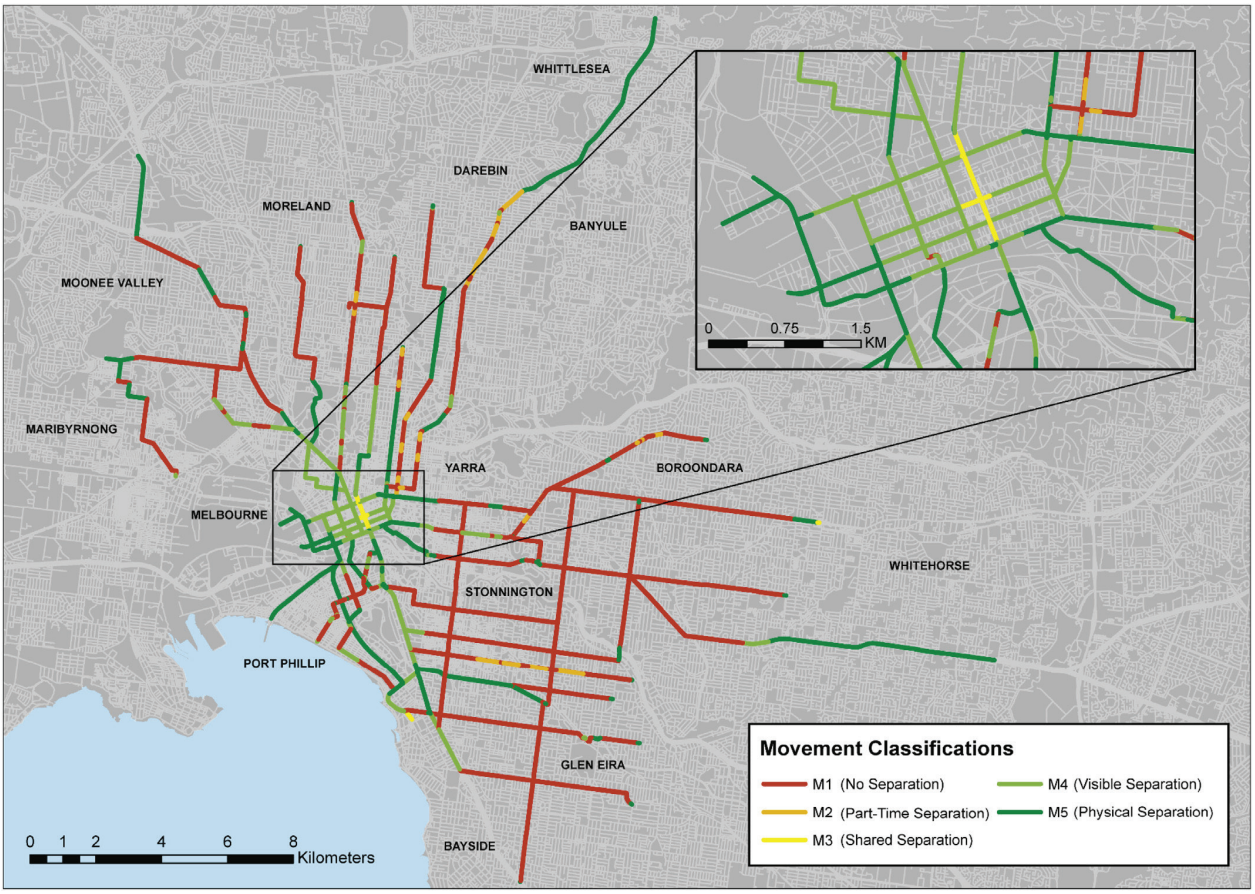

Fig. 6. Movement Classifications – Tram Network Spatial Distribution.

to improve tram movement because there is less demand for parking and other roadspace uses due to the streetscape's relatively small visitor catchment area. Increased tram separation may not be necessary in all corridors, particularly if general traffic levels are not very high. But, where road width and other factors allow, these segments provide the easiest opportunity to increase tram separation across the network due to a comparatively small number of stakeholders.

5.2. Politically challenging streetscapes

The amount of stakeholders involved is also the reason why the next category, comprised of segments rated as M1P3, M1P4, M1P5, M2P3, M2P4, or M2P5, is referred to as 'Politically Challenging Streetscapes'. Trams also operate in mixed traffic in this category but the difference is that they are servicing streetscapes with high levels of place quality and therefore large visitor catchment areas. This makes it difficult to alter the roadway to provide tram separation due to a large number of involved stakeholders with competing priorities for use of roadspace. Local traders will often argue their businesses need on-street parking, and even if an agreement on parking removal came to fruition, there are typically other competing priorities for the roadspace such as the addition of bike infrastructure or wider footpaths. This category is the most difficult to address because there is no clear answer on the best way to improve the streetscapes that fall within it. Fig. 9 provides an example of a corridor that would have previously been classified within this category but, due to the recent transformation of the corridor into a pedestrian and transit mall, is now classified as an 'Ideal Tram Streetscape'.

5.3. Opportunity for Placemaking and TOD

The 'Opportunity for Placemaking and TOD' category includes segments rated as M3P1, M3P2, M3P3, M4P1, M4P2, M5P1, or M5P2. Segments within this category all have some form of full-time tram separation, but are located in streetscapes with small visitor catchment areas due to a lack of place quality. Since the tram provides a high quality, light-rail like service within these segments, it makes sense to use placemaking and TOD strategies in an attempt to increase the corridor's significance as a destination. M3P3 was included in this category due to M3 (Shared Separation) being network links where there is a pedestrian or transit mall. Many European cities have pedestrianised tram operations within historic town centres and squares, as this type of tram infrastructure has been shown to blend well and even enhance existing place quality (Parkinson and Currie, 2012). However, tram movement quality is negatively impacted by this separation design treatment, in comparison to the alternative improvement options of M4 (Visible Separation) or M5 (Physical Separation), due to slower average speeds. Therefore, this design treatment should only be incorporated where tram infrastructure is directly penetrating locations with a highly significant level of place quality, such as P4 (Regional) or P5 (State).

5.4. Ideal tram streetscapes

The 'Ideal Tram Streetscapes' category, including segments rated as M3P4, M3P5, M4P3, M4P4, M4P5, M5P3, M5P4, or M5P5, represent streetscapes where tram separation provides a reliable service to streetscapes that include destinations with large visitor catchment

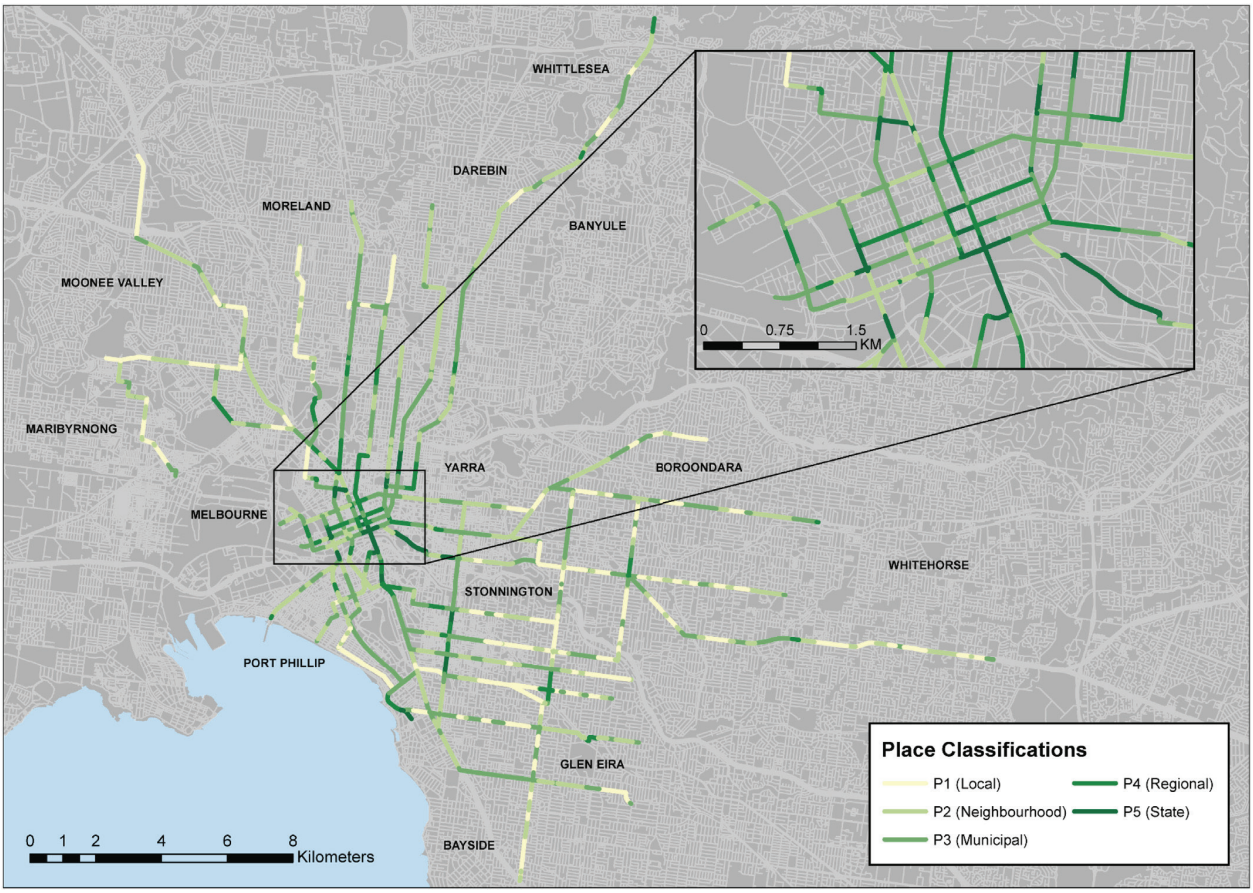

Fig. 7. Place Classifications – Tram Network Spatial Distribution.

areas. M4P3 and M5P3 were included in this category in a recognition that not all tram streetscapes will have region-wide visitor catchment areas, but since they are corridors with a quality public transport service they should at least be high/main street corridors whose catchment area covers their local municipality. Fig. 9 visualises how modernised tram infrastructure design strategies can positively effect both movement and place. It shows before and after images from a recent upgrade to the Acland Street tram corridor, where the stop modernisation program was coupled with broader streetscape design changes that nearly doubled dedicated pedestrian space (Carey, 2015) and separated tram operations from private vehicle movement.

5.5. Network representation of tram streetscape categories

Table 3 summarises key components of the four tram streetscape categories described above and shows their coverage by percentage of total network track kilometres. Fig. 10 provides a bit more detail by including tram streetscape categories and individual matrix cells, with each cell scaled to compare overall representation across the network. Additionally, the spatial distribution of the tram streetscape categories are shown in Fig. 11.

The 'Opportunity for Movement Improvement' category has the largest representation on the network. This and the second highest category, 'Politically Challenging Streetscapes', combine to represent just under 60% of the entire tram network. This is mainly due to the large portion of M1 (No Separation) tram operations present in the network, but is also the result of the expansive size of Melbourne's tram network which services a combination of residential streets with small visitor catchment areas on the outer suburban parts of the network, and main/high streets with medium visitor catchment areas in the middle, and inner suburban parts of the network. The 'Opportunity for Placemaking and TOD' category represents 18.4% of the overall network and is mostly made up of the outer parts of the network where tram movement quality is high, but the tram sits in the middle of a large boulevard where the surrounding streetscape isn't designed for pedestrian activity. 22.2% of tram corridors are 'Ideal Tram Streetscapes' which are mainly within the CBD and inner suburbs where tram movement quality is high and the streetscape has a large visitor catchment area due to a large number of destinations and overall pedestrian-orientated design of the street.

Understanding the scale of each individual matrix cell's representation (Fig. 10) provides more insight into the nature of tram streetscapes as well as the problems which need to be addressed in network modernisation. The segments placed within the two streetscape categories on the bottom of the matrix, 'Easy Opportunity for Movement Improvement' and 'Politically Challenging Streetscapes', are mostly clustered into three out of ten possible matrix boxes. In contrast, the segments within the two categories on the top of the matrix, 'Opportunity for Placemaking and TOD' and 'Ideal Tram Streetscapes' are more evenly spread out. Additionally, there are no segments classified as M3 that were also classified P2 or P1. This is mainly due to the comparatively small representation of pedestrian/transit malls on the tram network, as well as the reality that most of the pedestrianised areas that do exist have a relatively high visitor catchment area.

Fig. 11 displays the spatial distribution of the four tram streetscape categories. 'Ideal Tram Streetscapes' are a feature of the CBD and

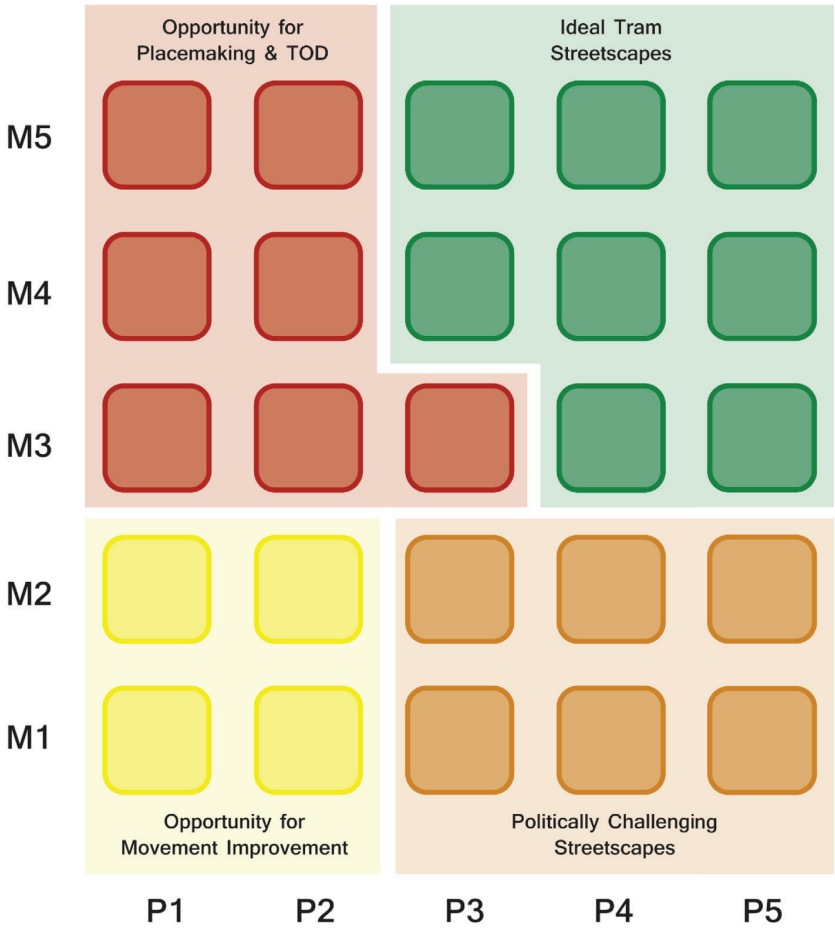

Fig. 8. 'Movement & Place' Matrix and Identified Tram Streetscape Environment Types.

selected inner suburban CBD approach routes. This in part reflects the emphasis given to protect tram rights of way in heavily developed areas and congested CBD approach corridors. 'Opportunities for Movement Improvement' are essentially suburban. 'Politically Challenging Streetscapes' are also mostly suburban but in each case tend to be main/high street commercial corridors where parking is in demand and available roadspace is heavily contested. 'Opportunities for Placemaking and TOD' are more scattered and include a mix of contexts. The most prevalent are light rail segregated rights of way through linear parkland or in highway medians on the outer parts of the network. As a result these segments have little significance as a destination but are clearly opportunities to improve place quality. Indeed, they suggest somewhat of a disconnection between high quality (and expensive) transit infrastructure and the prioritisation of high quality built environment design in more suburban locations. The streetscape category also represents CBD and inner suburban corridors that are almost entirely high density residential or office space, but were not designed with a mixed-use approach that would provide destinations at the street level.

6. Conclusion and discussion

This paper has adapted the 'Movement and Place' framework to Melbourne's tram network, and is the first example of the framework being adopted to analyse a tram (or streetcar) network. Review of tram separation design strategies (used for movement classification) identified that trams share road space, with no separation from private vehicles, across 57% of all network track kilometres. Analysis of visitor catchment area (used for place classification) showed a much more even distribution. Local, Neighbourhood, and Municipal places each represented about 25 to 30% of all network track kilometres. Regional and State places combined to represent about 12% of all network track kilometres.

Arrangement of tram route segments on the twenty-five block matrix, identified by both their movement classification and place classification, enabled the conceptualisation of four tram streetscape environment types. 'Opportunity for Movement Improvement' and 'Politically Challenging Streetscapes' combined to represent about 60% of all network track kilometres. This is mainly a reflection on the prevalence of the M1 (No Separation) classification in tram segments that traverse low-density residential streets; but it also provides some insight into the fact that M1 (No Separation) is prevalent in suburban streetscapes where competing interests for limited road space have complicated the construction of improved tram infrastructure that would better connect to the surrounding streetscape environment. 'Opportunity for Placemaking & TOD' and 'Ideal Tram Streetscapes' each represented about 20% of all network track kilometres. This shows that tram separation has been provided in both locations where it's the least complicated due to a small visitor catchment area (i.e. outer suburban parts of the network), and in the locations where it's most

Fig. 9. Acland Street – From 'Politically Challenging' to 'Ideal Tram Streetscape'.
Images provided by the City of Port Phillip. Photographer: Christian Pearson (Misheye Photography).
Note: Acland Street, located 6 km from the CBD, is an example of the complications as well as potential opportunities that arise for links within the 'Politically Challenging Streetscapes' category. The corridor is a major destination for both locals and tourists due to its many eclectic shops, eateries and bars, as well as its proximity to St. Kilda Beach. It is also the southern terminus of Route 96, one of Melbourne's most patronised tram corridors. Due to issues with both movement function and place function, state government, in conjunction with the local council and Yarra Trams, introduced a plan to permanently close part of the road and transform the space into a pedestrian and transit mall. The plan was met with opposition from local business owners, who argued private vehicle access and on-street parking were crucial to their bottom line. They staged protests (Carey, 2013) and successfully stalled the project for two years (Carey, 2015). However, after local council took the lead on the project and placed an emphasis on prioritising public input in the design process, a slightly modified version of the original project eventually came to fruition. The final redesign project nearly doubled the amount of dedicated pedestrian space, as well as increased the size of footpath trading zones, separated tram operations from private vehicle movement and provided level boarding access for DDA compliance. Images A, C, E and G (left) display the corridor before the redesign while images B, D, F and H (right) display the corresponding locations after the redesign work was completed.

needed due to a large visitor catchment area (i.e. the central business district).

This framework provides a way for policymakers to categorise various segments of tram networks and develop more focussed design solutions targeting the challenges specific to each group and cell in the movement and place matrix. It can also assist with the public consultation process, as comparison between segments of a similar classification can help members of the public visualise potential options for design changes. For example, a segment that was previously in the 'Politically Challenging Streetscapes' category, but underwent a tram separation project and is now in the 'Ideal Tram Streetscapes' category, could be used as an example in outreach for other projects. Future research could also use the categories as part of a qualitative inquiry with the aim of investigating what members of the public view as the discrepancies between segments of the different tram streetscape types.

A limitation of the framework is the method of place classification. A large visitor catchment area does not necessarily equate to an active streetscape frontage. For example, major train stations are given the highest possible classification (P5, State) due their role as an entry point into the city that draws visitors from a large area. But outside of peak travel hours, the surrounding streetscape could be relatively lifeless due to a lack of other destinations and/or design elements that would encourage people to spend time in the area. Future research could resolve this by incorporating an urban design evaluation into the place classification method, as well as conducting people-counts as a way to analyse how much a streetscape's place rating varies throughout the day and week.

The framework presented in this paper is part of a wider PhD

Table 3
Summary of tram streetscape categories.

Category name	M + P ratings within category	Category characteristics	Percent of network (Track KM)
Opportunity for movement improvement	M1P1, M1P2, M2P1, M2P2	• Trams Operating in Mixed Traffic • Small destination catchment radius • Less competition for road space	36.2%
Politically challenging streetscapes	M1P3, M1P4, M1P5, M2P3, M2P4, M2P5	• Trams Operating in Mixed Traffic • Large destination catchment radius • Large number of stakeholders with competing priorities for road space	23.3%
Opportunity for placemaking and TOD	M3P1, M3P2, M3P3, M4P1, M4P2, M5P1, M5P2	• Trams separated from general traffic • Small destination catchment radius • Ideal location for Placemaking and TOD initiatives due to high quality tram service	18.4%
Ideal tram streetscapes	M3P4, M3P5, M4P3, M4P4, M4P5, M5P3, M5P4, M5P5	• Trams separated from general traffic • Large destination catchment radius • High quality tram operational environment servicing a vibrant, active streetscape	22.2%

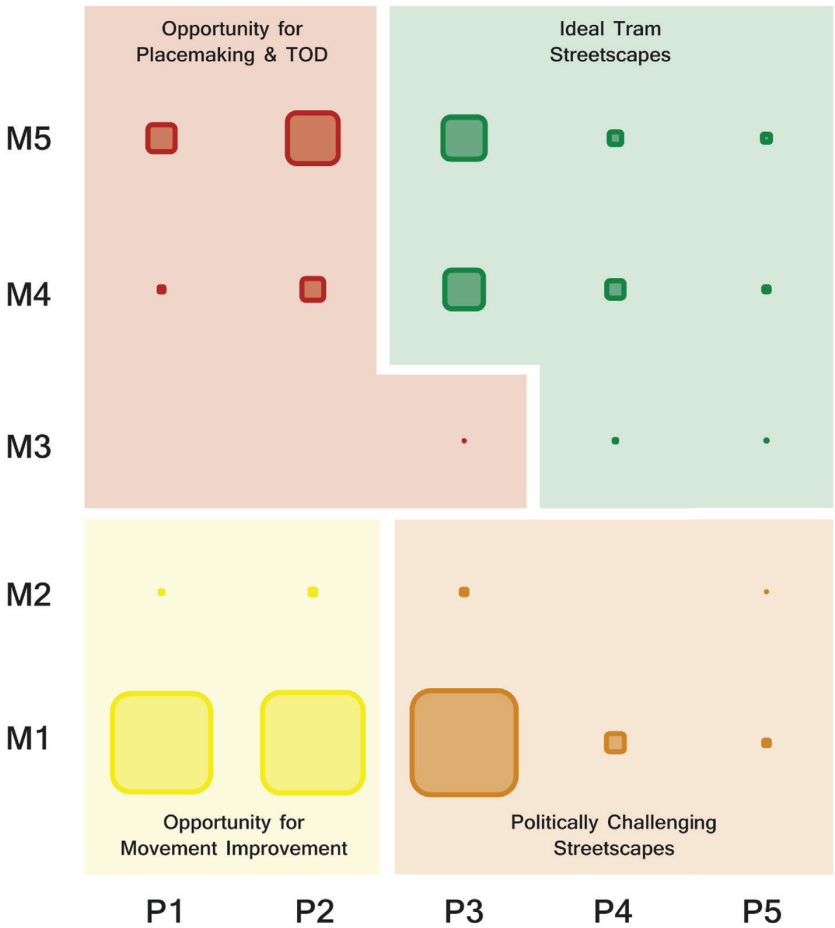

Fig. 10. Movement & Place Groups & Component Cells by Tram Network Coverage.

programme which is now utilising the matrix displayed in Figs. 8 and 10 to target tram stops within specific matrix cells and streetscape categories to better understand perceptions of place quality within the various types of tram streetscape environment present within Melbourne. The aim is to disaggregate performance of streetscapes within each matrix cell to better understand the potential effects of design strategies from the user perspective. The PhD research project is also developing the framework's methodology for place classification to better align with the concepts of Gehl (2010), thereby further connecting methodologies from the planning, design, engineering and placemaking fields.

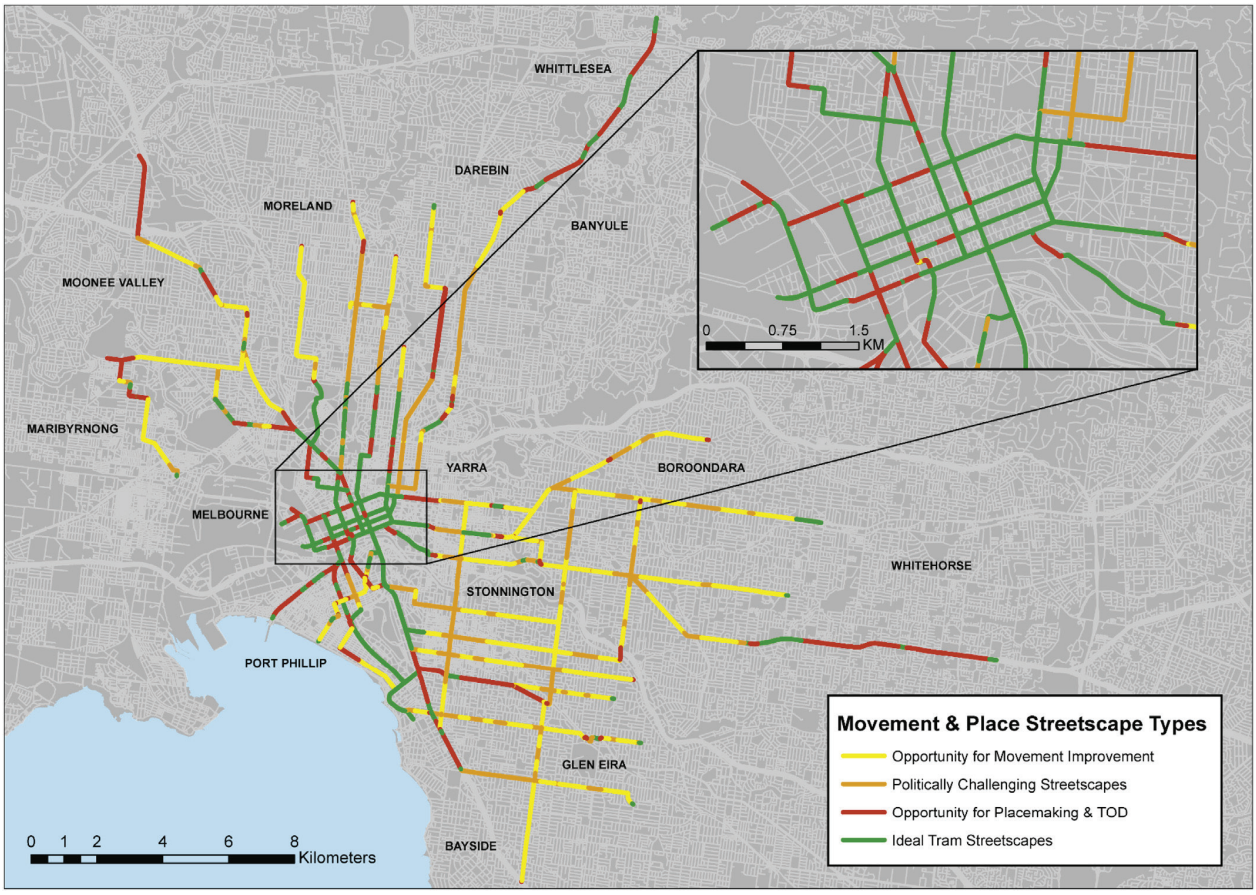

Fig. 11. Movement & Place Streetscape Types – Tram Network Spatial Distribution.

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5.2 Chapter Summary and Key Takeaways

The adaption of the Movement and Place framework (Jones et al., 2007) to Melbourne's tram network, developed in the above publication, revealed that 88% of the tram network is housed in corridors with low-to-medium significance as a destination (P1, P2 and P3). Additionally, 60% of the network has no physical roadway infrastructure separating trams from general traffic (M1 and M2). Regardless of the high presence of these specific environmental characteristics, each network segment is likely to have different needs that will influence how people perceive their quality.
The primary outcome of this publication is the categorisation of tram network segments into four 'streetscape types' based on similarities in 'movement' and 'place' rankings:

1. **Opportunity for Movement Improvement** – Low Movement Ranking, Low Place Ranking
2. **Politically Challenging Streetscapes** – Low Movement Ranking, High Place Ranking
3. **Opportunity for Placemaking and TOD** – High Movement Ranking, Low Place Ranking
4. **Ideal Tram Streetscapes** – High Movement Ranking, High Place Ranking

These streetscape categories provide a method to understand existing conditions across Melbourne's tram network, while still accounting for the unique complexities of individual corridors. A key conclusion of this publication is that higher levels of existing place significance complicate the ability to undertake tram modernisation projects. This is primarily due to locations with higher place significance tending to have higher numbers of stakeholder groups with different, and often competing, priorities for streetscape design. The concept was central to naming the streetscape categories, particularly in regard to the 'Politically Challenging Streetscapes' category, where 'place' is ranked relatively high and 'movement' is ranked relatively low. In these streets, the relatively high number of stakeholder groups has complicated the ability to bring tram modernisation projects to fruition.

Development and application of the classification system has resolved Research Question 1:

How can the variety of streetscape contexts across the tram network be classified into groups that enable the differences in need between them to be more easily addressed?

The four streetscape categories resulting from adaption of the Movement and Place classification system help to define the unique qualities of streetscapes across the network, while also catering to the need for some level of contextually-sensitive categorisation. Chapter 7 employs the streetscape categories as a method for selecting a representative sample of tram streetscapes to measure user perceptions of place quality. This ensures the research findings can be applied to unique contexts across the network, while still facilitating a level of standardisation in design and consistency in user experience across the broader network.

6 SYNTHESIS OF ASSESSMENT TOOLS

Following classification of Melbourne tram streetscapes in the previous chapter, Chapter 6 reviews existing place assessment tools to identify a comprehensive set of place quality performance indicators. As documented in Chapter 3, academic research has not produced a comprehensive, broadly applicable methodology for measuring perception of place quality. Since placemaking projects are based in practice, however, there are a number of governmental and private organisations that have developed toolsets to assess locations and identify priorities to improve them. The large number of projects these organisations oversee, as well as the public accountability that comes along with that responsibility, has incentivised them to adopt a broader and more applied approach that seems in advance of current academic research. The chapter begins by presenting an overview of key place-focused organisations based in practice, as well as the assessment toolsets they have developed. It then presents a comparative review of the toolsets, and synthesises the elements they are designed to measure, in order to identify a comprehensive set of place quality performance indicators.

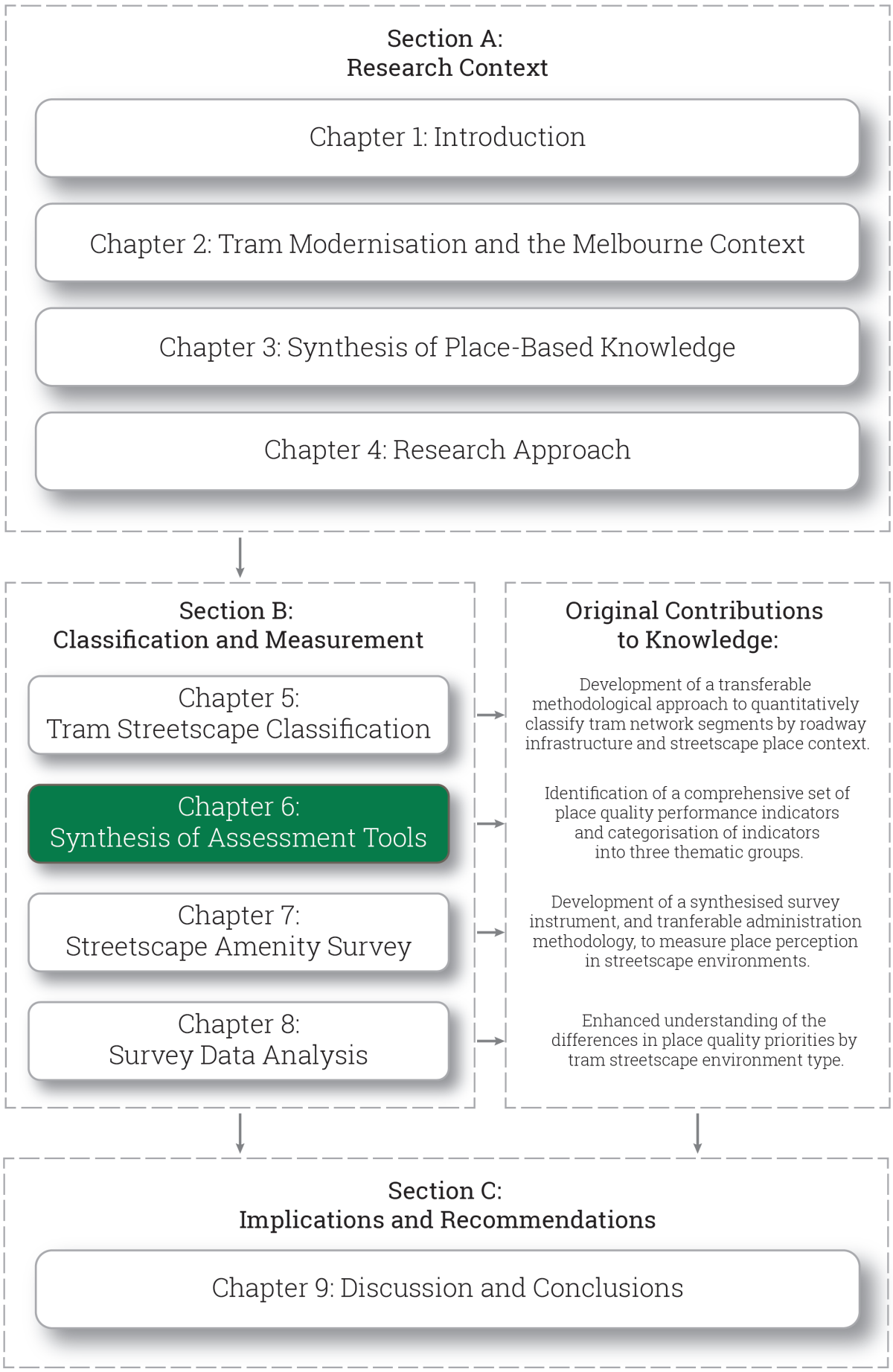


Figure 6.1 – Position of Chapter 6 in the Thesis Structure

6.1 Overview of Place-Focused Organisations

In order to understand the various methodologies applied to analyse perception of place quality, it is important to understand the various reasons organisations have become involved in place-based projects. This subsection introduces practice-based organisations that have developed place assessment tools.

6.1.1 Project for Public Spaces

Project for Public Spaces (PPS) is a New York based non-profit organisation that refers to themselves as the 'central hub of the global placemaking movement'. The organisation was founded by Fred Kent in 1975 to build upon a study he worked on called the 'Street Life Project' (Project for Public Spaces, 2020). The study represented a significant foundational pillar of the modern placemaking movement as it was one of the first to analyse place function in a qualitative manner, via observational videos and face-to-face interviews (Whyte, 1980). The methodology this study incorporated offers insights to the approach Project for Public Spaces has taken in the many placemaking projects they have organised around the globe. One of the organisation's mottos is 'the community is the expert' and the tools they have developed reflect this by enabling residents to not only participate, but lead and play the guiding role of placemaking in their communities.

6.1.2 The Scottish Government

In 2008, the Scottish Government published a report that linked the quality of public space to the overall health and wellbeing of residents (Scottish Government, 2008). While many governmental bodies have statements or reports that lend symbolic support to the ideals of placemaking the Scottish Government stands out as a unique example due to commitments made in their 'National Outcomes' which identify what the government aims to achieve over a ten-year period.

Specifically, the government identified '…well-designed, sustainable places where we are able to access the amenities and services we need' as one of fifteen National Outcomes in 2007 (Scottish Government, 2012). The statement is particularly relevant to this thesis as the government highlights ease of access as a key aspect of an ideal

location. The inclusion of increased place quality as a National Outcome meant that the Scottish Government needed to develop a way to assess progress made toward this outcome when they revisited the outcomes in a decade's time. The method of assessment they developed is explored in Section 6.2.

6.1.3 Gehl Institute

Jan Gehl is a Danish architect who arguably sparked the shift towards applying the 'human-centred design' approach to the urban context. His books outlined how particular urban design choices either encourage or discourage the development of social liveliness within a city (Gehl, 2010; Gehl, 2011). He has applied these theories in numerous 'Public Space Public Life' studies in major cities worldwide, including Melbourne. Public realm improvement projects the City of Melbourne implemented in response to Gehl's findings are consistently credited as playing a major role in revitalising the city's central business district, which has witnessed a fifty-five fold increase in residents between 1993 and 2013 (McMahon, 2014).

Gehl Institute is a non-profit organisation founded to help make the principles behind these studies more widely available through the development of an open source data protocol. The suite of tools that the institute provides are based in the human-centred design approach championed by Gehl, and provide a structured methodology to develop assessments of how people make use of public realm spaces. The structured approach to data collection enhances opportunity for cross-comparative studies of various locations with a similar design context.

6.1.4 Place Score

Place Score is a Sydney-based consulting firm that was founded with the specific purpose of addressing the performance measurement gap in place-based projects. The company has developed an analysis methodology that incorporates online and in-person surveys with the aim of 'providing decision makers with a transparent, rigorous and nationally consistent platform for place measurement, investment prioritisation and tracking' (Place Score Pty Ltd, 2020). The statement makes clear that the company's main goal is to enable place managers to make data-based decisions, a goal that has historically eluded planning and design professionals. Additionally, Place Score suggests their 'nationally consistent platform' enables comparison of results between locales.

6.2 Overview of Place Assessment Tools

Each of the above organisations has identified the need to improve place assessment strategies in order to identify improvement strategies, as well as measure the longitudinal impacts of those strategies upon implementation. Each organisation, however, has developed a unique approach to assessment. The following text provides an overview of each of the place assessment tools the organisations have developed.

6.2.1 'Place Diagram' – Project for Public Spaces (2016)

The Place Diagram organises variables into four key attributes: Sociability, Uses & Activities, Comfort & Image, and Access & Linkages. The core contribution of the tool, however, is that it links measurement variables to 'intangibles'; descriptive words that people commonly utilise to describe their perception of place in a subjective manner. A visualisation of the Place Diagram, along with its three layers of 'Key Attributes', 'Intangibles', and 'Measurements', is displayed in Figure 6.2.

The core themes of the Place Diagram are represented by the 'Key Attributes' layer shown in the centre of the circle in Figure 6.2. Each of these are linked to a set of 'Intangibles' which are subjective notions of place, and then 'Measurements' which are suggested indicators to objectively measure the 'Intangibles'. For example, 'Safe' is an intangible for the 'Comfort & Image' key attribute. The third layer of the diagram, 'measurements' suggests an analysis of crime statistics as a way to measure this intangible. In this sense, the 'Measurement' layer is the most important part of the tool because it creates linkages between subjective notions of place with objective, quantitative measurements.

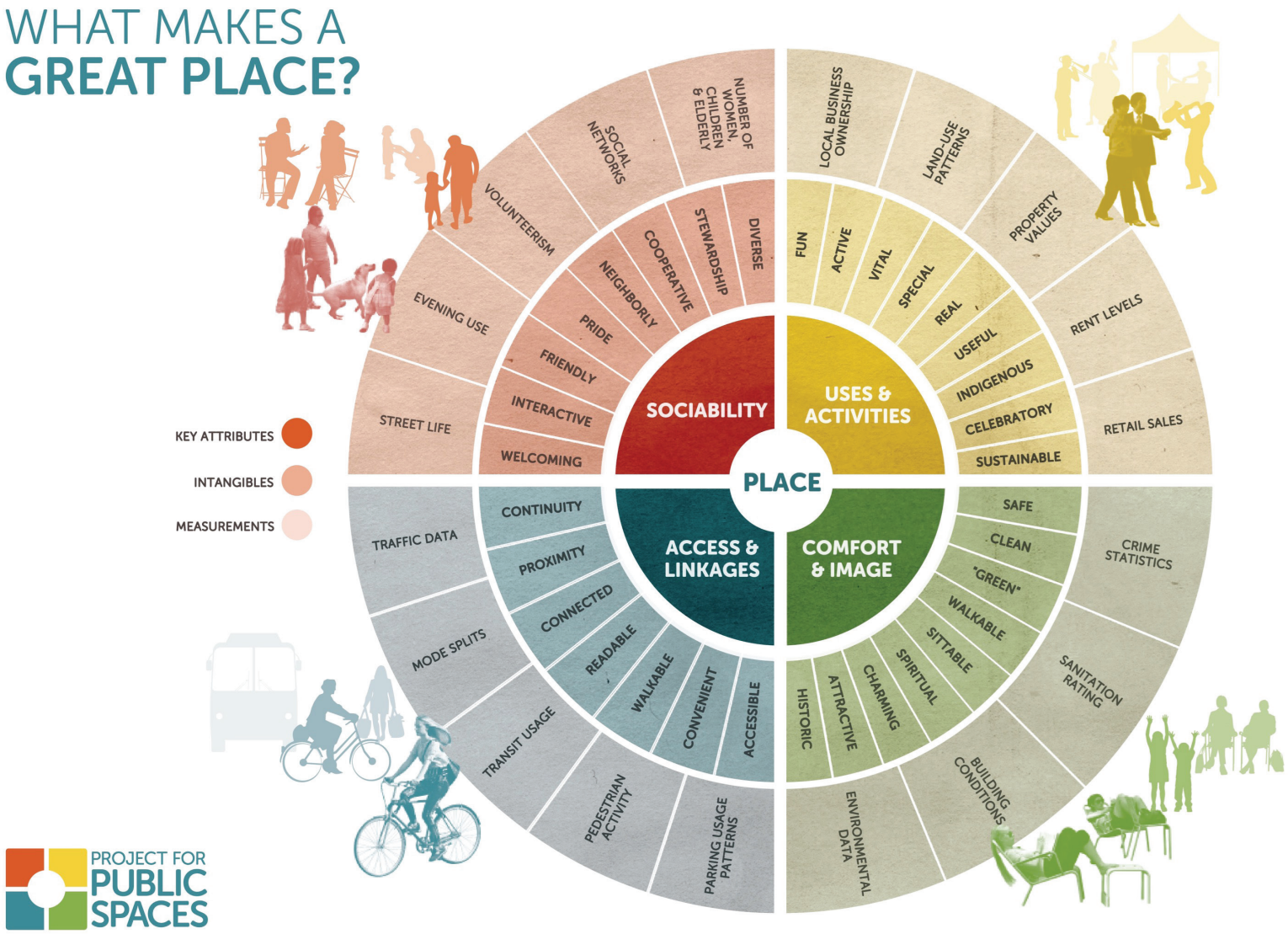


Figure 6.2 – 'Place Diagram'

Source: Project for Public Spaces (2016)

6.2.2 'Place Game' – Project for Public Spaces (2016)

The Place Game is a survey that builds upon the Place Diagram by asking scale-based questions about some of the 'intangibles' and 'measurements'. It also includes five open-ended questions such as 'List things that you would do to improve this place that could be done right away and that wouldn't cost a lot'. The two tools within Project for Public Spaces' toolset are able to be utilised independently of each other, but having one build off the other implies that better outcomes can be achieved if they are used in conjunction. A worksheet displaying the Place Game is shown in Figure 6.3.

SITE #:_____

Rate the Place:

COMFORT & IMAGE	POOR			GOOD
Overall attractiveness	1	2	3	4
Feeling of safety	1	2	3	4
Cleanliness/Quality of Maintenance	1	2	3	4
Comfort of places to sit	1	2	3	4
Comments/Notes:				

ACCESS & LINKAGES	POOR			GOOD
Visibility from a distance	1	2	3	4
Ease in walking to the place	1	2	3	4
Transit access	1	2	3	4
Clarity of information/signage	1	2	3	4
Comments/Notes:				

USES & ACTIVITIES	POOR			GOOD
Mix of stores/services	1	2	3	4
Frequency of community events/activities	1	2	3	4
Overall busy-ness of area	1	2	3	4
Economic vitality	1	2	3	4
Comments/Notes:				

SOCIABILITY	POOR			GOOD
Number of people in groups	1	2	3	4
Evidence of volunteerism	1	2	3	4
Sense of pride and ownership	1	2	3	4
Presence of children and seniors	1	2	3	4
Comments/Notes:				

Identify Opportunities

1. What do you like best about this place?

2. List things that you would do to improve this place that could be done right away and that wouldn't cost a lot:

3. What changes would you make in the long term that would have the biggest impact?

4. Ask someone who is in the "place" what they like about it and what they would do to improve it. Their answer:

5. What local partnerships or local talent can you identify that could help implement some of your proposed improvements? Please be as specific as possible.

PLACE GAME

Figure 6.3 – 'Place Game' Survey Worksheet

Source: Project for Public Spaces (2016)

6.2.3 'Place Standard' – Scottish Government (2017)

Building upon the 2007 National Outcomes, the Place Standard tool was developed for the Scottish Government to measure perception of place amenity. The tool is structured around fourteen 'elements of place' that respondents rank on a seven-point scale, with prompts provided for each element to help respondents understand what criteria they should consider in their ranking. An example of the prompts provided to respondents for 'Streets and Spaces', one of the fourteen elements of place, is shown in Figure 6.4.

Streets and spaces

Buildings, landmarks, greenery, views and natural landscape can all help to create an attractive, distinctive place that people enjoy. These features can also help people to find their way around.

Now think about the place you are assessing and ask yourself:

Do buildings, streets and public spaces create an attractive place that is easy to get around?

Next, rate the place on a scale from 1 to 7, where 1 means there is a lot of room for improvement and 7 means there is very little room for improvement. {Record your rating on the compass diagram.}

Think about the following when considering your rating:

- Do the buildings or public spaces make being in or passing through the area a pleasant experience?
- Are there positive features such as local landmarks, historic buildings, public squares or natural features that make the place look attractive?
- Do poor aspects such as derelict buildings, vacant land or excessive noise reduce the effect that these positive features have?
- Do features and routes help people find their way around?
- Is it much harder to enjoy the place at night, in different seasons, or during bad weather?

Figure 6.4 – 'Place Standard' survey prompts for 'Streets and Spaces' element

Source: Scottish Government, 2017

Respondents are asked to consider multiple criteria about the streets and spaces of their community, and come to a conclusion on how much potential for improvement exists. A weakness of the tool is that despite the prompts asking users to consider multiple criteria for each place theme, they must then combine these insights into just one ranking for each of the fourteen place themes. This results in a loss of potentially valuable insights for place managers, because the seven-point scale ranking does not indicate which criteria impacted the ranking or by how much. The tool attempts to alleviate this issue by providing space for notes below the prompts for each place theme. However, if the respondent does not write any notes these insights are lost, and either way they are not captured in an easily quantifiable manner. This method does, however, enable the primary innovation of Place Standard which is how the results are displayed. The seven-point scale rankings for each of the fourteen place elements are visualised on a radar chart, as displayed in Figure 6.5, allowing for rapid communication of a location's strengths and weaknesses. This makes the toolset particularly useful for stakeholder engagement, as participants can leave a visioning workshop with a clear understanding of priorities for improvement.

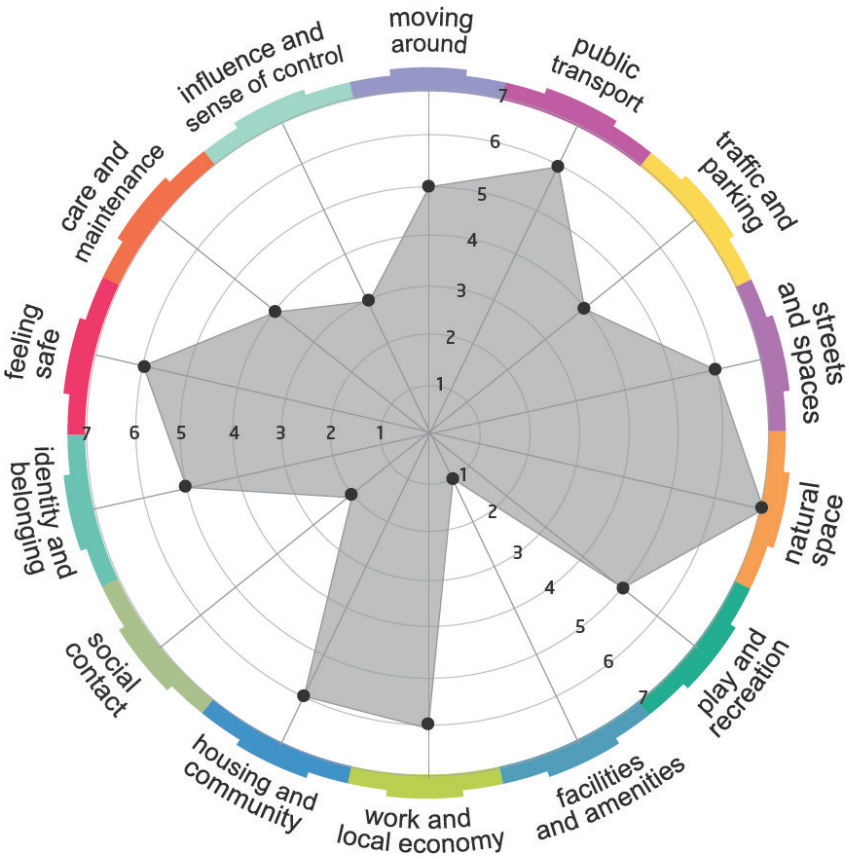


Figure 6.5 – 'Place Standard' Radar Chart

Source: Scottish Government, 2017

6.2.4 'Place Score' – Place Score Pty Ltd (2019)

Place Score is a survey instrument separated into two parts, both of which are structured by five 'Dimensions of Great Places': 'Look and Function', 'Sense of Welcome', 'Things to Do', 'Uniqueness', and 'Care'. The first part of the toolset is called 'Care Factor' and presents respondents with lists of variables for each of the five place dimensions. Respondents rank their top three from each list in terms of which variables are most important to them in a generic location. This enables general identification of what the respondent prioritises in a place. The second part of the toolset, 'PX Assessment', presents respondents with the same lists for each place dimension and asks them to rank a specific location's performance for each variable on an eleven-point scale.

Combined analysis of both parts of the toolset allows for cross comparison between the general importance of a variable to respondents with how well a particular location is perceived to be meeting the criteria of the variable. Variables that received high rankings in both 'Care Factor' and the 'PX Assessment' are identified as place strengths, whereas variables that ranked highly in 'Care Factor' but low in the 'PX Assessment' are identified as priorities for improvement. Place Score stands out amongst other tools due to this ability to quantify place priorities, using what is commonly referred to as Importance-Performance Analysis (IPA). An example of Place Score's reporting method, which plots place quality performance indicators on an IPA Matrix, is displayed in Figure 6.6.

3A CITY CENTRE STRENGTHS AND PRIORITIES

carefactor PXassessment neighbourhood

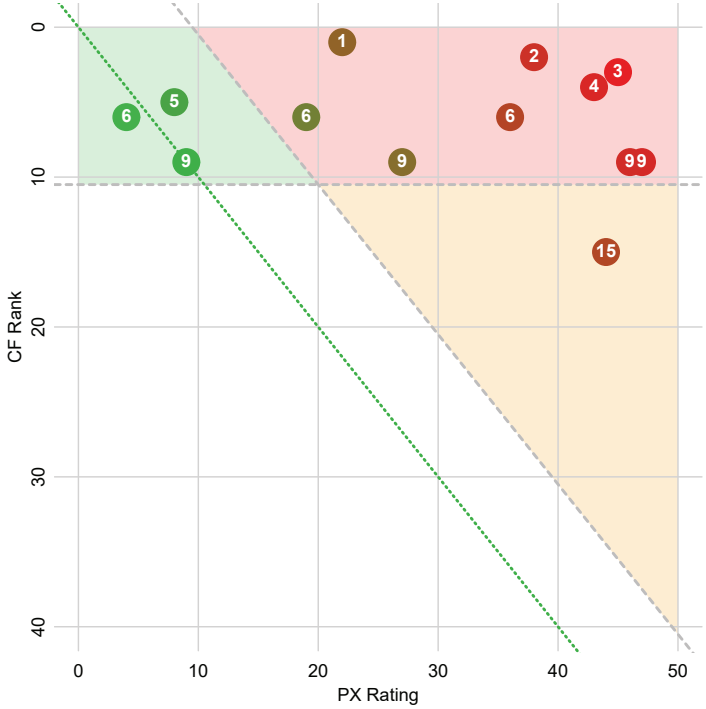
These tables and graph illustrate your neighbourhood strengths, liveability improvement priorities and secondary priorities.

STRENGTHS should be celebrated and protected.

LIVEABILITY IMPROVEMENT PRIORITIES identify the aspects of your neighbourhood that are important to people but are currently underperforming. Improving these attributes will have the most significant impact on your community.

SECONDARY PRIORITIES identify attributes to look-out for, they are negatively affecting liveability and can become more significant issues if more people start caring about them.

CF	NEIGHBOURHOOD STRENGTHS
6	**Access to neighbourhood amenities** (cafes, shops, health and wellness services etc.)
9	**Overall visual character of the neighbourhood**
5	**Locally owned and operated businesses**



CF	LIVEABILITY IMPROVEMENT PRIORITIES
3	**Sense of personal safety** (for all ages, genders, day or night)
4	**Access and safety of walking, cycling and/or public transport** (signage, paths, lighting etc.)
9	**Sustainable urban design** (water sensitive design, transport-oriented design, sustainable building design, density etc.)
9	**Sense of neighbourhood safety** (from crime, traffic, pollution etc.)
2	**Quality of public space** (footpaths, verges, parks etc.)
6	**Walking/jogging/bike paths that connect housing to communal amenity** (shops, parks etc.)
1	**General condition of public open space** (street trees, footpaths, parks etc.)
9	**Things to do in the evening** (bars, dining, cinema, live music etc.)
6	**Elements of natural environment** (natural features, views, vegetation, topography, water, wildlife etc.)

CF	SECONDARY PRIORITIES
15	**Sustainable behaviours in the community** (water management, solar panels, recycling etc.)

PLACESCORE www.placescore.org

Notes: *CF - Care Factor ranking out of 50 - the lower the number the higher the number of people who think this attribute is important. Neighbourhood Strengths have a high CF and high PX. Liveability Priorities are the poorest performing CF ranked in the overall top 10. Secondary Priorities are the worst performing overall outside of the Top 10 CF.*

Place Score © 2019 | P.37
Coffs Harbour Neighbourhood CIR | March 2019

Figure 6.6 – IPA Matrix of Coffs Harbour City Centre (NSW, Australia) Strengths and Prioirities

Source: Coffs Harbour City Council and Place Score Pty Ltd (2019)

6.2.5 'Public Life Tools' – Gehl Institute (2019)

Gehl Institute has developed fourteen tools that when combined make up a set of surveys, worksheets, and other structured methods to analyse various aspects of public space. The tools are structured into three groups, 'Tried and True', 'Beta', and 'Unfinished', based on how far along they are in the development process. This section reviews all three groups, fourteen tools in total, since the primary purpose of the review is to document variety in variables and measurement methods.

'Tried and True' Group

The five tools within this group have been utilised by Gehl and its partners for a number of years and across a large number of projects. This has enabled them to strengthen the tools over time based on observations and feedback from project partners.

Age and Gender Tally

This tool is a worksheet that provides a structure for counting the various age and gender groups occupying an identified public space. It includes space for a map in order to show exactly where the surveyor stood as well as the direction they were facing, or to display their path if they walked through the area while counting. It also includes instructions on how to collect the data so that the process can be easily replicated. Finally, there's a space for surveyors to document items such as time and weather conditions.

People Moving Count

This worksheet provides a similar structure to the Age and Gender Tally, but instead documents how people move through the space. It analyses active modes of transport and is broken down by six categories: Walking, Running/Jogging, Supported (e.g. wheelchair or mobility scooter), Carried (e.g. stroller/pram), Rolling (e.g. skateboard or scooter), and Cycling. Similar to the Age and Gender Tally, the worksheet also includes space for a map, listing the date and time of day, weather conditions, and instructions on how to conduct the count. The worksheet is displayed in Figure 6.7.

People Moving Count

10–30 MINUTES OR 100 PEOPLE (CIRCLE ONE)

CATEGORY		COUNT—TALLY EVERYONE	
PEDESTRIANS	WALKING		TOTAL
	RUNNING/ JOGGING		TOTAL
	SUPPORTED (e.g., wheelchair)		TOTAL
	CARRIED (e.g., stroller)		TOTAL
	ROLLING (e.g., skateboard)		TOTAL
PEOPLE ON BICYCLES			TOTAL

NAME DATE WEATHER

LOCATION TIME

ADD MAP HERE

INSTRUCTIONS: Count people moving across the indicated line for 10–30 minutes or until you count 100 people. Adjust the location of your line as necessary to maintain a clear sightline from end to end.

Figure 6.7 – 'People Moving Count' Worksheet

Source: Gehl Institute (2019)

Stationary Activity Mapping

This tool enables both an analysis of the types of activities prevalent in a public space, as well as the locations within the space that each of the activities are occurring. There are seven 'posture' categories: Standing, Sitting (Public), Sitting (Private), Sitting (Commercial), Sitting (Informal), Lying Down, and Multiple/Movement. Each of these posture categories have an assigned symbol that is used to show where they are happening on the location map, and a tally box to mark how many people were occupying the space in that posture. The tally box also includes five activity categories: Waiting for Transport, Consuming Food/Beverages, Commercial Activity, Cultural Activity, and Recreational Play/Exercise. This allows for the posture tallies to be further broken down by the type of activity that was taking place while in that particular posture.

Participant Survey

A survey worksheet that includes a mixture of Likert-scale, open ended, and closed answer questions. The included questions analyse how people use a space, how often they use it, how they typically access it, how much time they spend there, as well as the type of people that are using it (demographics). The qualitative questions aim to analyse individual perception of the space. For example, one question asks participants to describe the public space in three words. Another asks them to list two things they'd like to do in the public space that they can't do now. Like the rest of the tools, instructions regarding methodology are provided to the surveyor.

Twelve Quality Criteria

This worksheet suggests twelve criteria that make a good public space, which are categorised into three themes: Protection, Comfort, and Enjoyment. Each of the criteria contain a description of how they should be met. For example, the 'Options to Stand and Linger' criterion is supplemented with a description that describes features that could be leaned on such as a bus stop, bench, tree or ledge. Surveyors are asked to read through these criteria and provide a three-point ranking of the location's performance. A score of one means the criteria is not met, a two means it is partially met, and a three means it is adequately met. The themes and criteria are displayed in Figure 6.8.

Protection	**Protection against traffic and accidents.** Do groups across age and ability experience traffic safety in the public space? Can one safely bike and walk without fear of being hit by a driver?	**Protection against harm by others.** Is the public space perceived to be safe both day and night? Are there people and activities at all hours of the day because the area has, for example, both residents and offices? Does the lighting provide safety at night as well as a good atmosphere?	**Protection against unpleasant sensory experience.** Are there noises, dust, smells, or other pollution? Does the public space function well when it's windy? Is there shelter from strong sun, rain, or minor flooding?
Comfort	**Options for mobility.** Is this space accessible? Are there physical elements that might limit or enhance personal mobility in the forms of walking, using of a wheelchair, or pushing a stroller? Is it evident how to move through the space without having to take an illogical detour?	**Options to stand and linger.** Does the place have features you can stay and lean on, like a façade that invites one to spend time next to it, a bus stop, a bench, a tree, or a small ledge or niche?	**Options for sitting.** Are there good primary seating options such as benches or chairs? Or is there only secondary seating such as a stair, seat wall, or the edge of a fountain? Are there adequate non-commercial seating options so that sitting does not require spending money?
	Options for seeing. Are seating options placed so there are interesting things to look at?	**Options for talking and listening/ hearing.** Is it possible to have a conversation here? Is it evident that you have the option to sit together and have a conversation?	**Options for play, exercise, and activities.** Are there options to be active at multiple times of the day and year?
Enjoyment	**Scale.** Is the public space and the building that surrounds it at a human scale? If people are at the edges of the space, can we still relate to them as people or are they lost in their surroundings?	**Opportunities to enjoy the positive aspects of climate.** Are local climatic aspects such as wind and sun taken into account? Are there varied conditions for spending time in public spaces at different times of year? With this in mind, where are the seating options placed? Are they located entirely in the shadows or the sun? And how are they oriented/ placed in relation to wind? Are they protected?	**Experience of aesthetic qualities and positive sensory experiences.** Is the public space beautiful? Is it evident that there is good design both in terms of how things are shaped, as well as their durability?

Figure 6.8 – 'Twelve Quality Criteria'

Source: Gehl Institute (2019)

The three themes shown in Figure 6.8 cover basic attributes the average person is likely to desire in public spaces they choose to spend time in. The 'Protection' theme touches on general safety and cleanliness; the 'Comfort' theme acknowledges that the design of the space will impact people's ability to use it in particular ways; and the 'Enjoyment' theme addresses the need for a diversity of amenities and experiences to encourage people to stay in a place instead of just pass through.

'Beta' Group

The Gehl Institute also has four 'beta' tools that are relatively new, and therefore are still being experimented with. However, the Institute's website states that they have all been incorporated and proven useful in at least one or two projects (Gehl Institute, 2019).

Social Space Survey

This tool defines the potential activities a public space encourages through its design, as well as identifies specific elements that encourage or discourage specific activities. It begins with a Site Inventory Questionnaire that mainly consists of yes/no questions such as 'Does the place have tables for eating and socializing', and 'Are there any unnecessary permanent fences/barriers?'. The second section asks the surveyor to map the space using three symbols that help to display how the location functions. A star is used to symbolise 'magnets', or attractions, within the location. These can be features such as a mural, play area, or storefront. The next symbol, similar to contour lines, is then utilised to show the range of participation with the magnet. Range of participation is defined as places to spend time around the magnet, such as seating or a viewpoint. Finally, backwards parentheses-like symbols are then used to show compression points within the space. These are pathways or gateways that bring users of the space closer together. An example 'Pattern of the Site' sketch is displayed in Figure 6.9.

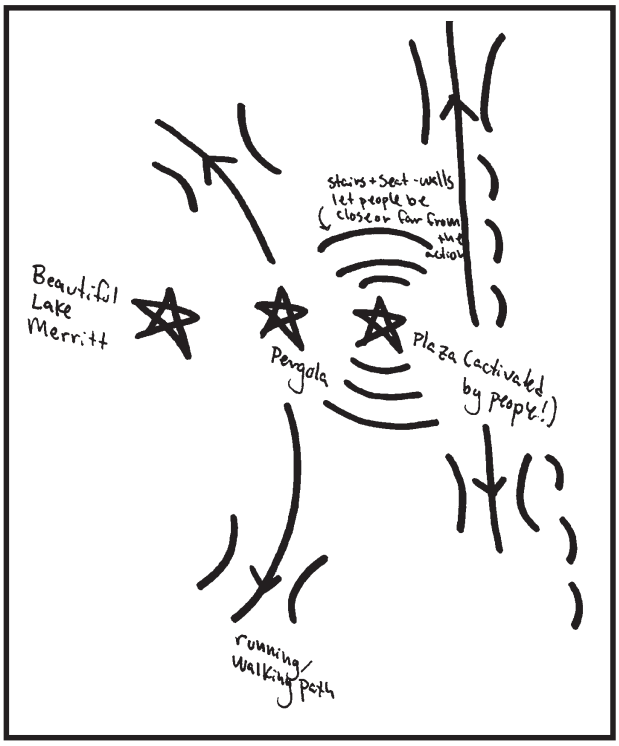


Figure 6.9 – Lake Merritt (Oakland, CA, US) 'Social Space Survey' sketch

Source: Gehl Institute (2019)

The survey worksheet ends with a 'Thoughts and Notes' section that asks four Likert-scale questions and three open-ended questions that further delve into how the place is being used, who it is being used by, and whether the design of the space is facilitating the functions its users desire.

Neighbourhood Price Diversity Index

With this tool, the Gehl Institute provides a defined spatial analysis methodology that incorporates Google Places API to analyse the diversity of price classification for businesses within an area. Google Maps users can rank businesses on a four-point price scale, from $ to $$$$, based on the necessary budget for patronisation of that business. An identified study area is divided by a 200 x 200 metre grid, and then a 500-metre buffer around each grid cell is used to analyse the price rating of the businesses within each buffer zone. The grid cells then receive a diversity score based on the range of price rankings businesses within the area have received. An example application of the index in San Francisco, and the resulting map of price diversity, is shown in Figure 6.10. The Institute suggests this analysis can be incorporated with other data to get a clearer picture of the type of people that may be most likely to utilise a space.

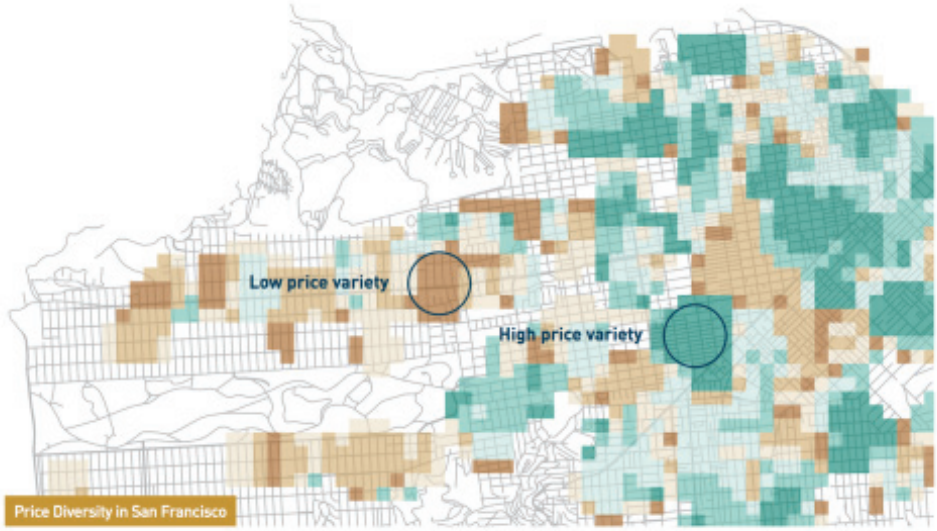


Figure 6.10 – 'Neighbourhood Price Diversity Index' Example Application in San Francisco
Source: Gehl Institute (2019)

Building Façade Activation Survey

This worksheet asks users to rank the activation of a street's building façades based on opportunities for interaction like number of entrances and windows, average size of building units, and unique architectural details. A map of the street is included for users to write their ranking of each façade on a four-point scale: Vibrant, Active, Dull, and Inactive. Each potential ranking includes a description. For example, an 'Active' façade should have relatively small units, some transparency such as windows, few passive units, and some articulation and detail. A fifth category is also provided for monuments or heritage buildings that may not have an active frontage, but add to the area through a distinctive visual character.

Place Inventory

Place Inventory provides an opportunity to document the amenities provided in a public space. It is a two-part process, beginning with mapping the location of amenities and obstacles throughout the site. Amenities are broken down into nine categories: Seating, Vegetation, Shade/Shelter, Bike Parking, Trash and Recycling Bins, Lighting, Areas to Play, Water Features, and Public Art; and Obstacles are covered by three categories: Walking/Wheelchair obstructions, Physical Boundaries, and Street Crossings. Surveyors are asked to map the amenities and obstacles present throughout the site, as well as take pictures of each one to supplement the maps, and provide counts of different types of seating. The mapping process is then followed by a mostly Likert-scale based survey that gathers more detail surrounding the quality of each amenity and level of difficulty caused by the identified obstacles.

Public Life Data Protocol

This tool provides a template to digitise three 'Tried and True' tools; the 'Age and Gender Count', 'People Moving Count', and the 'Stationary Activity Mapping' worksheet. It also builds on these tools by expanding on some of the included variables. For example, when classifying people moving through the space by bicycle, you first specify whether it's a privately owned or commercial share bike, then if it's an individual or multiple people on the bike, next if its powered manually or by battery, and finally you specify whether it's a regular, recumbent, cargo, or other type of bike.

There are also entirely new additions such as the ability to inventory items that are being carried or worn by people in the space. These include both cultural and activity-based clothing, such as a burqa or bathing suit, as well as belongings that might indicate nearby activities such as a gym bag or briefcase. There are also inventory items that seem to be an indication of amenities that may be lacking from the space. For example, someone carrying a folding chair or table may mean there is not enough sitting spaces to meet the needs of people using a space. Likewise, high numbers of persons using an umbrella may be an indication that not enough sheltered space is provided.

Finally, the protocol aims to further Gehl Institute's goal of creating a universal language in the measurement of public life. They accomplish this by incorporating terminology sets such as those defined in NACTO's Urban Street Design Guide (NACTO, 2013) to describe vehicular lanes, or the California Department of Transportation's five classifications of bikeways (State of California, 2019) to describe types of cycling lanes and paths.

'Unfinished' Group

This group completes Gehl Institute's suite with four experimental tools that have not yet been tested in practice. The Institute states that these tools may not make it into their permanent collection. Nonetheless, their experimentation with the variables indicates they could be useful in measuring aspects of place.

Familiar Stranger Survey

This tool aims to gauge sense of community by asking survey participants if they recognise people displayed in a set of photos. For each photo, the survey respondent is asked to put an 'R' if they recognise the person, or a 'K' if they know them personally. If neither apply, the circle is left blank to indicate the respondent does not recognise the person. There is also space for the respondent to provide context on their relationship with the person. An example response is shown in Figure 6.11.

After responding to each of the photos, respondents are asked three closed answer questions that analyse how often they visit the place, how much time they typically spend there, and what activities they typically visit for. Finally, the survey ends with a Likert-scale question that asks respondents how they feel about the place on a five-point scale that ranges from 'Strongly Negative' to 'Strongly Positive'.

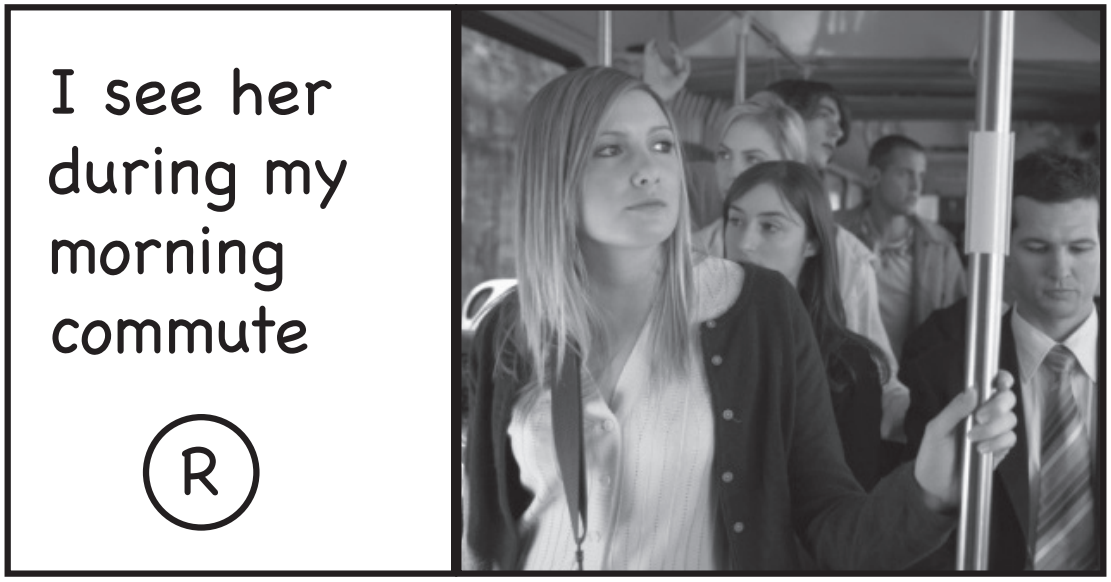


Figure 6.11 – 'Familiar Stranger Survey' Example Response

Source: Gehl Institute (2019)

Census for City Streets

This tool capitalises on social media as a way to analyse place function. Through geo-tagged Instagram posts, the tool is able to identify landmarks and businesses that are most appreciated in a particular streetscape. However, Gehl Institute states that their tests of the tool in San Francisco found Instagram data to be highly skewed towards visitors, and so it did not provide an accurate representation of residents' perception of place. They are currently looking for a new dataset for this tool.

Neighbourhood Socioeconomic Mix Data

This tool combines primary data documenting place visitor demographics, with secondary demographic data on residents of the local area, obtained from the US Census' American Community Survey. The goal is to analyse if a public space or businesses within an area are catering to the local community or people that are coming into the local community from elsewhere. Gehl Institute, however, states that the analysis requires making many assumptions about the definition of 'local area' as the boundaries of census tract areas often do not conform to the neighbourhood context.

Urban Connectivity Survey

This tool establishes methodological instructions for measuring the connectivity of an area's street network. In GIS, a street network file should be split into 20-metre segments, with 500-metre buffers created around each segment. A connectivity score is then assigned to each 20-metre segment documenting how many other 20-metre street segments fall within its 500-metre buffer zone. Street segments can then be classified by their level of connectivity, essentially defining how easy it is to access localised parts of the broader street network.

6.3 Comparative Review of the Toolsets

The purpose of this section is to discuss both the differences and commonalities between the tools, as well as analyse strengths and weaknesses of each. A two-level review is provided by first comparing the overall orientation and then indexing the individual attributes included in each assessment toolset. The reviewed toolsets have a wide diversity in measurement methodology. Some of the toolsets are aimed towards public engagement, whereas others are designed to structure a professionally conducted audit. Some are focused on the collection of primary data, whereas others form methodological guidelines for the analysis of secondary data. Furthermore, the toolsets differ in the size of the area they're meant to be applied to.

6.3.1 'Attributes', 'Criteria', 'Dimensions' and 'Elements': Defined Place Themes

Although each tool adopted different words to communicate it, all of the reviewed tools had a set of themes that they used to define various aspects of locations. Even the quantitative, analysis-oriented 'Public Life Tools' included a worksheet that structured 'place' around twelve quality criteria. This is crucial as determining the best method of assessment requires a strong definition and understanding of what is proposed to be measured. It also helps participants to develop a better conceptualisation of the task at hand when detailing their perception on a survey or other assessment tool. Since each of these described what aspects the tool was designed to measure, they are referred to as 'Place Quality Performance Indicators' in the remainder of this thesis.

6.3.2 Place Performance Definition: 'Function' versus 'Fulfilment'

After determining the indicators to be measured, defining how the tool views 'performance' enhances the ability to select a measurement methodology. The toolsets presented in this review have two distinct definitions of place performance. The first definition is centred on analysing the daily functions of a location, the people and activities present within it. There are no preconceived notions of what good or bad performance looks like, the purpose is simply to develop insight to the general function of the location. Typical measurement methodologies are to document the demographics of people within the space, their movements, waiting and lingering locations, and the various activities happening in the space. This definition of

performance is essentially analysing the 'function' of a location since the main purpose of the tools incorporating this definition is to analyse how a location is being utilised. For these tools, place performance is an open definition that is meant to be filled after developing an understanding of how people use the space.

The second definition of performance is centred on specific ideals that represent what a quality place should be and analysis of the location's fulfilment of those standards. It differs from the previous definition in that there are preconceived notions of what a quality place consists of. For toolsets incorporating this definition of place performance, referred to as 'fulfillment', measurement is accomplished in two ways. The first requires the development of a survey to directly ask users about the location's performance on a set of pre-defined criteria, typically through scale-based or open-ended questions. The second method is an audit conducted by a professional place manager, typically a planner or designer, to make informed judgements on the ability of the location to meet those same pre-defined performance criteria. Across both methods, the tools within the 'fulfilment' performance definition identify strategies for improvement based on how a location is currently performing against a pre-defined set of standards. Table 6.1 shows the extent to which each toolset applies the two definitions of performance.

Table 6.1 – Applied Definition of 'Place Performance' by Assessment Toolset

Applied Definition of 'Place Performance'		
Assessment Tool:	Function	Fulfilment
Place Diagram	○	●
Place Game	◑	◑
Place Score	◑	◑
Place Standard	◔	◕
Public Life Tools (On Average)	◕	◔

Key:	
Not Applicable	○
Partially Applicable	◔
Mixed Applicability	◑
Mostly Applicable	◕
Fully Applicable	●

Source: Author's Synthesis of Reviewed Toolsets

Both definitions of place performance have their own strengths and weaknesses. Analysing the utilisation of a location provides a good indication of how design could be improved to better facilitate current utilisation. However, it provides no insight into what users may want out of the location that is not feasible with the current design. Analysis of a location's performance against a pre-defined set of standards can help bring life into a place that currently has little or no activity happening in it. However, there is no way to be sure an improvement strategy resulting from this type of analysis will meet user priorities for the location unless this is also directly investigated.

The organisations involved in creating these tools have recognised these strengths and weakness, and as a result the majority of toolsets combine aspects of both. This is reflected in their respective performance measurement structures, as displayed in Table 6.1. The main focus of Place Standard, for example, is to assess how well a location performs against pre-defined criteria through a Likert-scale based survey. However, it also provides an open-answer space following each scale so respondents can provide more qualitative information such as whether they might view a particular item as a top priority. In this sense, the survey has the potential to gain qualitative insights that the Likert-scale responses alone would not provide.

6.3.3 Variation in Measurement Strategy

The reviewed toolsets also have differences in measurement strategy, as well as the locational scale that they are intended to be applied to. Table 6.2 provides a classification of each toolset's measurement strategy. The classification is based on whether the toolset is designed to be completed by place managers conducting an internal audit, or by place users as part of an engagement process. The toolsets are relatively evenly split between the two categories, with a slight trend towards Audit-Oriented measurement.

Table 6.2 – Applied Measurement Strategy by Toolset

Place Performance Measurement Strategy		
Assessment Tool:	Audit-Oriented	User-Oriented
Place Diagram	●	○
Place Game	◑	◑
Place Score	◔	◕
Place Standard	◔	◕
Public Life Tools (On Average)	◕	◔

Key:	
Not Applicable	○
Partially Applicable	◔
Mixed Applicability	◑
Mostly Applicable	◕
Fully Applicable	●

Source: Author's Synthesis of Reviewed Toolsets

6.3.4 Intended Scale of Application

Table 6.3 compares the tools based on whether they are intended to facilitate assessments of a specific site, a street/corridor, or an entire community. None of the tools are intended solely for one scale of application, but most straddle between the middle and one of the two sides. Gehl's 'Public Life Tools', for example, involve intensive data collection such as the number and location of seating opportunities and the documentation of activities that occupants of the place are undertaking. This pushes the suite towards the Specific Site side of the scale, because the measures look at a smaller-scale space instead of a larger, corridor or community-wide location. In contrast, Place Standard leans more toward the Community-Wide side of the scale because the included prompts ask respondents to make broader judgements. For example, one question asks if "a variety of housing allows people to stay in the area as their needs change, or they grow older". While this could be answered at both the street/corridor and community-wide level, it is likely more applicable to the community-wide level. Additionally, answering this question about a specific public space is not possible as by definition that space would not have any private housing.

Table 6.3 – Intended Scale of Application by Toolset

Intended Scale of Application			
Assessment Tool:	Specific Site	Street/Corridor	Community-Wide
Place Diagram	○	◑	◑
Place Game	◑	◑	○
Place Score	◑	◑	○
Place Standard	○	◔	◕
Public Life Tools (On Average)	◑	◔	◔

Key:	
Not Applicable	○
Partially Applicable	◔
Mixed Applicability	◑
Mostly Applicable	◕
Fully Applicable	●

Source: Author's Synthesis of Reviewed Toolsets

6.3.5 Overall Categorisation of Assessment Approach: Observation, Reflection, and Analysis

A more detailed categorisation of the toolsets is provided in Figure 6.12. It shows that there are discrepancies between the individual tools that go beyond the thematic comparisons made in Tables 6.1 through 6.3. There are two different methods that the tools employ for the collection of primary data. The first method, 'Observation', sends surveyors to observe the place, its built qualities, the people within it and how they are using the space. This type of data is usually collected through counts, inventories, and mapping processes and is aimed for utilisation in internal analysis projects. It typically applies the 'Function' definition of place performance. The second method of primary data collection, 'Reflection', involves place users reflecting on their general experiences in a location. This is typically facilitated through Likert-scale surveys as part of a public outreach process.

Other tools, however, act as methodological guides for the interpretation of secondary data. Tools in this third category, 'Analysis', have pre-defined criteria assumed to result in high-quality places across all contexts, and then use existing data sources to analyse how a specific place performs against them. These tools are designed to be part of an internal analysis project, or as a preliminary exploratory study meant to inform an upcoming public outreach process that would use tools in the other two categories.

Each of the tools presented in this review have their own strengths and weaknesses. The categories presented in Figure 6.12, 'Observation', 'Reflection', and 'Analysis', could typically comprise a three-step process when they are considered outside the context of a comparative review. A synthesised analytical framework should utilise the strengths of each to develop a more broadly applicable measurement process.

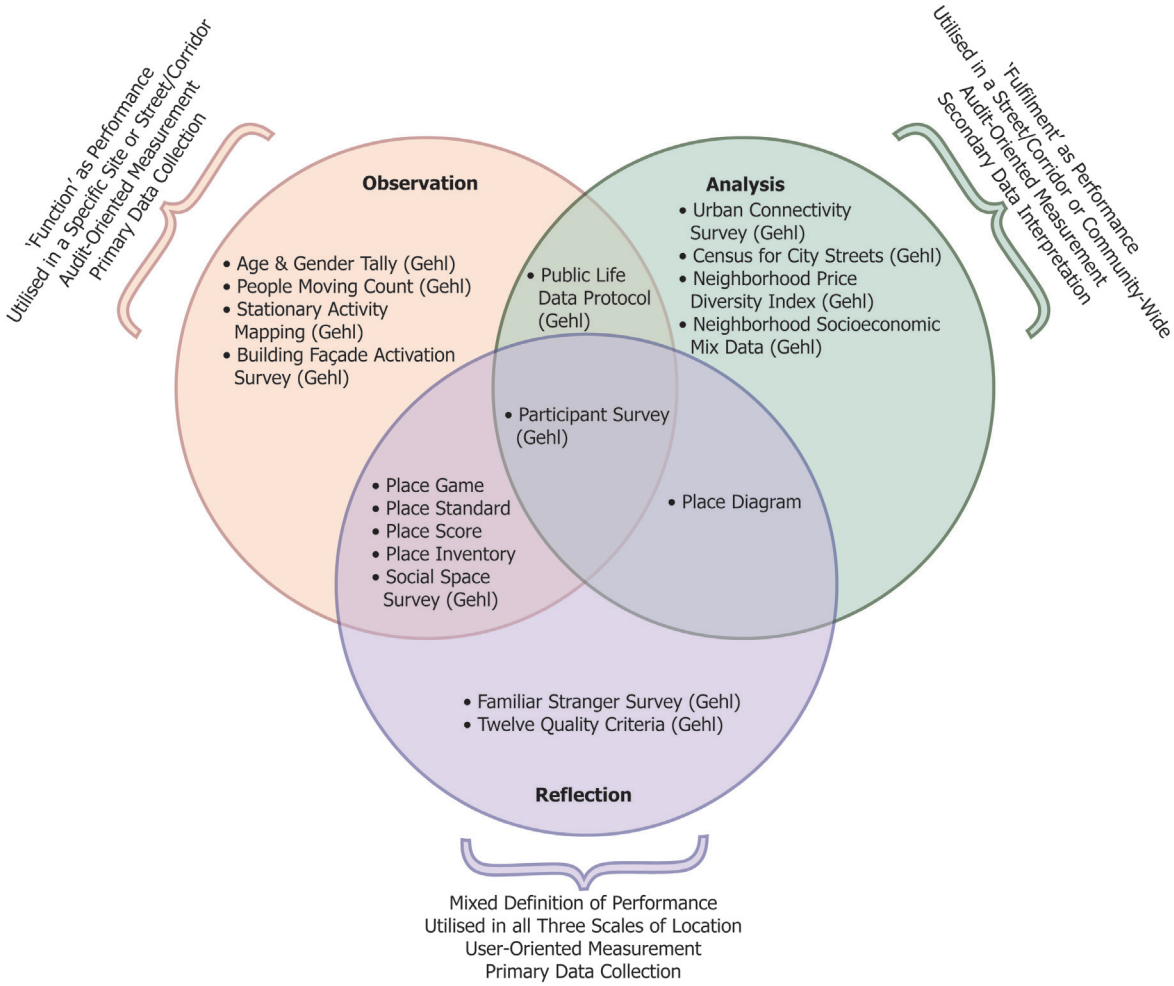


Figure 6.12 – Categorisation of the Reviewed Measurement Tools

Source: Author's Synthesis of Reviewed Toolsets

6.4 Synthesis of the Tools and Recommendation of Place Quality Indicators

This section discusses the process of synthesising the tools and suggests a comprehensive place analytical strategy that combines elements of each. The first part of this process was to document all of the indicators analysed across the reviewed toolsets, as well as trends in how each indicator was measured. The result is displayed in Table 6.4, which groups indicators into themes identified in the review.

Table 6.4a – Index of Variables and Inclusion Count Across Reviewed Toolsets – Part A: 'Form' Indicator Group

Theme:	Sub Theme:	Place Quality Performance Indicator:	Place Diagram:	Place Game:	Place Standard:	Place Score:	Public Life Tools:	Total Inclusion Count (of 5):	Audit-Oriented	User-Oriented
Form	Streetscape	Presence and Quality of Walking Routes (pedestrian permeability)	1	1	1	1	1	5	◑	◑
		Presence and Quality of Public Transit Infrastructure	1	1	1	1	1	5	◑	◑
		Presence and Quality of Public Seating Opportunities	0	1	0	1	1	3	◑	◑
		Visual Permeability of the Space	0	1	1	0	1	3	◑	◑
		Presence and Quality of Cycling Infrastructure (bicycle permeability)	0	0	1	1	1	3	◑	◑
		Landmarks and Magnets (historic buildings, public squares, sculpture, mural, water feature, etc.)	0	0	1	1	1	3	◑	◑
		Lighting and Shelter	0	0	1	1	1	3	◑	◑
		Presence and Quality of Natural Space/Landscaping/Vegetation	0	0	1	1	1	3	◑	◑
		Information and Signage	0	1	0	1	0	2	◔	◕
		Prioritisation of People Movement over Vehicle Movement	0	0	1	0	1	2	◑	◑
		Presence of Trash Bins	0	0	1	0	1	2	◑	◑
		Separation/Protection from Vehicles	0	0	1	1	0	2	◔	◕
		No obstacles to accessibility	0	0	1	0	1	2	◑	◑
		Unusual or Unique Public Space Design	0	0	0	1	0	1	◔	◕
		Evidence of Recent Public Investment	0	0	0	1	0	1	◔	◕
		High Density Grid Street Pattern	0	0	0	0	1	1	◕	◔
		Paths that Lead to Landmarks/Magnets	0	0	0	0	1	1	◕	◔
	Buildings	Diverse Mix of Land-Uses/Business Types/Services	1	1	1	1	1	5	◑	◑
		Vibrant, Active Building Façades	0	0	0	1	1	2	◑	◑
		Diversity of Housing Types (multi-family attached, single-family detached, etc.)	0	0	1	0	0	1	◔	◕
		Evidence of Recent Private Investment	0	0	0	1	0	1	◔	◕

Source: Author's Synthesis of Reviewed Toolsets

Table 6.4b – Index of Variables and Inclusion Count Across Reviewed Toolsets – Part B: 'Function' Indicator Group

Theme:	Sub Theme:	Place Quality Performance Indicator:	Place Diagram:	Place Game:	Place Standard:	Place Score:	Public Life Tools:	Total Inclusion Count (of 5):	Audit-Oriented	User-Oriented
Function	Public	Overall Busyness/Activity Density	1	1	0	1	1	4	◑	◑
		Number of People in Groups & Group Space/Meeting Points	0	1	1	1	1	4	◑	◑
		Volunteerism	1	1	1	0	0	3	◕	◔
		Count of Design Sensitive Users (women, children, seniors)	1	1	0	0	1	3	◕	◔
		Presence & Quality of Recreation Opportunities	0	0	1	1	1	3	◑	◑
		Space for Specific Activities (tables to eat, equipment to exercise/play, etc.)	0	0	1	1	1	3	◑	◑
		Pedestrian Movement Counts	1	0	0	0	1	2	◕	◔
		Public Transit Usage Rates	1	0	0	0	1	2	◕	◔
		Evening Usage	1	0	0	1	0	2	◑	◑
		Presence of Community Events/Activities (market, festival, community garden, etc)	0	1	0	1	0	2	◔	◕
		Amenities and Facilities (toilets, water fountains, parent's rooms, etc.)	0	0	1	1	0	2	◔	◕
		Count of Car Park Occupancy	1	0	0	0	0	1	●	○
		Travel Mode Splits	1	0	0	0	0	1	●	○
		Traffic Data	1	0	0	0	0	1	●	○
		Inventory of Activities (how are people using the space?)	0	0	0	0	1	1	◕	◔
		Inventory of Carried Objects (why are people coming to the space?)	0	0	0	0	1	1	◕	◔
		Inventory of Standing/Resting Postures (do people seem comfortable here?)	0	0	0	0	1	1	◕	◔
		Inventory and Density of Instagram Posts	0	0	0	0	1	1	◕	◔
	Private	Local Business Ownership	1	0	1	1	0	3	◑	◑
		Cluster of Different Activities (dining, shopping, sport, recreation, people watching, etc.)	0	1	0	1	1	3	◑	◑
		Diversity in Housing Tenancy Type & Price (rented versus owned, and affordability of each)	1	0	1	0	0	2	◕	◔
		Diversity of Business Price Points	0	0	0	1	1	2	◑	◑
		Presence of Private Seating (café, restaurant, etc.)	0	0	0	1	1	2	◑	◑
		Unusual or Unique Shops	0	0	0	1	0	1	◔	◕

Source: Author's Synthesis of Reviewed Toolsets

Table 6.4c – Index of Variables and Inclusion Count Across Reviewed Toolsets – Part C: 'Feeling' Indicator Group

Theme:	Sub Theme:	Place Quality Performance Indicator:	Place Diagram:	Place Game:	Place Standard:	Place Score:	Public Life Tools:	Total Inclusion Count (of 5):	Audit-Oriented	User-Oriented
Feeling	Image	Well Kept Buildings, Lots, and Public Spaces	1	0	1	1	1	4	◑	◑
		Overall Attractiveness	0	1	1	1	1	4	◑	◑
		Cleanliness/Quality of Maintenance	0	1	1	1	1	4	◑	◑
		Perception of Safety	0	1	1	1	0	3	◔	◕
		Crime Statistics	1	0	1	0	0	2	◕	◔
		Absence of Negative Sensory Attributes (unpleasant noise levels, smells, etc.)	0	0	1	1	0	2	◔	◕
		Sanitation Rating	1	0	0	0	0	1	●	○
		Environmental Data	1	0	0	0	0	1	●	○
		Community-Held Perception of Place	0	0	1	0	0	1	◔	◕
		Distinct/Unique in Comparison to Similar Locations	0	0	0	1	0	1	◔	◕
	Identity	Social Inclusion and Safety for All Demographics	1	1	1	1	1	5	◑	◑
		Individually-Held Perception of Place	0	0	0	1	1	2	◑	◑
		Sense of Community, Recognition of Strangers (familiarity between place users)	0	0	1	0	1	2	◔	◕
		Historic Identity	0	0	1	1	0	2	◔	◕
		Cultural Identity	0	0	1	1	0	2	◔	◕
		Sense of Pride and Ownership	0	1	0	0	0	1	◑	◑
		Public Influence over Decision Making	0	0	1	0	0	1	◔	◕
		Personal Attachment to Place	0	0	0	1	0	1	◔	◕
		Cluster of Similar Businesses (cultural, food, fashion, etc.)	0	0	0	1	0	1	◔	◕
		Unusual Mix or Diversity of People	0	0	0	1	0	1	◔	◕

Source: Author's Synthesis of Reviewed Toolsets

6.4.1 Usage Count: Searching for Common Agreement Amongst the Reviewed Toolsets

Table 6.4 is populated with each of the indicators measured across the reviewed toolsets, resulting in a total of sixty-five place quality performance indicators. Interestingly, only nine individual indicators are analysed by a total of four or more of the reviewed toolsets. At the other end of the spectrum, there are twenty-three individual indicators analysed by only one of the toolsets. This documents that methods of place assessment are still being developed and there are varying viewpoints of what should be prioritised for analysis. It is suggested that an incorporation of an indicator in more than one of the reviewed toolsets represents a broader sense of agreement amongst place-focused organisations that the indicator plays a significant factor in place quality. Therefore, these indicators should be prioritised for a synthesised assessment framework. The more toolsets that incorporated the indicator, the darker the shade of its corresponding row in Table 6.4.

6.4.2 'Form', 'Function', and 'Feeling': Synthesised Place Themes

Table 6.4 also suggests a thematic categorisation of the indicators. The 'Form' group includes variables that address physical design of the streetscape and immediately adjacent buildings. 'Function' accounts for the public and private activities happening in and around the streetscape. And the 'Feeling' group includes subjective aspects that impact personal perception of the location's image and identity. In many ways, these three thematic indicator groups align with the three 'place perspectives' identified in Chapter 3.

6.4.3 Variation in Measurement Tactics

Finally, the 'User-Based' and 'Audit-Based' columns within Table 6.4 summarise the applied measurement strategy to assess a location's performance for each indicator. This was calculated using the average of how each assessment tool that analysed the indicator was ranked in Table 6.2. It allows for identification of which indicators can be analysed in an audit conducted by the place manager, those which should be analysed by place users via a scale-based survey, and those variables which require a combination of the two methods.

6.5 Chapter Summary and Selection of Performance Indicators

The review of practice-based place measurement toolsets outlined in this chapter has documented sixty-five place quality indicators incorporated across five toolsets. It has also shown that all of the reviewed tools are at least partially applicable to the street/corridor contextual definition of 'place'. In order to be comprehensive in the measurement process, the synthesised measurement approach applied in this thesis is based on the indicators displayed in Table 6.4. Additionally, to address common agreement on impact of the indicators, only those that were incorporated in at least two of the reviewed toolsets, will be included in the synthesised set of performance indicators. Since Research Question 2, presented in Chapter 4, aimed to measure place quality by enquiring directly to users, indicators that were ranked as entirely 'Audit-Oriented' in Table 6.4 will not be utilised. These criteria exclude 29 of the indicators shown in Table 6.4 and result in 36 total indicators to be included in the measurement approach within this thesis.

The synthesised set of place quality performance indicators resulting from the review presented in this Chapter are shown in Table 6.5. The next chapter, Chapter 7, documents the process of developing a questionnaire and methodological approach to measure these indicators in the context of Melbourne tram streetscapes.

Table 6.5 – Synthesised Set of Place Quality Performance Indicators

Theme:	Sub Theme:	Place Quality Performance Indicator:	Total Inclusion Count (of 5):	Audit-Oriented	User-Oriented
Form	Streetscape	Presence and Quality of Walking Routes (pedestrian permeability)	5	◑	◑
		Presence and Quality of Public Transit Infrastructure	5	◑	◑
		Presence and Quality of Public Seating Opportunities	3	◑	◑
		Visual Permeability of the Space	3	◑	◑
		Presence and Quality of Cycling Infrastructure (bicycle permeability)	3	◑	◑
		Landmarks and Magnets (historic buildings, public squares, sculpture, mural, water feature, etc.)	3	◑	◑
		Lighting and Shelter	3	◑	◑
		Presence and Quality of Natural Space/Landscaping/Vegetation	3	◑	◑
		Information and Signage	2	◔	◕
		Prioritisation of People Movement over Vehicle Movement	2	◑	◑
		Presence of Trash Bins	2	◑	◑
		Separation/Protection from Vehicles	2	◔	◕
		No obstacles to accessibility	2	◑	◑
	Buildings	Diverse Mix of Land-Uses/Business Types/Services	5	◑	◑
		Vibrant, Active Building Façades	2	◑	◑
Function	Public	Overall Busyness/Activity Density	4	◑	◑
		Number of People in Groups & Group Space/Meeting Points	4	◑	◑
		Presence & Quality of Recreation Opportunities	3	◑	◑
		Space for Specific Activities (tables to eat, equipment to exercise/play, etc.)	3	◑	◑
		Evening Usage	2	◑	◑
		Presence of Community Events/Activities (market, festival, entertainment, community garden, etc)	2	◔	◕
		Amenities and Facilities (toilets, water fountains, parent's rooms, etc.)	2	◔	◕
	Private	Local Business Ownership	3	◑	◑
		Cluster of Different Activities (dining, shopping, sport, recreation, sitting, people watching, etc.)	3	◑	◑
		Diversity of Business Price Points	2	◑	◑
		Presence of Private Seating (café, restaurant, etc.)	2	◑	◑
Feeling	Image	Well Kept Buildings, Lots, and Public Spaces	4	◑	◑
		Overall Attractiveness	4	◑	◑
		Cleanliness/Quality of Maintenance	4	◑	◑
		Perception of Safety	3	◔	◕
		Absence of Negative Sensory Attributes (unpleasant noise levels, smells, etc.)	2	◔	◕
	Identity	Social Inclusion and Safety for All Demographics	5	◑	◑
		Individually-Held Perception of Place	2	◑	◑
		Sense of Community, Recognition of Strangers (familiarity between place users)	2	◔	◕
		Historic Identity	2	◔	◕
		Cultural Identity	2	◔	◕

Source: Author's Synthesis of Reviewed Toolsets

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7 STREETSCAPE AMENITY SURVEY

Chapter 7 describes the development and administration process of the Streetscape Amenity Survey. It builds upon the synthesised set of place quality performance indicators identified in Chapter 6, by incorporating them into a questionnaire to measure user perception of place quality in Melbourne tram streetscapes. The chapter begins by discussing the methodology applied to survey site selection as well as the chosen format for survey administration. It then details development of the survey instrument itself, including the use of 'Video Elicitation' methodology and 'Importance Performance Analysis' question structure to gather insights regarding variation in user perception across Movement and Place streetscape categories. Lastly, an overview of the administration process is provided. The Streetscape Amenity Survey has been designed to target a knowledge gap identified in Chapter 3 by developing a comprehensive, synthesised measurement approach to analyse perception of place quality in tram streetscape environments.

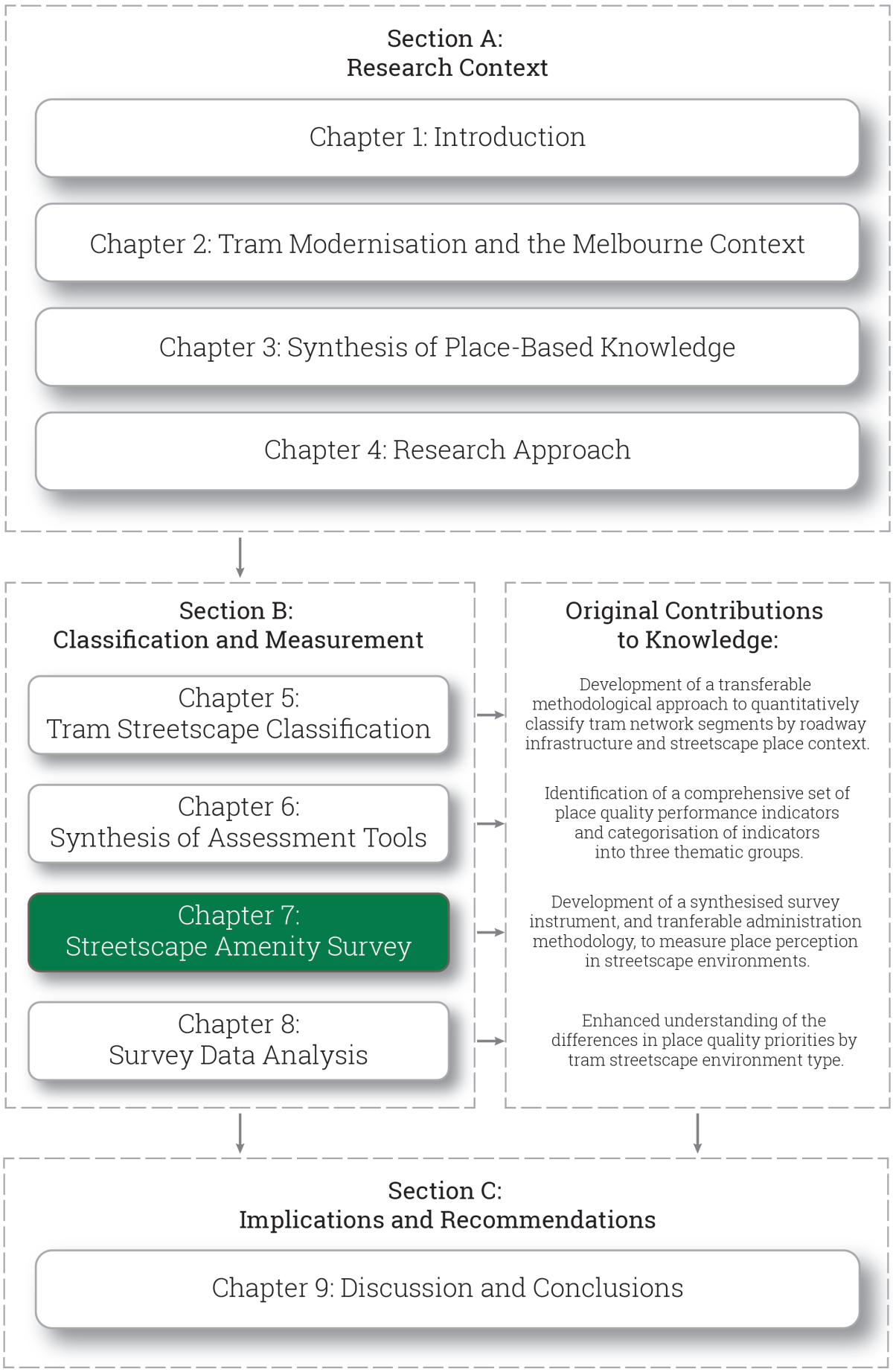

Figure 7.1 – Position of Chapter 7 in the Thesis Structure

7.1 Site Selection

In order to ensure the measurement process included sites that were representative of the entire tram network, the four 'Movement and Place Streetscape Categories' discussed in Chapter 5 were incorporated into a sampling framework. Each of the four streetscape categories was assigned six total sites for survey administration, with sites distributed amongst matrix cells based on network representation as documented in Chapter 5. The distribution of the twenty-four resulting survey sites across the Movement and Place Matrix is displayed in Figure 7.2.

Figure 7.2 – Distribution of the 24 Survey Sites by Movement and Place Matrix Cell

The numbers within the matrix blocks in Figure 7.2 show how the six sites per streetscape type were divided. As a whole, these 11 matrix cells represent 93% of the tram network, based on the classification system developed in Chapter 5. After this was defined, a quasi-random selection process was undertaken to choose the actual sites while setting some boundaries relevant to the study. In order to be selected as a survey site, tram segments needed to meet the following criteria. A brief justification of the criteria reasoning is also included.

Site Selection Criteria:

1. Segment is located within 1 of 9 Inner Melbourne Local Government Areas (LGAs).
    - *91% of the tram network is located in these 9 LGAs.*
2. Segment is located on a corridor within 30-degrees of North/South orientation.
    - *Helps to ensure a higher level of consistency in environmental conditions such as presence of shadows and level of visibility.*
3. Segment is located within a street (not a segment with segregated right-of-way).
    - *The survey is designed to analyse amenity on the tram segment's surrounding streetscape. This is not possible if the tram is not located within a street.*
4. Have a consistent Movement and Place categorisation for at least 300 metres.
    - *Enables findings to be associated with Movement and Place streetscape categories.*
5. Have a tram stop located within the segment.
    - *Enables analysis of impacts tram stop design features may have on place quality.*
6. Allow for maximum available diversity of tram stop design types within each streetscape category.
    - *Enables comparative analysis regarding how various tram stop design types may impact place quality.*

A code was developed to randomly select twenty-four segments that met each of the selection criteria outlined above. The code was executed through QGIS, an open-source spatial data analysis program. The distribution of the resulting survey sites across the network are displayed in Figure 7.3, which also documents variation in the level of tram network modernisation at each site.

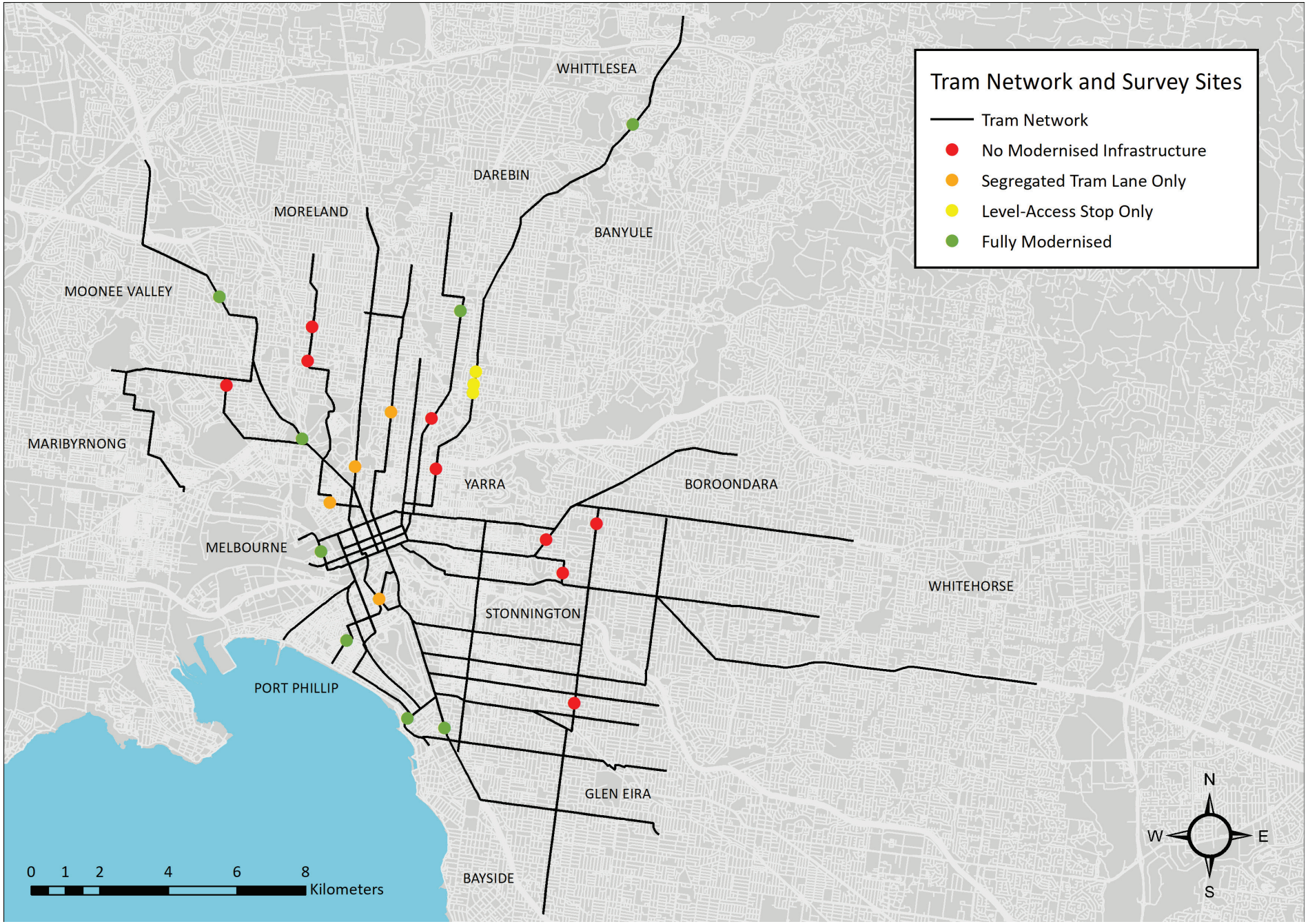

Figure 7.3 – Survey Site Locations and the Level of Modernisation at Each

As displayed in Figure 7.3, the 24 survey site locations are spread across the network. There is a slight bias against the eastern part of the network, due to the requirement that selected sites be located on a north/south oriented corridor to control variation in natural light conditions. There is also diversity in level of modernisation between the sites, with 9 sites having no modernised infrastructure, 7 sites having one of two requirements to be deemed fully modernised, and 8 sites classified as fully modernised. As documented in the Site Selection Criteria, this was purposefully done to enable analysis of potential impacts of tram modernisation. However, this criteria resulted in a cluster of three sites (yellow dots in Figure 4) occurred because this is the only 'Level-Access Stop Only' portion of the network that met all the selection criteria. In general, however, the survey sites are well distributed across the broader network with at least one site being located in each of the 9 Inner-Melbourne LGAs where 91% of the tram network is located.

7.2 Selection of 'Video Elicitation' Method to Facilitate Cross-Category Comparisons

The 'Streetscape Amenity Survey' aims to investigate user perception of place quality in tram streetscapes, as well as how perceptions change across the streetscape categories developed in Chapter 5. Therefore, it is important that each survey respondent be able to contrast sites from different streetscape categories. However in practice, the logistics of managing respondents' travel between survey sites was considered infeasible within time and budget constraints. An approach similar to the Ewing et al. (2005) study identified in Chapter 3 was adopted, using 'Video Elicitation' methodology to facilitate streetscape comparisons in an online survey. The use of videos enabled control of survey respondent experience and negated the need for respondents to travel between sites. However, it also created new concerns to be managed; most notably the need to make videos comparable while still maintaining a level of consistency across sites to avoid any potential bias in survey results. A structured recording methodology was developed to achieve this across all twenty-four survey sites.

All videos were filmed on weekdays, between the hours of 9:30 AM – 11:30 AM and 2:00 PM – 4:00 PM. This timing avoided peak hours and helped to ensure the video captured an unobstructed view of both the footpath and roadway environments.

Additionally, the videos were only filmed on days with partly cloudy weather conditions. This ensured the video recordings had sufficient lighting without being affected by extreme sunlight. It also ensured responses would not be biased towards a particular type of weather due to consistency between all videos.

Specific steps of the filming process are outlined below to facilitate repeatability of the process in future studies. A 'GoPro Hero 5 Black' was chosen as the recording device due to its compactness, as well as its incorporation of a wide angle lens so constant panning was not necessary for the viewer to see a broad view of the streetscape. Additionally, a 'Karma Grip' gimbal from the GoPro brand was utilised for image stabilisation. All twenty-four videos recorded for this study followed these exact steps in the filming process:

Steps in the Filming Process:

1. Go to the southern intersection closest to the identified tram stop, on the western side of the corridor

2. Stand as close as possible to the kerb, while ensuring a straight path free from obstructions

3. Set the camera to 'wide-angle view'

4. Hold the gimbal so that the camera is positioned about 160 cm from the ground

5. Begin the recording with a 180-degree pan from south to north

6. End the pan about a 30-degree angle from straight ahead, capturing both the footpath and street environments in the final view

7. Keep the camera at this angle for the remainder of the video

8. Begin walking up the footpath in a straight line towards the north, at a steady pace of about 2 kph

9. Capture a tram passing at some point during the recording, preferably while stopping at the identified stop to display the passenger alighting experience

10. Non-stop, continuous walking until reaching mid-block

11. Stop the recording

Filming was conducted until a video consistent with all of the outlined criteria was obtained for each of the twenty-four survey sites. The process took about three months to complete in total, and the videos were then uploaded to YouTube so that they could be embedded into the online survey. Videos ranged in time from 51 seconds to 1 minute and 22 seconds, as the amount of time required to reach mid-block varied between each site.

7.3 Questionnaire Development and Incorporation of 'Importance Performance Analysis'

As outlined in the previous chapter, 36 performance indicators were identified for inclusion in the synthesised measurement approach. To aid the context of this specific study, an additional 5 indicators relating specifically to public transport infrastructure were added for a total of 41 indicators assessed within the survey. The 5 additional questions for these indicators were embedded into the 'Form' section of the survey, as they were focused on design-based criteria.

Additionally, since a primary goal of the survey is to compare how user perception of place quality changes between streetscape category, the instrument was designed to gather as much information on user priorities as possible. For this reason, 'Importance Performance Analysis' (IPA) was chosen as a method for users to rank the place quality performance indicators, as this would gather information on user perception of both the importance and performance of each indicator, and allow for the determination of improvement priorities across the four streetscape categories. As documented in Chapter 3, IPA has been incorporated in academic studies to analyse perceived quality of transport interchanges (Hernandez et al., 2016) and town centres (Riviezzo et al., 2009) so its ability to determine improvement priorities is broadly recognised.

The general structure of the survey was that each respondent would answer questions about two of the twenty-four sites. The videos were presented randomly, but did contain the condition that they were of opposing Movement and Place streetscape categories. This is displayed in Figure 7.2, showing that the randomisation process maintained 'Place' rating as a constant, but showed the viewers a second video of an opposing 'Movement' rating. The survey structured into three sections, based on the three synthesised place themes of 'Form', 'Function', and 'Feeing' identified in Chapter 6. The online 'Qualtrics' platform was chosen to host the survey, as a comprehensive license to the platform is provided by Monash University. Additionally, the Qualtrics platform offered a survey design that facilitated the IPA method. After asking respondents to accept the Monash Ethics Statement, as well as gathering demographic information, the survey began with a contextual script to help respondents understand the structure of the survey and how to answer the questions. The script is displayed in Figure 7.4.

MONASH University

Please read the following information. It will help you understand how to provide responses to the survey:

In this survey, the word **street refers to**: both the roadway and footpath, any amenities within them, and the design and utilisation of adjacent buildings and open spaces.

The following pages will present videos of **two different types of streets**. You'll be asked to view each video three times, paying specific attention to different aspects each time.

After each viewing, you'll read a list of **characteristics that may or may not be present in the video**. You'll then be asked to rank:

- The importance of this characteristic to you, generally, regarding **the type of street** shown in the video.
- The performance of this characteristic in **the specific street** shown in the video.

It is important to remember that **not all streets serve the same purposes and your responses to the questions may differ** between the two streets you are asked to analyse.

Figure 7.4 – Introductory Script Presented to Survey Respondents

The contextual script presented in Figure 7.4 was designed to help respondents understand how the IPA method would be presented in the survey, without actually explaining the methodology of IPA to them. Following this script, respondents were presented with the first video and either the Form, Function, or Feeling section as randomised by Qualtrics. At the beginning of each section, a script asked the respondent to watch the embedded video of the survey location and guided them towards what they should pay attention to based on the specific theme of indicators they'd be answering questions to first. The script for the 'Form' indicator group is displayed in Figure 7.5.

MONASH University

The video below this text shows the experience of walking through a location.

Please watch the video at full-screen, with your sound on, **paying specific attention to the design of the location - particularly characteristics of the building frontages, footpath, and roadway**.

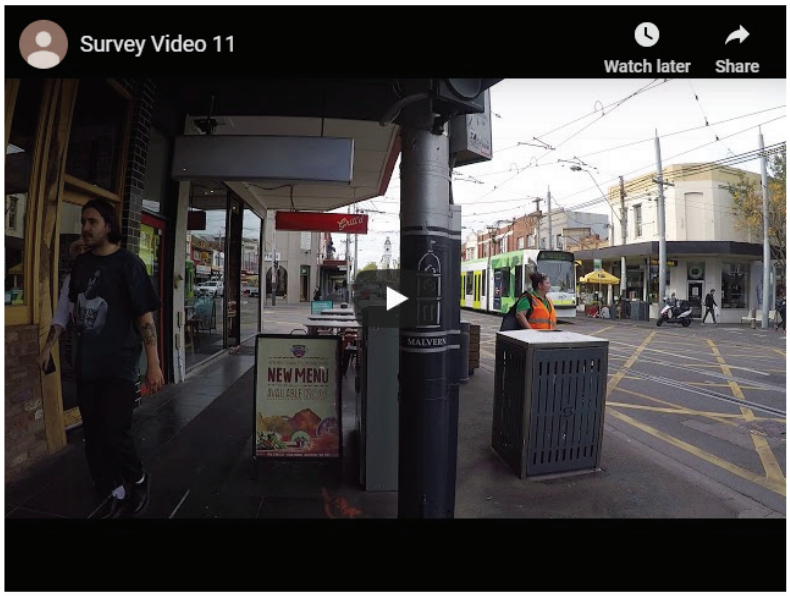

Figure 7.5 – Introductory Script for the 'Form' Indicator Group

Following the video, respondents were presented with a list of questions that first asked them to rank the importance of each element in the type of street they had just seen. The context behind 'type of street' was left up to the respondent to determine subjectively. After responding to the importance questions, respondents were then asked about the same variables, but in a way that asked them to rank their performance in the specific street they saw in the video. Examples of the format for 'importance' and 'performance' questions for the Form place theme are shown in Figure 7.6 and Figure 7.7, respectively.

The following statements discuss design characteristics that may or may not be displayed in the street shown in the above video. Use the prompts below to state:

- The importance of the design element for **the type of street** shown in the video.

	Importance to you generally, **in this type of street**:				
	Not Important at All	Of Little Importance	Of Average Importance	Very Important	Absolutely Essential
This type of street ...should be comfortable to walk through.	○	○	○	○	○

Figure 7.6 – Example of Survey Question on Indicator 'Importance'

Please re-read the statements, this time using the prompts below to state:

- Your level of agreement with the statement, for the performance of **the specific street** shown in the video.

	Your agreement with **this specific street's performance**:				
	Strongly Disagree	Slightly Disagree	Neither Agree or Disagree	Slightly Agree	Strongly Agree
This specific street ...is comfortable to walk through.	○	○	○	○	○

Figure 7.7 – Example of Survey Question on Indicator 'Performance'

As seen in Figures 7.6 and 7.7, importance and performance questions were both set up to be answered on a five-point Likert scale, allowing for enhanced comparison between the two responses. For each of the three survey sections (Form, Function, and Feeling) questions on variable importance were displayed first and were followed by questions on variable performance. Both included prompting scripts (the text displayed next to a bullet point in Figures 7.6 and 7.7), helping respondents understand how their thinking process should be different for each. Additionally, the Qualtrics platform allowed for questions within each section to be randomised so that the list of questions between the importance and performance sub-sections would not be ordered the same way. This helped ensure respondents would not answer by simply choosing the same scale rating for each variable across the Importance and Performance questions. Finally, once the respondent answered importance and performance questions for all three survey sections, they were asked to rank their overall perception of the location on a five-point scale from 'Strongly Negative' to 'Strongly Positive'. Respondents then repeated this process for a second video. In total, each respondent answered 168 questions between two locations, 84 documenting variable importance and 84 documenting variable performance. A summary of all survey questions is provided in Table 7.1, using the 'performance' text as an example.

7.4 Administration Process

In order to help obtain a representative sample, the market research firm IPSOS Australia (IPSOS) was contracted so that the survey could be distributed to their respondent pool. IPSOS uses a points system as an award to their respondents for fully completing the survey. Considering the length of the Streetscape Amenity Survey, this was identified as a benefit because voluntary (unpaid) respondents likely would not take the time to complete the survey. Contracting IPSOS also enabled certain conditions to be met in the respondent sample, such as only allowing responses from residents of the 9 Inner-Melbourne LGAs where the survey video sites are located, and setting demographic quotas to ensure the sample was largely representative of the survey area's broader population. The survey was administered online until a sample size of at least 600 that met the demographic quotas was achieved. This sample size allowed for at least 25 responses to be collected at each of the 24 survey sites.

As outlined in an agreement with the Monash University Ethics Committee, IPSOS was not involved in any part of the survey development or data collection/storage process. The company's only involvement was in the distribution of a URL link to their respondent pool that provided access to the survey. This lack of involvement in the survey development and analysis process was specifically designed to negate any potential conflict of interest. The survey administration process took place from June through October 2019.

7.5 Chapter Summary

In summary, this chapter has described the development and administration process of the Streetscape Amenity Survey. 'Video Elicitation' methodology and 'Importance Performance Analysis' were selected to gather insights regarding variation in user perception across Movement and Place streetscape categories. The 36 synthesised place quality performance indicators identified in Chapter 6, along with 5 indicators added to measure tram infrastructure elements and 1 'Overall Rating of Location', were incorporated into the survey and are summarised in Table 7.1. A complete version of the questionnaire, in exact form as seen by respondents, is provided in Appendix A. The next chapter, Chapter 8, presents an analysis of the survey results as structured by the Research Questions outlined in Chapter 4.

Table 7.1 – Summary of All Survey Questions

	Place Quality Performance Indicator:	Actual Question Text Used in the Survey – 'Performance' Section: (Five-point scale response option – Strongly Disagree, Slightly Disagree, Neither Agree or Disagree, Slightly Agree, Strongly Agree)
'Form' Indicator Group	1. Pedestrian Comfort	This specific street …is comfortable to walk through.
	2. Public Seating	...provides public benches or other seating spaces not associated with a business.
	3. Minimal Visual Clutter	...is free of visual clutter.
	4. Cyclist Comfort	...is comfortable to ride a bike through.
	5. PT Movement Priority	...is designed for public transport vehicles to move freely between stops with minimal delay.
	6. Comfortable PT Stop	...provides a comfortable space to wait for public transport services.
	7. Accessible PT Boarding	...makes boarding public transport vehicles easily accessible to all, regardless of any personal mobility impairments.
	8. Landmarks/Reference Points	...contains landmarks or other easily recognisable reference points.
	9. Shelter from Harsh Weather	...provides shelter from harsh weather conditions.
	10. Grass, Trees, Landscaping	...has grass, trees, or other landscaping/plantings.
	11. Wayfinding Signage	...has signs that help people find their destination.
	12. Universal Accessibility	...is easily accessible to all, regardless of any personal mobility impairments.
	13. Land Use Diversity	...includes a diverse mixture of building types (residential, commercial, public/open space, etc.).
	14. Positive Impact of Design	...incorporates design strategies that make it a more pleasant space overall.
	15. Private Vehicle Movement Priority	...is designed for private vehicles to move freely with minimal delay.
	16. Comfort of Crossing	...provides opportunities to comfortably cross the roadway on foot.
'Function' Indicator Group	17. Space for Small Groups	This specific street ...has space where small groups could meet or spend time outside/in public areas.
	18. Space for Play/Rec	...has space for outdoor play and recreation.
	19. Multi-Purpose Destination	...has destinations that fulfil multiple purposes (i.e. entertainment-based AND service-based).
	20. Space for Community Events	...has space where community events/activities (i.e. markets, club meetings, community gardening, etc.) could occur.
	21. Diversity in Commercial Space Size	...has various sizes of commercial space (i.e. small shops/cafés, medium size markets/restaurants, big box chain stores).
	22. Diversity in Residential Space Size	...has various sizes of residential space (i.e. apartments, attached town homes, detached homes).
	23. Diversity in Real Estate Affordability	...has space (residential and/or commercial) that would accommodate persons of various financial levels.
	24. Outdoor Café/Dining Space	...has outdoor café/dining space.
	25. Attractive Business Displays	...has destinations with attractive signage or other displays along the building frontages.
	26. Positive Impact of Destinations	...has destinations that make it an attractive place to spend time/money.
	27. Locally-Owned/Unique Businesses	...has businesses that are locally-owned and/or unique to the area.
	28. Presence of Community Services	...has community services (i.e. a post office, library, community centre, etc.).
'Feeling' Indicator Group	29. Appears Clean/Well-Kept	This specific street ...is clean and well kept
	30. Safe to Travel Through	...is a safe location to travel through.
	31. Welcoming of All Ages, Cultures	...is welcoming to people of all ages and cultural groups.
	32. Welcoming of All Income Levels	...is welcoming to people of all income levels.
	33. Represents Australian Heritage/Culture	...represents Australian heritage/culture.
	34. Hub for a Specific Cultural Group	...acts as a hub for a specific cultural group.
	35. Overall Pleasantness	...is a pleasant location overall.
	36. Free of Unpleasant Sounds	...is generally free from unpleasant sounds.
	37. Location for Social Activity	...is a location where social activity occurs.
	38. Interesting/Unique Location	...is an interesting and/or unique location.
	39. Safe to Spend Time	...is a safe location to spend time.
	40. Location for Entertainment	...is a location to visit for entertainment.
	41. Location for Personal Business / Shopping	...is a location to visit for personal business or shopping.

Overall	42. Overall Rating of Location	Please indicate your overall perception of **the specific street** shown in the video. (Also a five-point scale response option – Strongly Negative, Slightly Negative, Neutral, Slightly Positive, Strongly Positive)

8 SURVEY DATA ANALYSIS

Following discussion of the development and administration of the 'Streetscape Amenity Survey' in the preceding chapter, Chapter 8 presents the survey results. It begins with a brief summary of the survey structure, as well as a review of the sample and how representative it is of the broader population. Analysis and results of specific queries into the data are then presented as structured by the Research Questions outlined in Chapter 4. The chapter concludes with a summary of key findings centred on user priorities for place quality in tram streetscapes and how those priorities vary between environmental contexts.

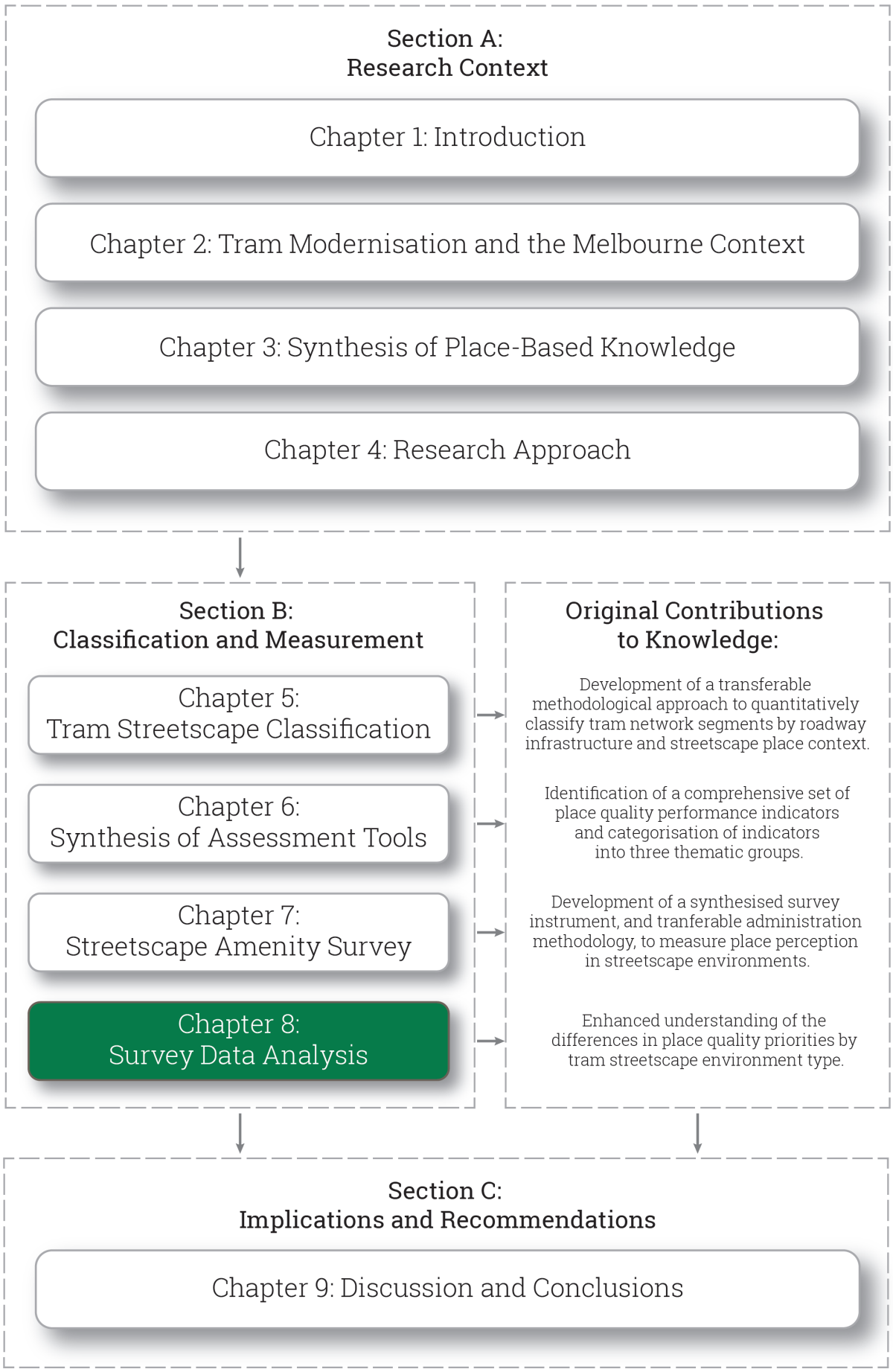

Figure 8.1 – Position of Chapter 8 in the Thesis Structure

8.1 Response Structure and Analysis Approach

As discussed in Chapter 7, the 'Streetscape Amenity Survey' was developed to measure place perception in streetscape environments, and to determine user priorities for improvement. This chapter is centred on analysis of the survey results. To assist in understanding the analyses shown in this chapter, this section summarises information presented in previous chapters regarding the structure of the survey. Figure 8.2 visualises the questionnaire response process as detailed in Chapter 7.

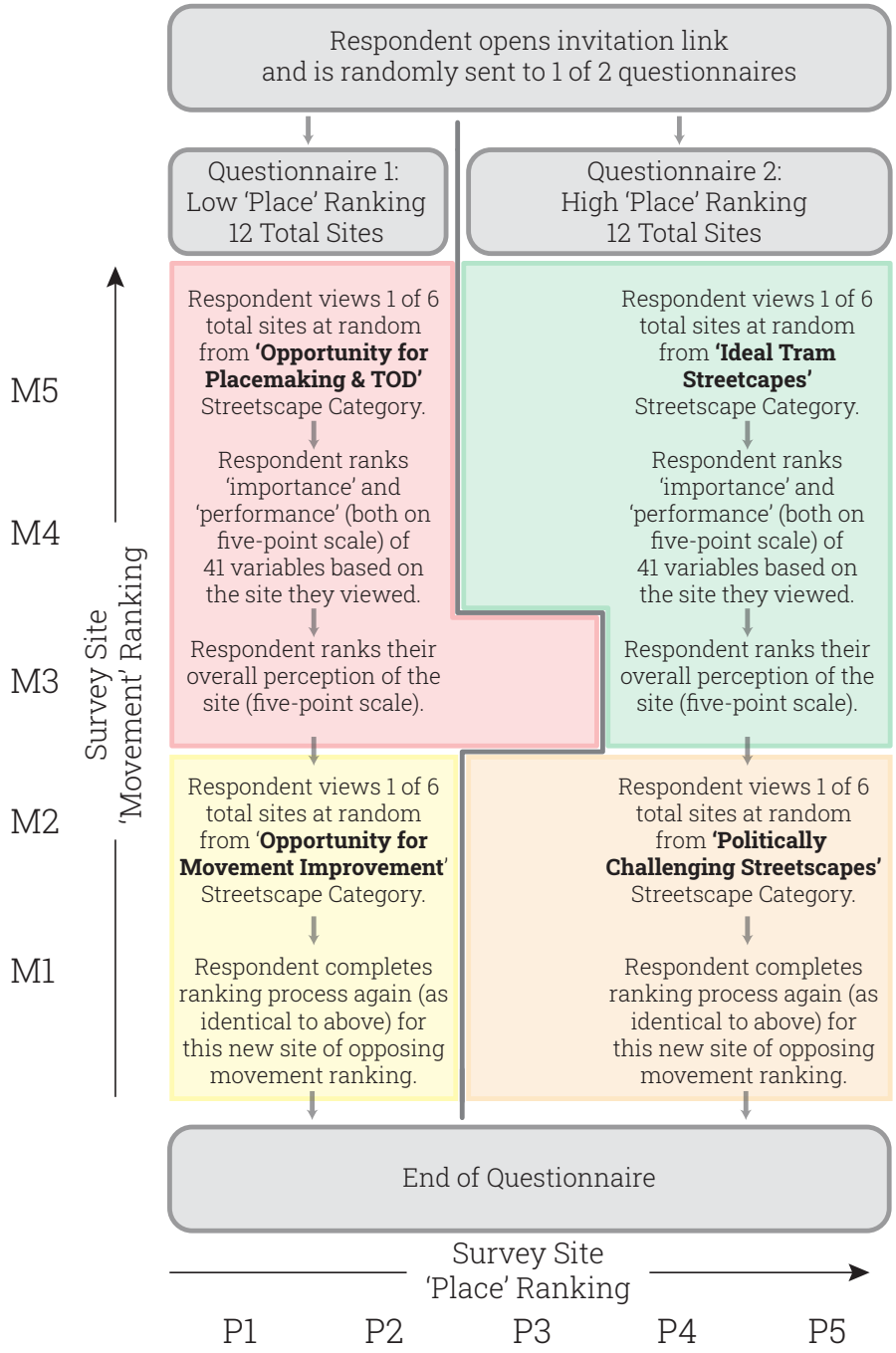

Figure 8.2 – 'Streetscape Amenity Survey' Response Process Overlaid onto the 'Movement and Place Matrix' to Visualise Streetscape Category Pairings

As displayed in Figure 8.2, the questionnaire covered twenty-four total sites across four streetscape categories. Using a process built into the Qualtrics web-based survey tool, each respondent was randomly distributed to one of two questionnaires. Both questionnaires contained an identical set of questions, but separating them allowed for the methodical pairing of sites so that 'place' ranking was maintained as a constant and only 'movement' ranking changed between the two sites each respondent considered. This method was chosen to ensure each respondent considered two sites with comparable functional contexts, reflected in the 'place' ranking, but different tram infrastructure design contexts as defined by the 'movement' ranking.

Each of the four streetscape categories shown in Figure 8.2 will be referred to frequently in this section. From this point on, the name of each category is abbreviated as follows:

- OMI: 'Opportunity for Movement Improvement'
- OPT: 'Opportunity for Placemaking and TOD'
- PCS: 'Politically Challenging Streetscapes'
- ITS: 'Ideal Tram Streetscapes'

As also outlined in Figure 8.2, survey respondents ranked the 'importance' (IMP) and 'performance' (PER) of 41 place quality indicators, on a five-point Likert scale. In the analyses presented in this chapter, the overall impact of each of the 41 indicators are estimated by multiplying these two scores. This is abbreviated as IMPxPER ('importance' multiplied by 'performance') and has a possible range from 1 to 25, with higher scores representing higher overall impact.

Lastly, to simplify interpretation of the large number of investigated indicators, some analysis strategies presented in this chapter summarise average indicator scores by the three thematic groups of place quality indicators, 'Form', 'Function', and 'Feeling', as identified in Chapter 6. Table 7.1, located in Chapter 7, documents which thematic group each of the 41 indicators belongs to, as well as wording of the question used to analyse performance of each indicator within the survey.

The remainder of this chapter presents various analyses of the survey data. It starts with a summary of sample characteristics and then presents specific data queries as structured by Research Questions 2 and 3. Each research question is briefly summarised in this chapter, but more detailed explanations can be found in Chapter 4.

8.2 Sample Characteristics

In order to ensure representative findings, the survey aimed to achieve a sample with characteristics generally representative of the nine Inner-Melbourne local government areas (LGAs) where the survey sites are located and the respondents reside.

Table 8.1 shows a comparison of achieved sample demographics to population statistics for the 9 Inner-Melbourne LGAs as of the 2016 Census. The achieved sample is largely representative of the broader population, with all key statistics less than 5 percentage point difference from the 2016 Census data. This provides support that findings from the survey are broadly representative of the opinion of the population of the 9 Inner-Melbourne LGAs (Davern, 2008).

Table 8.1 – Achieved Sample and Census Demographics of Survey Area

		N	Percent	Inner Melb (Census 2016)	Difference
Gender	Female	315	52.4%	52%	0.4%
	Male	281	48.6%	48%	0.6%
	Other	4	0.7%	N/A	N/A
	Prefer Not to Say	1	0.2%	N/A	N/A
	Total	601	100.0%	–	–
Age	18 - 19	16	2.7%	3%	-0.3%
	20 - 29	148	24.6%	25%	-0.4%
	30 - 39	144	24.0%	22%	2.0%
	40 - 49	101	16.8%	16%	0.8%
	50 - 59	82	13.6%	13%	0.6%
	60 - 69	62	10.3%	10%	0.3%
	70 - 79	38	6.3%	6%	0.3%
	80 years or more	10	1.7%	5%	-3.3%
	Total	601	100%	–	–
Income	No Income	47	7.8%	12%	-4.2%
	$1 - $25,999 per year	139	23.1%	25%	-1.9%
	$26k - $51,999 per year	143	23.8%	21%	2.8%
	$52k - $77,999 per year	108	18.0%	16%	2.0%
	$78k - $103,999 per year	75	12.5%	11%	1.5%
	$104k or more per year	89	14.8%	15%	-0.2%
	Total	601	100%	–	–

8.3 Research Question 2a: Examining Change in User Views between Streetscape Categories

Research Question 2a asked "are the differences considered within the tram streetscape categories reflected in average user views of streetscape quality?". Essentially it aims to analyse construct validity of the methodology applied in Chapter 5 (Tram Streetscape Classification) by investigating if the defining characteristics of the four tram streetscape categories were reflected in respondent scores. According to O'Leary-Kelly and J. Vokurka (1998), construct validity "pertains to the degree to which the measure of a construct sufficiently measures the intended concept" and can be examined by comparing the conceptual definition of a variable with an operational procedure to measure it. Since respondents provided an overall rating of place quality for each survey site, analysis of how that rating changed between streetscape categories can facilitate the analysis of construct validity for the methodology applied in developing the streetscape categories. This information is displayed in Table 8.2, which shows the mean and median scores for 'Overall Rating' for each of the four streetscape categories. To facilitate enhanced understanding of the connection to the methodology developed in Chapter 5, the table also shows the 'place' and 'movement' rankings associated with each streetscape category.

Table 8.2 – Mean and Median 'Overall Ratings' of the Four Streetscape Categories

		Place Ranking →			
		P1, P2		P3, P4, P5	
Movement Ranking ↑	M3, M4, M5	Opportunity for Placemaking and TOD (OPT)		Ideal Tram Streetscapes (ITS)	
		Mean (Max 5)	3.06	Mean (Max 5)	3.58
		Median (Max 5)	3.00	Median (Max 5)	4.00
	M1, M2	Opportunity for Movement Improvement (OMI)		Politically Challenging Streetscapes (PCS)	
		Mean (Max 5)	2.92	Mean (Max 5)	3.46
		Median (Max 5)	3.00	Median (Max 5)	4.00

Table 8.2 provides a clear indication that criteria considered within the place rankings have a positive impact on mean overall rating of the location. When comparing the streetscapes with low place rankings to those with high place rankings, mean and median scores of 'Overall Rating' increased. There is an indication that criteria considered within the movement rankings also have a positive impact on overall ratings of the location, but to a lesser extent. Only the mean scores increased when comparing streetscapes with low movement rankings to those with high movement rankings; the median scores, however, remained unchanged. Overall, the summary of results shown in Table 8.2 confirm a link between the 'place' and 'movement' rankings and respondent rating of the sites; but the connection was much clearer in the case of place rankings, suggesting that place ranking has a stronger relationship to 'Overall Rating'.

Aside from 'Overall Rating', users also scored the IMP and PER of 41 place quality indicators at each survey site. Two of the indicator groups, 'Form' and 'Function', contained direct measurements of aspects considered in development of the tram streetscape categories. Each respondent completed identical survey questions for two sites from streetscape categories with different 'movement' (but similar 'place') rankings. Therefore, Research Question 2a can be further answered through testing of a null hypothesis suggesting that:

> *There is no statistically significant difference between ranks of the two sites (with different movement rankings) that respondents viewed.*

The null hypothesis was examined through a nonparametric analysis of variance method known as the Wilcoxon Signed-Rank test. In this case, the test was used to compare ranks of IMPxPER average scores for the three indicator groups, as well as overall rating of the location, between the two pairs of streetscape categories that survey respondents viewed. In each of the four instances (the three indicator groups, and overall rating of location) the streetscape categories with high movement rankings (OPT, ITS) were ranked higher by survey respondents than streetscape categories with low movement rankings (OMI, OPT). Whether the difference in ranking was significant, however, depended on the specific instance. For both the 'Form' and 'Function' indicator groups, the difference in ranking was significant at a 95% confidence level as determined by the Wilcoxon Signed-Rank test. OPT and ITS streetscapes were also ranked higher, on average, than OMI and PCS streetscapes for the 'Feeling' indicator group but the difference in rankings were not statistically significant in this instance.

OPT streetscapes were significantly higher ranked for 'Overall Rating' than OMI streetscapes, but at the slightly lower confidence level of 90%. The higher ranking of ITS over PCS streetscapes for 'Overall Rating' was not found to be statistically significant at either the 90 or 95% confidence level.

Six of the sixteen indicators within the 'Form' group are direct, or closely related, measurements of quantitative attributes considered in the movement rankings developed in Chapter 5. Therefore, the significantly higher ranking of the 'Form' indicator group in streetscape categories with higher movement rankings provides a basis for validating the manner in which the movement rankings were determined in Chapter 5.

Similarly, all twelve indicators in the 'Function' group were either direct or closely related measurements of attributes considered in the development of the place rankings in Chapter 5. Since place ranking was maintained as a constant between the pairs of streetscape categories analysed by respondents, the difference in rankings of 'Function' indicators ideally would not have been statistically significant to confirm that respondent scores accounted for the shared place ranking of the two sites. The data, however, confirms the opposite was true and therefore this particular analysis is unable to provide construct validity for the manner in which the place rankings were determined in Chapter 5. This result demonstrates the difficulty of quantitatively categorising 'place' in a way that reflects subjective perceptions across unique sites.

The inability to reject the null hypothesis in the case of the 'Feeling' indicator group for both pairs of streetscape categories, as well as 'Overall Rating' for one pair, is difficult to interpret from this test alone and will require more exploration in the remaining analyses presented in this chapter. However, it is not necessarily a crucial inquiry for this research question, since neither the 'Feeling' indicator group or 'Overall Rating' question contained direct measures of the 'place' or 'movement' rankings.

Between the Wilcoxon-Signed Rank test results and the descriptive statistics shown in Table 8.2, there is a clear answer for Research Question 2a:

> *Are the differences considered within the tram streetscape categories reflected in average user views of streetscape quality?*

Changes in mean 'Overall Rating' scores (shown in Table 8.2), reflected the differences considered within the tram streetscape categories developed in Chapter 5. The results show both 'movement' and 'place' rankings have a positive impact on 'Overall Rating' mean score. Additionally, results of the Wilcoxon Signed-Rank test provided evidence that movement rankings had a positive relationship with average IMPxPER scores for the 'Form' and 'Function' indicator groups. The combined results of the two analyses provide evidence of construct validity for the methodology applied in Chapter 5 by identifying commonalities between the characteristics of the tram streetscape categories and the way user perceptions changed across those categories.

8.4 Research Question 2b: Exploring the Impacts of the Three Thematic Indicator Groups on Overall Place Quality

Research Question 2b asked "of the three identified thematic groups of place performance indicators, does a particular group have an outsized influence on overall place quality?". This is answered by correlating average IMPxPER scores for each of the three groups of place quality indicators to 'Overall Rating' of the location. The results are displayed in Table 8.3.

Table 8.3 displays correlation statistics for each indicator group with 'Overall Rating' by streetscape category. Each of the three indicator groups were significantly correlated to 'Overall Rating' across all four streetscape categories. However, the 'Feeling' group was the most highly correlated indicator group in all four cases. Indicators within this group gauged personal opinions about the sites, such as whether it appeared clean and if the respondent would feel safe spending time there. These results suggest that the indicators within the 'Feeling' group have a greater impact on 'Overall Rating' than indicators within the 'Form' group, which dealt with built environment design of the sites, as well as indicators within the 'Function' group, which analysed aspects of the services and activities present within the location.

While 'Feeling' was still the most highly correlated indicator group across all four streetscape categories, the correlation statistic for the 'Function' indicator group increased between OMI and PCS (both low 'movement', but opposing 'place' rankings) and between OPT and ITS (both high 'movement', but opposing 'place' rankings). This suggests that the 'Function' indicator group is more highly correlated to 'Overall Rating' at sites with high place rankings. The same is true for the 'Form' indicator group when comparing streetscape categories with high movement rankings to those with low movement rankings and maintaining place ranking as a constant (OMI vs OPT, and PCS vs ITS).

Overall, however, the results of the Spearman correlation analysis (shown in Table 8.3) provide a clear answer to Research Question 2b:

> *Of the three identified thematic groups of place performance indicators, does a particular group have an outsized influence on overall place quality?*

The analysis in Table 8.3 identifies the 'Feeling' indicator group as having the highest impact on overall rating of place quality across all four streetscape categories.

Table 8.3 – Spearman Correlation between Indicator Group IMPxPER Average Score and 'Overall Rating' of Location, by Streetscape Category

Streetscape Category:	Correlation of Indicator Group Average IMPxPER and 'Overall Rating' of Location:		
	Form:	Function:	Feeling:
Opportunity for Movement Improvement (OMI):	0.460***	0.342***	0.643***
Opportunity for Placemaking and TOD (OPT):	0.571***	0.469***	0.630***
Politically Challenging Streetscapes (PCS):	0.399***	0.448***	0.525***
Ideal Tram Streetscapes (ITS):	0.516***	0.554***	0.639***

****Significant correlation at 99% confidence level (2-tailed).*

Note: IMPxPER refers to importance score multiplied by performance score

8.5 Research Question 2c: Identifying Specific Indicators Most Relevant to User Place Perception

Identifying differences in how the three indicator groups impact user perception of place is helpful in the sense that it allows for broad assumptions about which thematic elements matter most to streetscape users. However, since analysing the groups as a whole involves averaging more than ten total indicators, it is possible that one specific indicator of high priority may be lost in a broader group of indicators with lower priority. Research Question 2c sets aside the thematic indicator groups used in the previous displayed analyses to explore:

> *Which specific place performance indicators (within each of the three thematic groups) are most relevant to overall place quality?*

One way to answer this question is to identify the 10 individual indicators with highest average IMP scores for each of the four streetscapes. These 10 (of 41) indicators represent the top 25% in terms of importance to respondents, and breaking down the results by streetscape category shows how priorities change between movement and place contexts. The results of this analysis are presented in Table 8.4.

Table 8.4 shows that across all four streetscape categories 'Safe to Travel Through' was the indicator respondents, on average, identified as the most important. 'Safe to Spend Time' was the second most important, on average, in every streetscape category except OPT. 'Universal Accessibility' and 'Appears Clean/Well-Kept' were also highly prioritised, as they were in the top five most important indicators for each streetscape category except OPT. 'Comfort of Crossing' was a top five priority in every streetscape category except OMI, and 'Accessible PT Boarding' was in the top 5 of OPT and OMI streetscapes.

Table 8.4 – Indicators with 10 Highest Average IMP Scores by Streetscape Category

Place Quality Indicators with 10 Highest Average IMP Scores:	Position in Top 10 by Streetscape Category:				
	OMI	OPT	PCS	ITS	All 4
Safe to Travel Through (Feeling)	1	1	1	1	1
Safe to Spend Time (Feeling)	2	7	2	2	2
Appears Clean/Well-Kept (Feeling)	3	6	4	4	6
Universal Accessibility (Form)	4	5	3	5	4
Accessible PT Boarding (Form)	5	4	7	6	5
Comfort of Crossing (Form)	6	2	5	3	3
Comfortable PT Stop (Form)	7	8	9	8	8
Overall Pleasantness (Feeling)	8	N/A	8	9	10
Pedestrian Comfort (Form)	9	10	N/A	10	9
Welcoming of All Ages, Cultures (Feeling)	10	N/A	6	N/A	N/A
PT Movement Priority (Form)	N/A	3	10	7	7
Wayfinding Signage (Form)	N/A	9	N/A	N/A	N/A

Table 8.4 Notes:

1. *IMP refers to importance score*
2. *OMI refers to the 'Opportunity for Movement Improvement' streetscape category*
3. *OPT refers to the 'Opportunity for Placemaking & TOD' streetscape category*
4. *PCS refers to 'Politically Challenging Streetscapes' streetscape category*
5. *ITS refers to 'Ideal Tram Streetscapes' streetscape category*
6. *'All 4' column shows the Top 10 across all responses, regardless of the four streetscape categories*

In general, respondent priorities are aligned across the four streetscape categories, with only seven indicators being included in the top ten most important across all streetscape categories. OPT streetscapes stood out as slightly different than others due to users prioritising indicators from the 'Form' group more highly than in other streetscapes. It was the only streetscape category where 'PT Movement Priority' was in the top five indicators by average IMP score, as well as the only streetscape category where 'Wayfinding Signage' was in the top ten. Another notable finding is that across all four streetscape categories, the top ten most important priorities did not include any indicators from the 'Function' group.

While identification of indicators with the highest 10 average IMP scores by streetscape category has provided some key insights, it is also essential to explore the impact each indicator had on 'Overall Rating' of each location. Spearman's Correlation is one possible way to explore any potential relationship between this rating and average IMPxPER scores of the indicators. This analysis strategy showed that each of the 41 indicators had a positive correlation with 'Overall Rating', at the 99% confidence level, across all four streetscape categories. Table 8.5 presents the top ten most correlated average IMPxPER scores by streetscape category.

Table 8.5 – Indicators with 10 Highest Correlations Coefficients between IMPxPER Average Score and 'Overall Rating' of Location by Streetscape Category

Place Quality Indicators with 10 Highest Correlation Coefficients between IMPxPER Average and 'Overall Rating' of Location:	Position in Top 10 by Streetscape Category:				
	OMI	OPT	PCS	ITS	All 4
Overall Pleasantness (Feeling)	1	1	1	1	1
Appears Clean/Well-Kept (Feeling)	2	N/A	10	N/A	10
Free of Unpleasant Sounds (Feeling)	3	N/A	N/A	N/A	9
Safe to Spend Time (Feeling)	4	5	8	3	7
Welcoming of All Ages, Cultures (Feeling)	5	6	4	5	4
Positive Impact of Design (Form)	6	3	N/A	7	5
Interesting/Unique Location (Feeling)	7	7	3	2	2
Represents Australian Heritage/Culture (Feeling)	8	N/A	N/A	N/A	N/A
Pedestrian Comfort (Form)	9	2	7	N/A	8
Welcoming of All Income Levels (Feeling)	10	9	N/A	9	N/A
Minimal Visual Clutter (Form)	N/A	4	N/A	N/A	N/A
Safe to Travel Through (Feeling)	N/A	8	N/A	N/A	N/A
Grass, Trees, Landscaping (Form)	N/A	10	N/A	N/A	N/A
Positive Impact of Destinations (Function)	N/A	N/A	2	6	3
Location for Social Activity (Feeling)	N/A	N/A	5	4	6
Location for Personal Business / Shopping (Feeling)	N/A	N/A	6	N/A	N/A
Attractive Business Displays (Function)	N/A	N/A	9	N/A	N/A
Public Seating (Form)	N/A	N/A	N/A	8	N/A
Shelter from Harsh Weather (Form)	N/A	N/A	N/A	10	N/A

Table 8.5 Notes:

1. *All correlations were positive, and all were statistically significant at the 99% confidence level*
2. *IMPxPER refers to importance score multiplied by performance score*
3. *OMI refers to the 'Opportunity for Movement Improvement' streetscape category*
4. *OPT refers to the 'Opportunity for Placemaking & TOD' streetscape category*
5. *PCS refers to 'Politically Challenging Streetscapes' streetscape category*
6. *ITS refers to 'Ideal Tram Streetscapes' streetscape category*
7. *'All 4' column shows the Top 10 across all responses, regardless of the four streetscape categories*

Table 8.5 shows that across all four streetscape categories, 'Overall Pleasantness' was the most highly correlated indicator to 'Overall Rating of Location'. Apart from this, in general, the other indicators were much more varied across streetscape categories than the average importance scores shown in Table 8.4; aside from 'Overall Pleasantness' only three other indicators were in the top ten most correlated across all four streetscape categories. These were 'Safe to Spend Time', 'Welcoming of All Ages, Cultures', and 'Interesting/Unique Location'. An additional three indicators were in the top ten most correlated across three of the four streetscape categories; these were 'Positive Impact of Design', 'Pedestrian Comfort', and 'Welcoming of All Income Levels'.

The analyses presented in Tables 8.4 and 8.5 answer Research Question 2c:

> *Which specific place performance indicators (within each of the three thematic groups) are most relevant to overall place quality?*

Across all four streetscape categories, 'Safe to Travel Through' had the highest average importance score. Additionally, 'Overall Pleasantness' showed the highest correlation to 'Overall Rating' of location across all four streetscape categories. These two place quality indicators are therefore the most relevant to overall place quality across the entire tram network, regardless of streetscape category.

The other indicators shown in Tables 8.4 and 8.5 should also be assumed to be highly relevant to overall place quality, based on their position in the top ten for their respective streetscape categories.

8.6 Research Question 2d: Impact of Tram Network Modernisation

Research Question 2d asks "does the change from legacy to modernised tram streetscapes bring elements that are perceived as adding to and/or depleting place quality?". There are two primary methods of defining what is meant by modernised tram streetscapes:

1. Separation of trams from general traffic, which was incorporated to classify tram segments into movement rankings in Chapter 5.

2. The presence of a level-boarding access stop within the tram segment.

If either one of these is present within the segment, it means that the streetscape has some form of modernised tram infrastructure, so both of these 'definitions of modernisation' will be analysed to see how they impact each of the 41 indicators in the survey. Lastly, sites that meet both definition criteria (i.e. high movement ranking and presence of a modernised tram stop in the same segment) will also be analysed as a whole and compared to those that do not.

This section employs 'Wilcoxon Signed-Rank' and 'Mann Whitney U' tests to explore how each definition of modernisation changes the performance ranking of each place quality indicator. The Wilcoxon-Signed Rank test is designed for repeated measures, which is appropriate for the first definition of modernisation since each survey respondent scored one site from a low movement streetscape category, and one site from a high movement streetscape category. The results are shown in Table 8.6, which displays difference in mean performance score between streetscapes of opposing movement rankings for each place quality indicator, as well as if the difference between each was determined to be significant by the Wilcoxon-Signed Rank test.

Table 8.6 – Difference in Mean Performance Scores by Change in 'Movement' Ranking, and Significance of the Difference per 'Wilcoxon Signed-Rank' Test

	Place Quality Indicators	Performance Mean Score (Max 5)		Difference between Means	Sig.
		High Movement	Low Movement		
'Form' Indicator Group	Pedestrian Comfort	3.79	3.51	0.28	.000***
	Public Seating	3.09	2.94	0.15	.014**
	Minimal Visual Clutter	3.49	3.03	0.46	.000***
	Cyclist Comfort	3.51	3.10	0.41	.000***
	PT Movement Priority	3.90	3.57	0.33	.000***
	Comfortable PT Stop	3.40	3.19	0.21	.000***
	Accessible PT Boarding	3.50	3.18	0.32	.000***
	Landmarks/Reference Points	3.38	3.16	0.23	.000***
	Shelter from Harsh Weather	3.03	2.88	0.14	.022**
	Grass, Trees, Landscaping	3.58	3.02	0.56	.000***
	Wayfinding Signage	3.32	3.06	0.26	.000***
	Universal Accessibility	3.51	3.24	0.27	.000***
	Land Use Diversity	3.42	3.33	0.09	.144
	Positive Impact of Design	3.37	3.00	0.37	.000***
	Private Vehicle Movement Priority	3.94	3.52	0.42	.000***
	Comfort of Crossing	3.71	3.40	0.31	.000***
'Function' Indicator Group	Space for Small Groups	3.07	2.75	0.32	.000***
	Space for Play/Rec	2.89	2.40	0.48	.000***
	Multi-Purpose Destination	3.03	2.84	0.19	.001***
	Space for Community Events	2.89	2.65	0.24	.000***
	Diversity in Commercial Space Size	3.12	3.10	0.02	.744
	Diversity in Residential Space Size	3.28	3.10	0.17	.002***
	Diversity in Real Estate Affordability	3.21	3.10	0.11	.025**
	Outdoor Café/Dining Space	3.01	3.09	-0.07	.241
	Attractive Business Displays	3.03	2.84	0.19	.001**
	Positive Impact of Destinations	2.97	2.80	0.17	.001**
	Locally-Owned/Unique Businesses	3.17	3.22	-0.05	.301
	Presence of Community Services	2.77	2.93	-0.16	.005***
'Feeling' Indicator Group	Appears Clean/Well-Kept	3.73	3.53	0.20	.001***
	Safe to Travel Through	3.72	3.59	0.13	.009***
	Welcoming of All Ages, Cultures	3.39	3.37	0.02	.643
	Welcoming of All Income Levels	3.42	3.38	0.04	.390
	Represents Australian Heritage/Culture	2.97	3.01	-0.05	.315
	Hub for a Specific Cultural Group	2.69	2.65	0.05	.371
	Overall Pleasantness	3.40	3.27	0.13	.029**
	Free of Unpleasant Sounds	3.14	3.12	0.02	.778
	Location for Social Activity	3.03	2.94	0.09	.129
	Interesting/Unique Location	3.10	2.94	0.16	.002***
	Safe to Spend Time	3.48	3.49	0.00	.878
	Location for Entertainment	2.86	2.70	0.16	.003***
	Location for Personal Business / Shopping	3.07	3.15	-0.08	.189
	Overall Rating of Location	3.32	3.19	0.13	.020**

**Indicator rankings significantly different at 90% confidence level*

***Indicator rankings significantly different at 95% confidence level*

****Indicator rankings significantly different at 99% confidence level*

The results in Table 8.6 show that streetscapes with high movement rankings performed better than those with low movement rankings for 29 of the 41 total indicators (71%) at a 95% confidence level. The majority of these indicators were from the 'Form' group, where 15 of 16 indicators (94%) had significantly higher mean performance ranks in streetscapes with high movement rankings. 'Land Use Diversity' is the only indicator in the 'Form' group where there was not a significant difference in performance between streetscape categories with opposing movement rankings. It is important to remember here that movement rankings were defined by degree of tram separation from general traffic (not high movement of any other mode of transport present in the roadway). Therefore, this analysis demonstrates that a higher degree of tram separation from general traffic results in higher performance of streetscape design indicators (as measured by the 'Form' variable group).

9 of the 12 indicators (75%) in the 'Function' group also had significantly higher performance in streetscapes with high movement rankings. Many of these deal with space for particular activities (e.g. 'Space for Community Events'), so this may reflect the fact the streetscapes with higher movement rankings typically are more likely to be wider corridors. The 'Function' group also contained the only indicator that performed better, at a statistically significant level, in streetscapes with low movement rankings. 'Presence of Community Services' was ranked significantly higher in streetscapes with low movement rankings. The other 3 indicators ('Diversity in Commercial Space Size', 'Outdoor Café/Dining Space', and 'Locally-Owned/Unique Businesses) showed no significant difference in indicator performance by change in movement ranking.

In the 'Feeling' indicator group, which related to subjective user perceptions of the streetscapes, 5 of 13 total indicators (38%) performed better in streetscapes with high movement rankings. On average, respondents felt that high movement streetscapes were cleaner and more well-kept, safer to travel through, more pleasant overall, more interesting/unique, and more likely to be a location to visit for entertainment when compared to streetscapes with low movement rankings. The remaining 8 indicators showed no statistically significant difference in indicator performance between streetscape categories of opposing movement rankings.

Lastly, streetscapes with higher movement rankings were statistically more likely to receive a higher 'Overall Rating' than streetscapes with low movement rankings. The mean score increased by .13 points (4%) between streetscapes with a low movement ranking and those with a high movement ranking. In summary, the results shown in Table 8.6 indicate that higher levels of tram separation from general traffic results in higher performance of indicators within the 'Form' group and 'Overall Rating' of the location. To a lesser extent, higher movement rankings also demonstrated a positive impact for 'Function' and 'Feeling' indicators of place quality, but results were more varied. One 'Function' indicator, 'Presence of Community Services', performed better in streetscapes with low movement rankings. This can possibly be attributed to the fact that streetscapes with low movement rankings are more likely to be neighbourhood-level corridors.

Table 8.7 shows a similar analysis, but now uses the presence of a modernised stop as the definition of modernisation. Differences in mean performance scores are shown for each indicator, comparing streetscapes with a legacy tram stop to those with a modernised tram stop. A Mann Whitney U test is employed to determine the significance of the difference in ranking, since this was not a repeated measure in the survey questionnaire.

Table 8.7 – Difference in Mean Performance Scores by Presence of Level Access Boarding Stop, and Significance of the Difference per 'Mann Whitey U' Test

	Place Quality Indicators	Performance Mean Score (Max 5)		Difference between Means	Sig.
		Modernised Tram Stop	Legacy Tram Stop		
'Form' Indicator Group	Pedestrian Comfort	3.74	3.58	0.15	.007***
	Public Seating	3.19	2.87	0.32	.000***
	Minimal Visual Clutter	3.46	3.10	0.36	.000***
	Cyclist Comfort	3.51	3.14	0.37	.000***
	PT Movement Priority	3.87	3.62	0.26	.000***
	Comfortable PT Stop	3.49	3.13	0.35	.000***
	Accessible PT Boarding	3.58	3.14	0.44	.000***
	Landmarks/Reference Points	3.37	3.19	0.18	.006***
	Shelter from Harsh Weather	3.00	2.92	0.08	.278
	Grass, Trees, Landscaping	3.55	3.08	0.47	.000***
	Wayfinding Signage	3.34	3.07	0.28	.000***
	Universal Accessibility	3.57	3.22	0.35	.000***
	Land Use Diversity	3.41	3.35	0.06	.216
	Positive Impact of Design	3.41	3.01	0.40	.000***
	Private Vehicle Movement Priority	3.79	3.67	0.12	.022**
	Comfort of Crossing	3.72	3.42	0.30	.000***
'Function' Indicator Group	Space for Small Groups	3.07	2.78	0.29	.000***
	Space for Play/Rec	2.85	2.48	0.37	.000***
	Multi-Purpose Destination	3.04	2.85	0.18	.008***
	Space for Community Events	2.90	2.66	0.24	.001***
	Diversity in Commercial Space Size	3.13	3.09	0.03	.708
	Diversity in Residential Space Size	3.22	3.17	0.04	.554
	Diversity in Real Estate Affordability	3.20	3.12	0.08	.223
	Outdoor Café/Dining Space	3.07	3.04	0.03	.723
	Attractive Business Displays	2.98	2.90	0.08	.285
	Positive Impact of Destinations	2.95	2.83	0.12	.093*
	Locally-Owned/Unique Businesses	3.17	3.22	-0.04	.420
	Presence of Community Services	2.83	2.87	-0.04	.463
'Feeling' Indicator Group	Appears Clean/Well-Kept	3.74	3.54	0.20	.003***
	Safe to Travel Through	3.70	3.61	0.09	.115
	Welcoming of All Ages, Cultures	3.43	3.34	0.09	.160
	Welcoming of All Income Levels	3.45	3.36	0.09	.104
	Represents Australian Heritage/Culture	2.99	2.99	0.00	.941
	Hub for a Specific Cultural Group	2.78	2.58	0.19	.006***
	Overall Pleasantness	3.40	3.28	0.12	.081*
	Free of Unpleasant Sounds	3.14	3.12	0.02	.678
	Location for Social Activity	3.04	2.94	0.10	.122
	Interesting/Unique Location	3.08	2.97	0.11	.104
	Safe to Spend Time	3.43	3.53	-0.10	.151
	Location for Entertainment	2.90	2.68	0.21	.002***
	Location for Personal Business / Shopping	3.07	3.15	-0.08	.258
	Overall Rating of Location	3.34	3.18	0.16	.006***

**Indicator rankings significantly different at 90% confidence level*

***Indicator rankings significantly different at 95% confidence level*

****Indicator rankings significantly different at 99% confidence level*

The results of this test were very similar to those of the previous test, particularly for the 'Form' indicator group. 14 of the 16 indicators in the group (88%), all except 'Shelter from Harsh Weather' and 'Land Use Diversity' performed better in streetscapes with a modernised stop than those with a legacy stop.

However, this test showed less of an impact in ranking for 'Function' and 'Feeling' indicators. 9 of the 25 (36%) indicators across the two groups performed better in streetscapes with a modernised stop than those with a legacy stop. Of these, the most notable is that users felt streetscapes with a modernised stop were more likely to 'Appear Clean/Well-Kept', and have a higher level of 'Overall Pleasantness' and 'Positive Impact of Destinations' than streetscapes with a legacy stop.

None of the indicators with a negative difference between means were determined to be statistically significant; meaning that there was no case in which the presence of a modernised stop resulted in a negative impact on any place quality indicator.

Lastly, for 'Overall Rating' of the location, streetscapes with a modernised stop were statistically higher ranked on average than those with a legacy stop. The mean rating increased by 0.16 points (5%) between streetscapes with a legacy stop and those with a modernised stop.

Table 8.8 repeats the Mann Whitney U analysis to compare streetscapes that meet both modernisation criteria (i.e. high movement ranking and presence of a modernised tram stop in the same segment) with those that meet neither of the criteria (i.e. low movement ranking and legacy stop in the same segment).

Table 8.8 – Difference in Mean Performance Scores by Presence of All Forms of Modernised Infrastructure, and Significance of the Difference per 'Mann Whitney U' Test

	Place Quality Indicators	Performance Mean Score (Max 5)		Difference between Means	Sig.
		Modern Stop and High Movement	No Modern Infrastructure		
'Form' Indicator Group	Pedestrian Comfort	3.74	3.44	0.30	.000***
	Public Seating	3.10	2.78	0.32	.000***
	Minimal Visual Clutter	3.57	2.98	0.59	.000***
	Cyclist Comfort	3.58	3.02	0.55	.000***
	PT Movement Priority	3.92	3.50	0.41	.000***
	Comfortable PT Stop	3.41	3.02	0.39	.000***
	Accessible PT Boarding	3.54	3.01	0.53	.000***
	Landmarks/Reference Points	3.36	3.08	0.28	.000***
	Shelter from Harsh Weather	2.90	2.76	0.14	.103
	Grass, Trees, Landscaping	3.67	2.94	0.73	.000***
	Wayfinding Signage	3.36	2.98	0.38	.000***
	Universal Accessibility	3.55	3.12	0.43	.000***
	Land Use Diversity	3.35	3.25	0.09	.121
	Positive Impact of Design	3.41	2.87	0.54	.000***
	Private Vehicle Movement Priority	3.94	3.55	0.39	.000***
	Comfort of Crossing	3.76	3.32	0.43	.000***
'Function' Indicator Group	Space for Small Groups	3.02	2.59	0.42	.000***
	Space for Play/Rec	2.93	2.33	0.60	.000***
	Multi-Purpose Destination	2.92	2.68	0.25	.003***
	Space for Community Events	2.84	2.52	0.33	.000***
	Diversity in Commercial Space Size	2.99	2.97	0.02	.882
	Diversity in Residential Space Size	3.30	3.14	0.16	.037**
	Diversity in Real Estate Affordability	3.20	3.07	0.13	.089*
	Outdoor Café/Dining Space	2.91	2.96	-0.05	.575
	Attractive Business Displays	2.95	2.77	0.18	.034**
	Positive Impact of Destinations	2.90	2.70	0.20	.027**
	Locally-Owned/Unique Businesses	3.05	3.13	-0.08	.182
	Presence of Community Services	2.66	2.82	-0.16	.041**
'Feeling' Indicator Group	Appears Clean/Well-Kept	3.72	3.44	0.28	.001***
	Safe to Travel Through	3.70	3.55	0.15	.019**
	Welcoming of All Ages, Cultures	3.36	3.29	0.07	.327
	Welcoming of All Income Levels	3.39	3.30	0.09	.172
	Represents Australian Heritage/Culture	2.90	2.94	-0.04	.573
	Hub for a Specific Cultural Group	2.69	2.52	0.16	.075*
	Overall Pleasantness	3.36	3.19	0.17	.032**
	Free of Unpleasant Sounds	3.08	3.06	0.02	.688
	Location for Social Activity	2.95	2.83	0.12	.137
	Interesting/Unique Location	3.04	2.85	0.18	.026**
	Safe to Spend Time	3.37	3.46	-0.09	.339
	Location for Entertainment	2.84	2.59	0.25	.003***
	Location for Personal Business / Shopping	2.92	3.05	-0.13	.109
	Overall Rating of Location	3.30	3.10	0.20	.005***

**Indicator rankings significantly different at 90% confidence level*

***Indicator rankings significantly different at 95% confidence level*

****Indicator rankings significantly different at 99% confidence level*

The results for the 'Form' indicator group were very similar to the previous two analyses, with 14 of 16 indicators (88%), performing better in streetscapes with both a modernised stop and high movement ranking. The remaining two, 'Shelter from Harsh Weather', and 'Land Use Diversity' showed no statistically significant difference in rankings.

Performance of the 'Function' indicator group showed very similar results to the first test (which compared 'high movement' and 'low movement'). 9 of the 12 indicators (75%) in the 'Function' group had significantly higher performance in modernised tram streetscapes. As mentioned before, many of these deal with space for particular activities (e.g. 'Space for Community Events'), so this may reflect the fact the streetscapes with higher movement rankings typically are more likely to be wider corridors. The 'Function' group also contained the only indicator that performed better in streetscapes with low movement rankings. Low movement streetscapes performed better for 'Presence of Community Services' than streetscapes with high movement rankings. The other 3 indicators showed no statistically significant difference in indicator performance by change in movement ranking

On average, users felt streetscapes with both a modernised stop and high movement ranking were more likely to 'Appear Clean/Well-Kept', be 'Safe to Travel Through', a 'Hub for a Specific Cultural Group', an 'Interesting/Unique Location', and 'Location for Entertainment'. Streetscapes with both a modernised stop and high movement ranking were also viewed as more pleasant locations overall, and received significantly higher 'Overall Rating of Location' than their legacy counterparts.

As a whole, the three analyses shown in Tables 8.6 through 8.8 provide key insights that help to answer Research Question 2d:

> *Does the change from legacy to modernised tram streetscapes bring elements that are perceived as adding to and/or depleting place quality?*

There is clear evidence that modernised tram infrastructure positively impacts user performance rankings of roadway and footpath design elements, as measured by the 'Form' indicator group. 14 of 16 indicators (88%) in this group performed better across all three applied definitions of modernisation. However, there was less evidence that modernisation has a positive impact on 'Function' and 'Feeling' indicators, with only 9 of the 25 (36%) indicators performing better across all three applied definitions of modernisation. 'Function' and 'Feeling' appear to be more dependent on the applied definition of modernisation, with high 'movement' ranking having a more positive impact than modernised tram stops. In the two definitions of modernisation that incorporated high 'movement' ranking 14 of the 25 (56%) indicators performing better across all three applied definitions of modernisation. Overall, however, 'Function' and 'Feeling' are less impacted by modernisation than 'Form', where 88% of all indicators performed better across each of the three applied definitions of modernisation. This indicates that users view tram modernisation as primarily a built form improvement strategy. They also view tram modernisation as having some degree of positive impact on the function and feeling of a location, but these impacts are relatively small in comparison to the resulting design improvement.

It is also worth noting that there was only one indicator where tram modernisation had a negative impact that was determined as statistically significant. 'Presence of Community Services' was ranked more highly in streetscapes with low movement rankings, as well as in streetscapes with both a low movement ranking and legacy stop. Some of the historically more politically contentious aspects of tram modernisation projects, such as the view that they may negatively impact 'Locally-Owned/Unique Businesses' or 'Private Vehicle Movement Priority' were not supported by the survey findings. In fact, tram modernisation was shown was shown to have a positive impact on 'Private Vehicle Movement Priority' in all three analyses. This is a key takeaway as it provides evidence that historical concerns of potential negative results from tram modernisation projects are unfounded in the actual results of completed projects.

Additionally, some context helps to consider correlation versus causation in regard to 'Presence of Community Services', the one place quality indicator where tram modernisation had a negative impact determined to be statistically significant. Neighbourhood-level corridors are more likely to have community services such as schools, post offices, libraries and parks. These corridors are also less likely to have already been modernised, due to lower levels of patronage as compared to locations like Melbourne's Central Business District. It is possible that this explanatory information may better explain why modernisation has a negative impact on 'Presence of Community Services' than simply assuming the impact was caused by the physical design of any specific tram modernisation project.

To summarise, it is clear that all forms of modernised tram streetscapes have a positive impact on user performance rankings of the 'Form' indicator group. To a lesser extent, modernised tram streetscapes also positively impacted indicators within the 'Function' and 'Feeling' groups. These trends also have a positive impact on user's 'Overall Rating of Location', with modernisation significantly increasing the rating by 4 to 5% across all three tests. There was just one indicator (out of a total of forty-one) where tram modernisation was identified to have a significant negative impact, and contextual information was provided that may help explain this finding. As a whole, users view tram modernisation projects as generally improving place quality, particularly in regard to the quality of streetscape design, with little-to-no negative impacts.

8.7 Research Question 3: Identification of Priorities for Tram Modernisation Projects by Streetscape Category

Research Question 3 asks for identification of "what changes can be made to tram modernisation planning and design processes in order to achieve better outcomes for streetscape place quality?" Determining answers to this question is facilitated through Importance Performance Analysis (IPA), which involves plotting average importance and performance scores of each indicator, and comparing them to the average scores of each streetscape category as a whole. The plots enable development of four quadrants of priorities based on average indicator scores. The four quadrants are explained below:

- **Locational Strengths:**

Importance and Performance above streetscape average.

- **High Priorities for Improvement:**

Importance above streetscape average, Performance below streetscape average.

- **Low Priorities for Improvement:**

Importance and Performance below streetscape average.

- **Over-Performing Indicators:**

Importance below streetscape average, Performance above streetscape average.

Figure 8.3 visualises each of the quadrants on an example matrix. When applied to each streetscape category, the lines separating the quadrants are shifted to represent average overall importance and performance scores for each category.

Figures 8.4 through 8.7 apply the example matrix shown in Figure 8.3 to each of the four streetscape categories. The 41 indicators are plotted based on their average importance and performance scores in each streetscape category. Tables 8.9 through 8.12 follow each figure to list the indicators, further document which quadrant each one is categorised into, and list the number used to represent them in the matrices.

For each streetscape category, any indicators categorised into the 'High Priorities for Improvement' quadrant should be viewed as an answer to Research Question 3. Tram modernisation planning and design processes should change to better address place quality indicators from this quadrant, since they were identified as above average importance and below average performance.

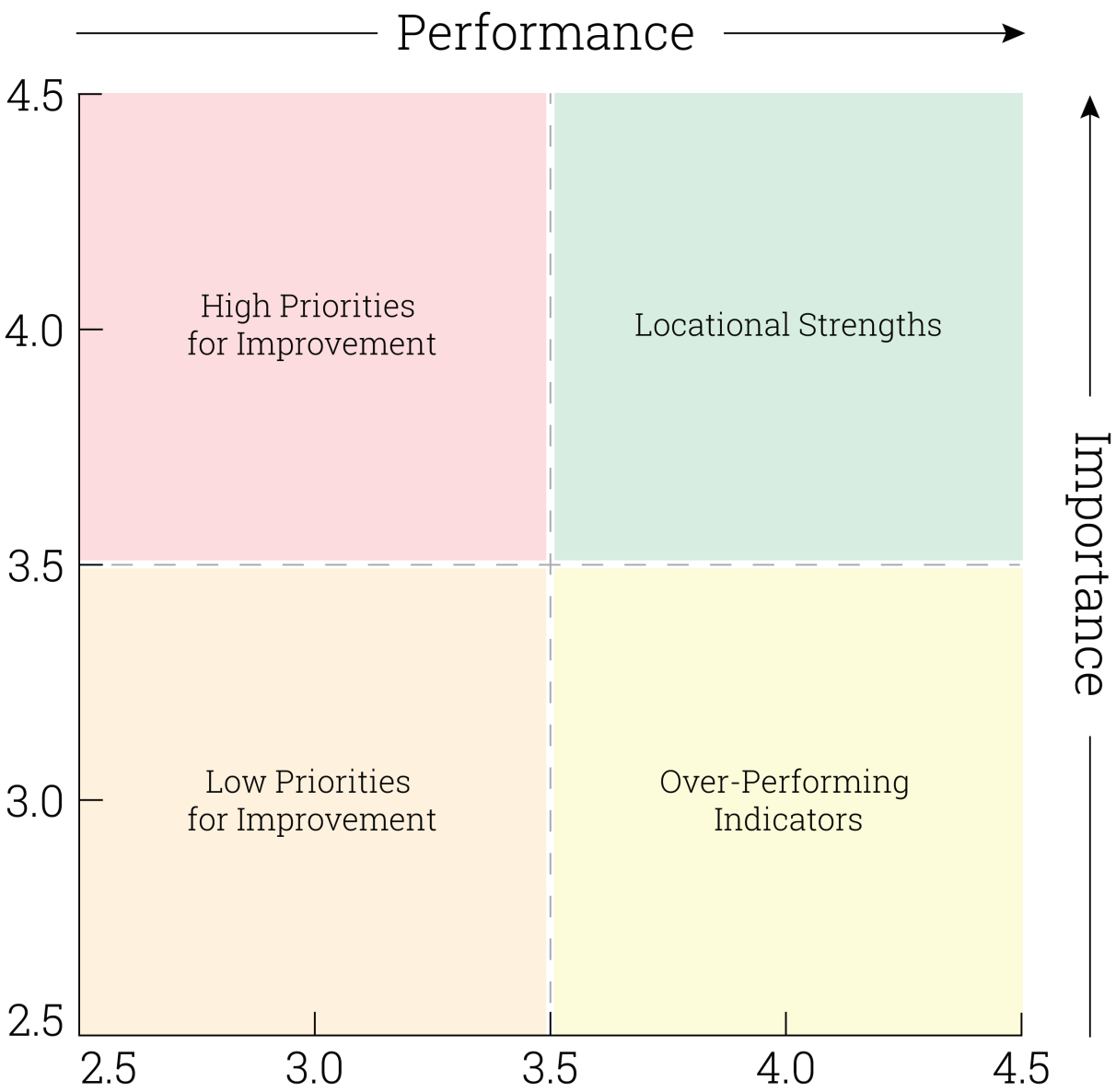

Figure 8.3 – Example Importance Performance Matrix

Table 8.9 – Quadrant Category Ranking of Each Indicator in the 'Opportunity for Movement Improvement' Streetscape Category

	Indicator:	Quadrant Ranking in 'Opportunity for Movement Improvent' Streetscape Category:
'Form' Indicator Group	1. Pedestrian Comfort	Locational Strengths
	2. Public Seating	Low Priorities for Improvement
	3. Minimal Visual Clutter	Locational Strengths
	4. Cyclist Comfort	Over-Performing Indicators
	5. PT Movement Priority	Locational Strengths
	6. Comfortable PT Stop	Locational Strengths
	7. Accessible PT Boarding	Locational Strengths
	8. Landmarks/Reference Points	Over-Performing Indicators
	9. Shelter from Harsh Weather	High Priorities for Improvement
	10. Grass, Trees, Landscaping	Locational Strengths
	11. Wayfinding Signage	Locational Strengths
	12. Universal Accessibility	Locational Strengths
	13. Land Use Diversity	Over-Performing Indicators
	14. Positive Impact of Design	High Priorities for Improvement
	15. Private Vehicle Movement Priority	Locational Strengths
	16. Comfort of Crossing	Locational Strengths
'Function' Indicator Group	17. Space for Small Groups	Low Priorities for Improvement
	18. Space for Play/Rec	Low Priorities for Improvement
	19. Multi-Purpose Destination	Low Priorities for Improvement
	20. Space for Community Events	Low Priorities for Improvement
	21. Diversity in Commercial Space Size	Low Priorities for Improvement
	22. Diversity in Residential Space Size	Over-Performing Indicators
	23. Diversity in Real Estate Affordability	Over-Performing Indicators
	24. Outdoor Café/Dining Space	Low Priorities for Improvement
	25. Attractive Business Displays	Low Priorities for Improvement
	26. Positive Impact of Destinations	Low Priorities for Improvement
	27. Locally-Owned/Unique Businesses	Low Priorities for Improvement
	28. Presence of Community Services	High Priorities for Improvement
'Feeling' Indicator Group	29. Appears Clean/Well-Kept	Locational Strengths
	30. Safe to Travel Through	Locational Strengths
	31. Welcoming of All Ages, Cultures	Locational Strengths
	32. Welcoming of All Income Levels	Locational Strengths
	33. Represents Australian Heritage/Culture	Low Priorities for Improvement
	34. Hub for a Specific Cultural Group	Low Priorities for Improvement
	35. Overall Pleasantness	Locational Strengths
	36. Free of Unpleasant Sounds	Locational Strengths
	37. Location for Social Activity	Low Priorities for Improvement
	38. Interesting/Unique Location	Low Priorities for Improvement
	39. Safe to Spend Time	Locational Strengths
	40. Location for Entertainment	Low Priorities for Improvement
	41. Location for Personal Business / Shopping	Low Priorities for Improvement

Opportunity for Movement Improvement

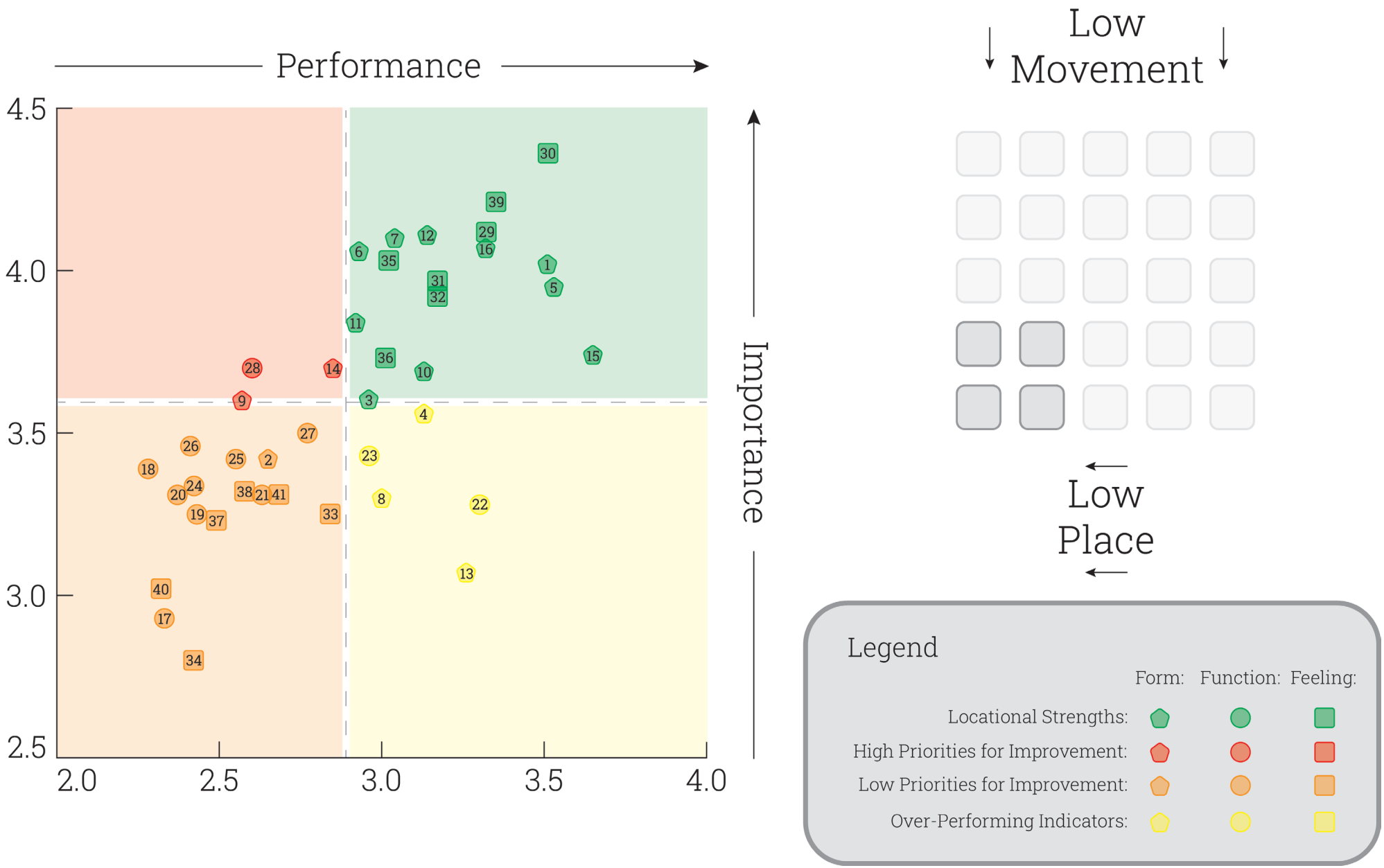

Figure 8.4 – Importance-Performance Matrix for the 'Opportunity for Movement Improvement' Streetscape Category

Table 8.10 – Quadrant Category Ranking of Each Indicator in the 'Opportunity for Placemaking & TOD' Streetscape Category

	Indicator:	Quadrant Ranking in 'Opportunity for Placemaking & TOD' Streetscape Category:
'Form' Indicator Group	1. Pedestrian Comfort	Locational Strengths
	2. Public Seating	Low Priorities for Improvement
	3. Minimal Visual Clutter	Locational Strengths
	4. Cyclist Comfort	Locational Strengths
	5. PT Movement Priority	Locational Strengths
	6. Comfortable PT Stop	Locational Strengths
	7. Accessible PT Boarding	Locational Strengths
	8. Landmarks/Reference Points	Locational Strengths
	9. Shelter from Harsh Weather	High Priorities for Improvement
	10. Grass, Trees, Landscaping	Locational Strengths
	11. Wayfinding Signage	Locational Strengths
	12. Universal Accessibility	Locational Strengths
	13. Land Use Diversity	Over-Performing Indicators
	14. Positive Impact of Design	Locational Strengths
	15. Private Vehicle Movement Priority	Locational Strengths
	16. Comfort of Crossing	Locational Strengths
'Function' Indicator Group	17. Space for Small Groups	Low Priorities for Improvement
	18. Space for Play/Rec	Low Priorities for Improvement
	19. Multi-Purpose Destination	Low Priorities for Improvement
	20. Space for Community Events	Low Priorities for Improvement
	21. Diversity in Commercial Space Size	Low Priorities for Improvement
	22. Diversity in Residential Space Size	Over-Performing Indicators
	23. Diversity in Real Estate Affordability	Over-Performing Indicators
	24. Outdoor Café/Dining Space	Low Priorities for Improvement
	25. Attractive Business Displays	Low Priorities for Improvement
	26. Positive Impact of Destinations	Low Priorities for Improvement
	27. Locally-Owned/Unique Businesses	Low Priorities for Improvement
	28. Presence of Community Services	Low Priorities for Improvement
'Feeling' Indicator Group	29. Appears Clean/Well-Kept	Locational Strengths
	30. Safe to Travel Through	Locational Strengths
	31. Welcoming of All Ages, Cultures	Locational Strengths
	32. Welcoming of All Income Levels	Locational Strengths
	33. Represents Australian Heritage/Culture	Low Priorities for Improvement
	34. Hub for a Specific Cultural Group	Low Priorities for Improvement
	35. Overall Pleasantness	Locational Strengths
	36. Free of Unpleasant Sounds	High Priorities for Improvement
	37. Location for Social Activity	Low Priorities for Improvement
	38. Interesting/Unique Location	Low Priorities for Improvement
	39. Safe to Spend Time	Locational Strengths
	40. Location for Entertainment	Low Priorities for Improvement
	41. Location for Personal Business / Shopping	Low Priorities for Improvement

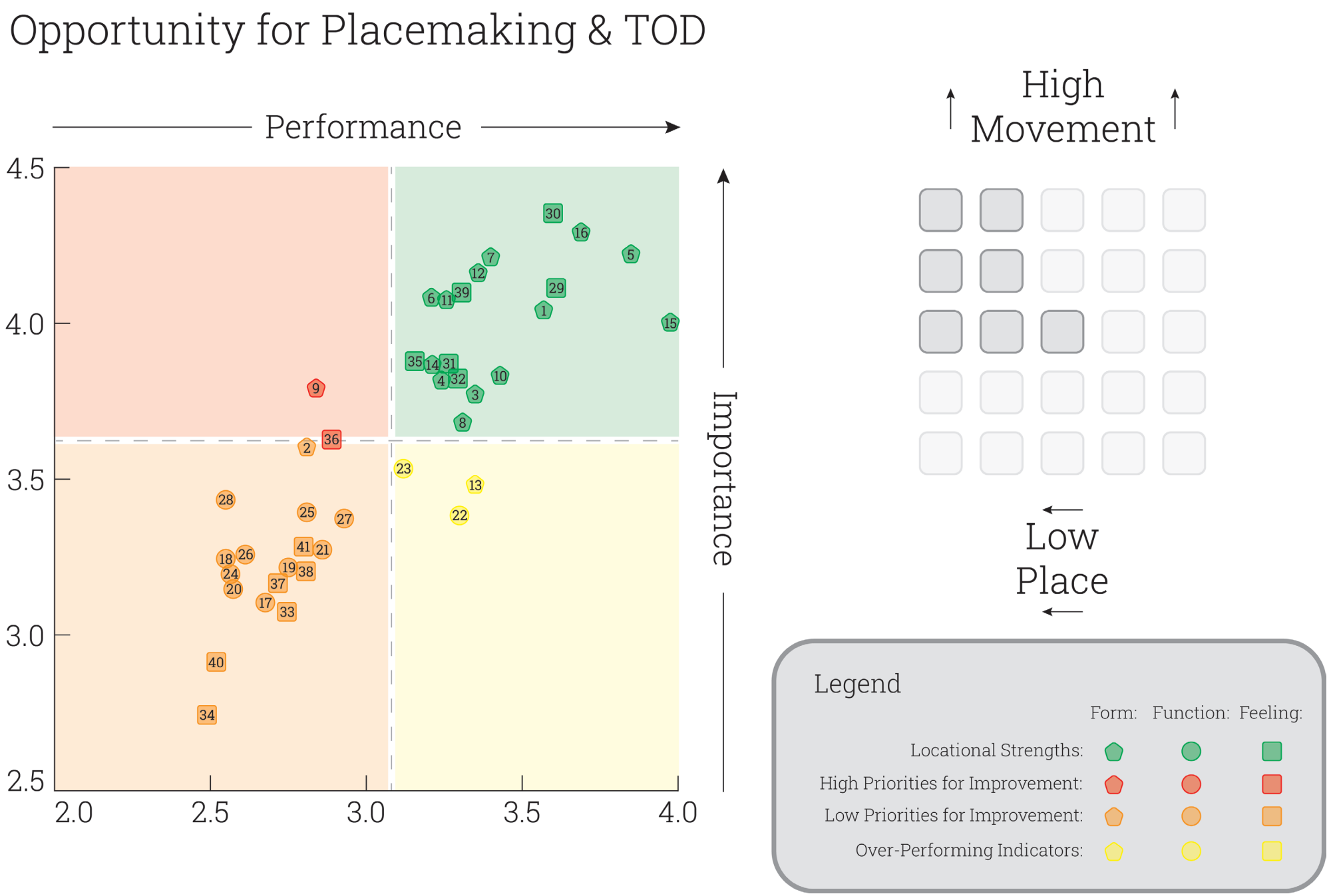

Figure 8.5 – Importance-Performance Matrix for the 'Opportunity for Placemaking & TOD' Streetscape Category

Table 8.11 – Quadrant Category Ranking of Each Indicator in the 'Politically Challenging Streetscapes' Streetscape Category

	Indicator:	Quadrant Ranking in 'Politically Challenging Streetscapes' Streetscape Category:
'Form' Indicator Group	1. Pedestrian Comfort	Locational Strengths
	2. Public Seating	Low Priorities for Improvement
	3. Minimal Visual Clutter	Low Priorities for Improvement
	4. Cyclist Comfort	Low Priorities for Improvement
	5. PT Movement Priority	Locational Strengths
	6. Comfortable PT Stop	Locational Strengths
	7. Accessible PT Boarding	Locational Strengths
	8. Landmarks/Reference Points	Over-Performing Indicators
	9. Shelter from Harsh Weather	High Priorities for Improvement
	10. Grass, Trees, Landscaping	Low Priorities for Improvement
	11. Wayfinding Signage	High Priorities for Improvement
	12. Universal Accessibility	Locational Strengths
	13. Land Use Diversity	Over-Performing Indicators
	14. Positive Impact of Design	High Priorities for Improvement
	15. Private Vehicle Movement Priority	Over-Performing Indicators
	16. Comfort of Crossing	Locational Strengths
'Function' Indicator Group	17. Space for Small Groups	Low Priorities for Improvement
	18. Space for Play/Rec	Low Priorities for Improvement
	19. Multi-Purpose Destination	Low Priorities for Improvement
	20. Space for Community Events	Low Priorities for Improvement
	21. Diversity in Commercial Space Size	Over-Performing Indicators
	22. Diversity in Residential Space Size	Low Priorities for Improvement
	23. Diversity in Real Estate Affordability	Low Priorities for Improvement
	24. Outdoor Café/Dining Space	Over-Performing Indicators
	25. Attractive Business Displays	Low Priorities for Improvement
	26. Positive Impact of Destinations	High Priorities for Improvement
	27. Locally-Owned/Unique Businesses	Locational Strengths
	28. Presence of Community Services	High Priorities for Improvement
'Feeling' Indicator Group	29. Appears Clean/Well-Kept	Locational Strengths
	30. Safe to Travel Through	Locational Strengths
	31. Welcoming of All Ages, Cultures	Locational Strengths
	32. Welcoming of All Income Levels	Locational Strengths
	33. Represents Australian Heritage/Culture	Low Priorities for Improvement
	34. Hub for a Specific Cultural Group	Low Priorities for Improvement
	35. Overall Pleasantness	Locational Strengths
	36. Free of Unpleasant Sounds	Low Priorities for Improvement
	37. Location for Social Activity	Over-Performing Indicators
	38. Interesting/Unique Location	Low Priorities for Improvement
	39. Safe to Spend Time	Locational Strengths
	40. Location for Entertainment	Low Priorities for Improvement
	41. Location for Personal Business / Shopping	Locational Strengths

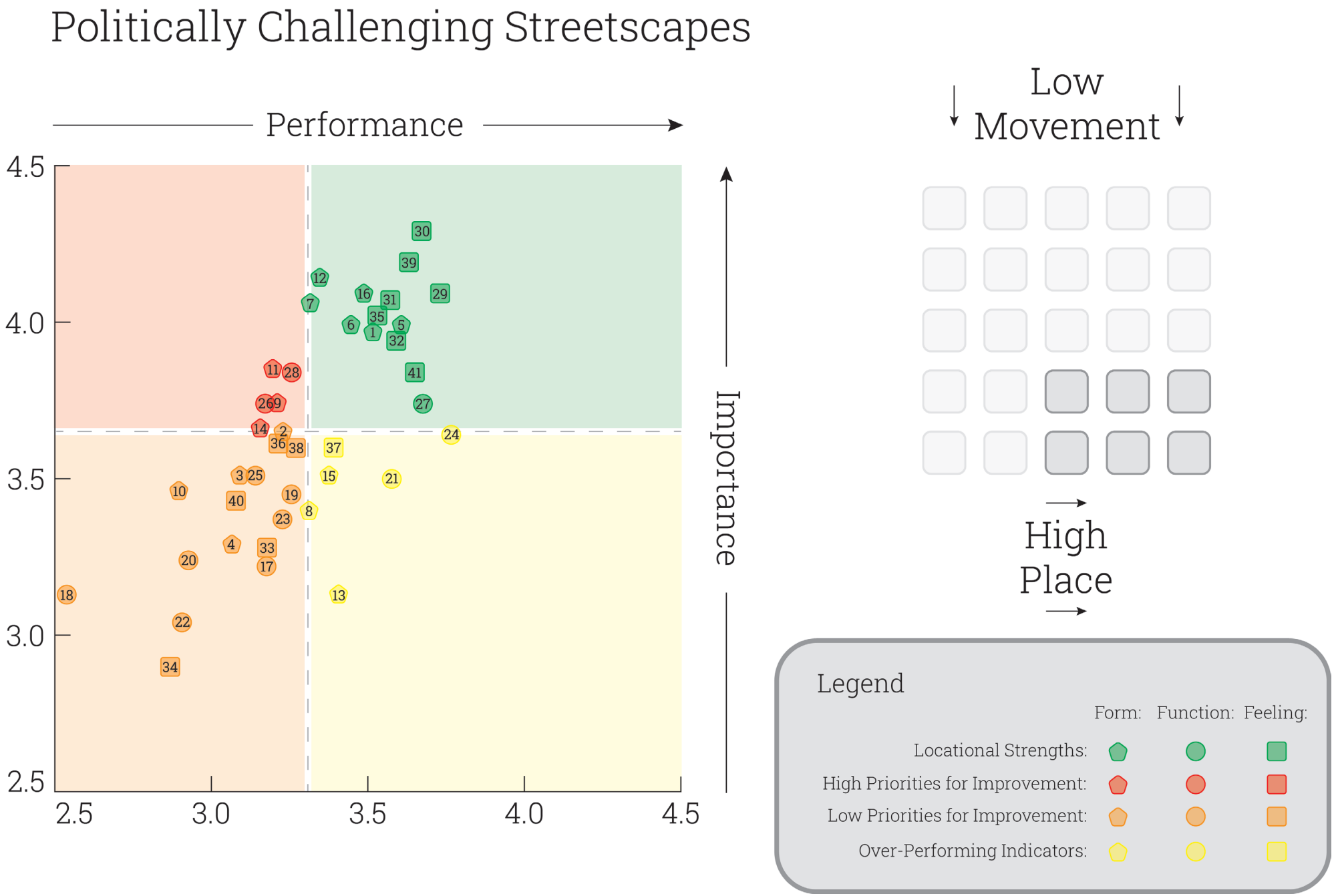

Figure 8.6 – Importance-Performance Matrix for the 'Politically Challenging Streetscapes' Streetscape Category

Table 8.12 – Quadrant Category Ranking of Each Indicator in the 'Ideal Tram Streetscapes' Streetscape Category

	Indicator:	Quadrant Ranking in 'Ideal Tram Streetscapes' Streetscape Category:
'Form' Indicator Group	1. Pedestrian Comfort	Locational Strengths
	2. Public Seating	High Priorities for Improvement
	3. Minimal Visual Clutter	Locational Strengths
	4. Cyclist Comfort	Locational Strengths
	5. PT Movement Priority	Locational Strengths
	6. Comfortable PT Stop	Locational Strengths
	7. Accessible PT Boarding	Locational Strengths
	8. Landmarks/Reference Points	Low Priorities for Improvement
	9. Shelter from Harsh Weather	High Priorities for Improvement
	10. Grass, Trees, Landscaping	Locational Strengths
	11. Wayfinding Signage	High Priorities for Improvement
	12. Universal Accessibility	Locational Strengths
	13. Land Use Diversity	Over-Performing Indicators
	14. Positive Impact of Design	Locational Strengths
	15. Private Vehicle Movement Priority	Locational Strengths
	16. Comfort of Crossing	Locational Strengths
'Function' Indicator Group	17. Space for Small Groups	Over-Performing Indicators
	18. Space for Play/Rec	Low Priorities for Improvement
	19. Multi-Purpose Destination	Low Priorities for Improvement
	20. Space for Community Events	Low Priorities for Improvement
	21. Diversity in Commercial Space Size	Low Priorities for Improvement
	22. Diversity in Residential Space Size	Low Priorities for Improvement
	23. Diversity in Real Estate Affordability	Low Priorities for Improvement
	24. Outdoor Café/Dining Space	Over-Performing Indicators
	25. Attractive Business Displays	Low Priorities for Improvement
	26. Positive Impact of Destinations	Low Priorities for Improvement
	27. Locally-Owned/Unique Businesses	Low Priorities for Improvement
	28. Presence of Community Services	Low Priorities for Improvement
'Feeling' Indicator Group	29. Appears Clean/Well-Kept	Locational Strengths
	30. Safe to Travel Through	Locational Strengths
	31. Welcoming of All Ages, Cultures	Locational Strengths
	32. Welcoming of All Income Levels	Locational Strengths
	33. Represents Australian Heritage/Culture	Low Priorities for Improvement
	34. Hub for a Specific Cultural Group	Low Priorities for Improvement
	35. Overall Pleasantness	Locational Strengths
	36. Free of Unpleasant Sounds	High Priorities for Improvement
	37. Location for Social Activity	Low Priorities for Improvement
	38. Interesting/Unique Location	Low Priorities for Improvement
	39. Safe to Spend Time	Locational Strengths
	40. Location for Entertainment	Low Priorities for Improvement
	41. Location for Personal Business / Shopping	Low Priorities for Improvement

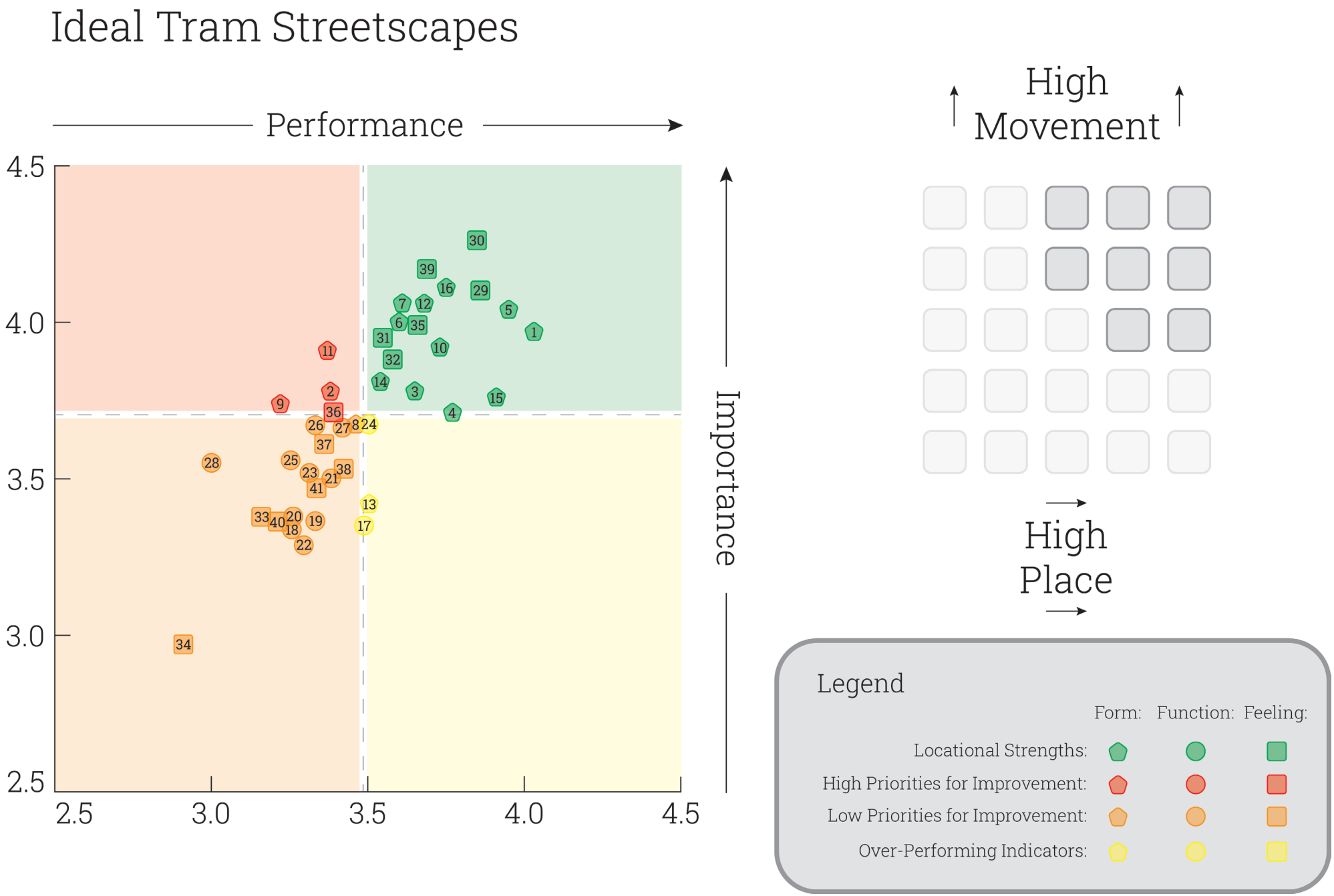

Figure 8.7 – Importance-Performance Matrix for the 'Ideal Tram Streetscapes' Streetscape Category

Figures 8.4 through 8.7 document the results of IPA analysis for each of the four streetscape categories. The following indicators were identified as 'High Priorities for Improvement' (high average importance, low average performance) in their respective streetscape category:

Opportunity for Movement Improvement:

- Shelter from Harsh Weather (Form)
- Positive Impact of Design (Form)
- Presence of Community Services (Function)

Opportunity for Placemaking & TOD:

- Shelter from Harsh Weather (Form)
- Free of Unpleasant Sounds (Feeling)

Politically Challenging Streetscapes:

- Shelter from Harsh Weather (Form)
- Wayfinding Signage (Form)
- Positive Impact of Design (Form)
- Positive Impact of Destinations (Function)
- Presence of Community Services (Function)

Ideal Tram Streetscapes:

- Public Seating (Form)
- Shelter from Harsh Weather (Form)
- Wayfinding Signage (Form)
- Free of Unpleasant Sounds (Feeling)

In each of the respective streetscape categories, tram modernisation planning and design processes should change to better address the above place quality indicators where possible. Survey responses indicate each were of above average importance, but of below average performance. This means they are of high priority for improvement and tram modernisation projects could enhance user perception of streetscape place quality by working to improve them.

In order to further answer Research Question 3, it is also critical to look for similarities in indicator quadrant ranking across the streetscape categories. This is particularly helpful for the pairs of streetscapes that share aspects such as a high movement ranking, low place ranking, or vice versa. Since the overall goal of this thesis is to make policy recommendations for upgrading tram corridors, it would be particularly helpful to see if there are indicators where high movement corridors outperform low movement corridors.

Table 8.13 facilitates this by documenting all of the information illustrated in Figures 8.4 through 8.7 ('Quadrant Ranking by Streetscape Category' columns in Table 8.13) and then using that information to show commonalities in quadrant ranking across relevant combinations of streetscape categories such as 'High Place' or 'Low Movement'. In the 'Commonalities in Quadrant Ranking Across Multiple Streetscape Categories' columns in Table 8.13, six potential patterns of commonality are displayed. If an indicator is placed in a common quadrant across streetscape types, then the name and colour of their shared quadrant category is displayed. The first pattern looks for commonalities 'Across All 4 Categories' of streetscape types. If an indicator meets this criterion, then it is automatically marked as N/A for the remaining potential commonality patterns.

Table 8.13 – Summary of Indicator IPA Quadrant Category Across Streetscape Categories

	Indicator:	Commonalities in Quadrant Ranking Across Multiple Streetscape Categories:					
		Across All 4 Categories	Across 3 Categories (But Not All 4)	Across Both 'Low Movement' Categories (But Not All 4)	Across Both 'High Movement' Categories (But Not All 4)	Across Both 'Low Place' Categories (But Not All 4)	Across Both 'High Place' Categories (But Not All 4)
'Form' Indicator Group	1. Pedestrian Comfort	Locational Strengths	N/A	N/A	N/A	N/A	N/A
	2. Public Seating	N/A	Low Priorities for Improvement	Low Priorities for Improvement	N/A	Low Priorities for Improvement	N/A
	3. Minimal Visual Clutter	N/A	Locational Strengths	N/A	Locational Strengths	Locational Strengths	N/A
	4. Cyclist Comfort	N/A	N/A	N/A	Locational Strengths	N/A	N/A
	5. PT Movement Priority	Locational Strengths	N/A	N/A	N/A	N/A	N/A
	6. Comfortable PT Stop	Locational Strengths	N/A	N/A	N/A	N/A	N/A
	7. Accessible PT Boarding	Locational Strengths	N/A	N/A	N/A	N/A	N/A
	8. Landmarks/Reference Points	N/A	N/A	Over-Performing Indicators	N/A	N/A	N/A
	9. Shelter from Harsh Weather	High Priorities for Improvement	N/A	N/A	N/A	N/A	N/A
	10. Grass, Trees, Landscaping	N/A	Locational Strengths	N/A	Locational Strengths	Locational Strengths	N/A
	11. Wayfinding Signage	N/A	N/A	N/A	N/A	Locational Strengths	High Priorities for Improvement
	12. Universal Accessibility	Locational Strengths	N/A	N/A	N/A	N/A	N/A
	13. Land Use Diversity	Over-Performing Indicators	N/A	N/A	N/A	N/A	N/A
	14. Positive Impact of Design	N/A	N/A	High Priorities for Improvement	Locational Strengths	N/A	N/A
	15. Private Vehicle Movement Priority	N/A	Locational Strengths	N/A	Locational Strengths	Locational Strengths	N/A
	16. Comfort of Crossing	Locational Strengths	N/A	N/A	N/A	N/A	N/A
'Function' Indicator Group	17. Space for Small Groups	N/A	Low Priorities for Improvement	Low Priorities for Improvement	N/A	Low Priorities for Improvement	N/A
	18. Space for Play/Rec	Low Priorities for Improvement	N/A	N/A	N/A	N/A	N/A
	19. Multi-Purpose Destination	Low Priorities for Improvement	N/A	N/A	N/A	N/A	N/A
	20. Space for Community Events	Low Priorities for Improvement	N/A	N/A	N/A	N/A	N/A
	21. Diversity in Commercial Space Size	N/A	Low Priorities for Improvement	N/A	Low Priorities for Improvement	Low Priorities for Improvement	N/A
	22. Diversity in Residential Space Size	N/A	N/A	N/A	N/A	Over-Performing Indicators	Low Priorities for Improvement
	23. Diversity in Real Estate Affordability	N/A	N/A	N/A	N/A	Over-Performing Indicators	Low Priorities for Improvement
	24. Outdoor Café/Dining Space	N/A	N/A	N/A	N/A	Low Priorities for Improvement	Over-Performing Indicators
	25. Attractive Business Displays	Low Priorities for Improvement	N/A	N/A	N/A	N/A	N/A
	26. Positive Impact of Destinations	N/A	Low Priorities for Improvement	N/A	Low Priorities for Improvement	Low Priorities for Improvement	N/A
	27. Locally-Owned/Unique Businesses	N/A	Low Priorities for Improvement	N/A	Low Priorities for Improvement	Low Priorities for Improvement	N/A
	28. Presence of Community Services	N/A	N/A	High Priorities for Improvement	Low Priorities for Improvement	N/A	N/A
'Feeling' Indicator Group	29. Appears Clean/Well-Kept	Locational Strengths	N/A	N/A	N/A	N/A	N/A
	30. Safe to Travel Through	Locational Strengths	N/A	N/A	N/A	N/A	N/A
	31. Welcoming of All Ages, Cultures	Locational Strengths	N/A	N/A	N/A	N/A	N/A
	32. Welcoming of All Income Levels	Locational Strengths	N/A	N/A	N/A	N/A	N/A
	33. Represents Australian Heritage/Culture	Low Priorities for Improvement	N/A	N/A	N/A	N/A	N/A
	34. Hub for a Specific Cultural Group	Low Priorities for Improvement	N/A	N/A	N/A	N/A	N/A
	35. Overall Pleasantness	Locational Strengths	N/A	N/A	N/A	N/A	N/A
	36. Free of Unpleasant Sounds	N/A	N/A	N/A	High Priorities for Improvement	N/A	N/A
	37. Location for Social Activity	N/A	Low Priorities for Improvement	N/A	Low Priorities for Improvement	Low Priorities for Improvement	N/A
	38. Interesting/Unique Location	Low Priorities for Improvement	N/A	N/A	N/A	N/A	N/A
	39. Safe to Spend Time	Locational Strengths	N/A	N/A	N/A	N/A	N/A
	40. Location for Entertainment	Low Priorities for Improvement	N/A	N/A	N/A	N/A	N/A
	41. Location for Personal Business / Shopping	N/A	Low Priorities for Improvement	N/A	Low Priorities for Improvement	Low Priorities for Improvement	N/A

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What Do All Four Streetscape Categories Have in Common?

Identifying place quality indicators that were placed in the same quadrant across all four streetscape categories is helpful in identifying network-wide strengths and priorities. As displayed in Table 8.13, 22 of the 41 total indicators (53%) were placed into the same IPA matrix quadrant across all four streetscape categories. This is a significant outcome because it means that users feel half the indicators require similar levels of attention across the entire tram network, regardless of which movement and place streetscape category the segment at hand belongs to.

'Shelter from Harsh Weather' was identified as the only indicator deemed 'High Priorities for Improvement' across all four tram streetscape categories. This is a key finding in the answer to Research Question 3 as it indicates respondents feel every tram corridor across the network, regardless of streetscape category, should do a better job of providing shelter from harsh weather.

Similarly, across all four types of tram streetscapes, users scored the following indicators as 'Low Priorities for Improvement':

- Space for Play/Rec (Function)
- Multi-Purpose Destination (Function)
- Space for Community Events (Function)
- Attractive Business Displays (Function)
- Represents Australian Heritage/Culture (Feeling)
- Hub for a Specific Cultural Group (Feeling)
- Interesting/Unique Location (Feeling)
- Location for Entertainment (Feeling)

All four streetscape categories had the following indicators as 'Locational Strengths':

- Pedestrian Comfort (Form)
- PT Movement Priority (Form)
- Comfortable PT Stop (Form)
- Accessible PT Boarding (Form)
- Universal Accessibility (Form)
- Comfort of Crossing (Form)
- Appears Clean/Well-Kept (Feeling)
- Safe to Travel Through (Feeling)
- Welcoming of All Ages/Cultures (Feeling)
- Welcoming of All Income Levels (Feeling)
- Overall Pleasantness (Feeling)
- Safe to Spend Time (Feeling)

Lastly, 'Land Use Diversity' was the only indicator in the 'Over-Performing Indicators' quadrant across all four categories.

These results identify what tram streetscapes across the network are doing well, and what they need to address. The most significant finding for answering Research Question 3 is that 'Shelter from Harsh Weather' is a high priority for improvement for streetscapes across Melbourne's entire tram network.

What Do Similar 'Movement Ranking' Streetscapes Have in Common?

OMI and PCS streetscapes both have 'low movement' rankings, and OPT and PCS streetscapes both have 'high movement' rankings. This section documents indicators placed in the same IPA quadrant across these two 'movement ranking' streetscape pairs to establish evidence that movement ranking impacts perception of the indicator. The following list shows indicators that were ranked as either 'Locational Strengths' or 'High Priorities for Improvement' across movement ranking streetscape pairs:

- **Minimal Visual Clutter** – no commonality across 'Low Movement' streetscapes, 'Locational Strengths' across both 'High Movement' streetscapes.

- **Cyclist Comfort** – no commonality across 'Low Movement' streetscapes, 'Locational Strengths' across both 'High Movement' streetscapes.

- **Grass, Trees, Landscaping** – no commonality across 'Low Movement' streetscapes, 'Locational Strengths' across both 'High Movement' streetscapes.

- **Positive Impact of Design** – 'High Priorities for Improvement' across both 'Low Movement' streetscapes, 'Locational Strengths' across both 'High Movement' streetscapes.

- **Private Vehicle Movement Priority** – no commonality across 'Low Movement' streetscapes, 'Locational Strengths' across both 'High Movement' streetscapes.

- **Presence of Community Services** – 'High Priorities for Improvement' across both 'Low Movement' streetscapes, 'Low Priorities for Improvements' across both 'High Movement' streetscapes.

- **Free of Unpleasant Sounds** – no commonality across 'Low Movement' streetscapes, 'High Priorities for Improvement' across both 'High Movement' streetscapes.

5 of these 7 indicators showed a commonality between one 'movement' ranking streetscape pair. Most were from the 'Form' indicator group, and were classified as 'Locational Strengths' in 'High Movement' streetscapes. However, 'Free of Unpleasant Sounds', was found to be a high priority for improvement in 'High Movement' streetscapes, potentially alluding to higher traffic volumes causing unpleasant noise in these streetscapes. This illustrates that high movement streetscapes are more likely to have higher levels of overall traffic, and that users consider this detrimental to place quality.

'Presence of Community Services' had below average performance in both pairs, but was in the 'High Priorities for Improvement' quadrant in both 'Low Movement' streetscapes (indicating higher than average importance), and in the 'Low Priorities for Improvement' quadrant in 'High Movement' streetscapes (indicating lower than average importance).

Of particular significance is the one indicator placed in opposing quadrants across the movement ranking streetscape pairs. 'Positive Impact of Design' was categorised as 'High Priorities for Improvement' in 'Low Movement' streetscapes, but as 'Locational Strengths' in 'High Movement' streetscapes. This provides reason to believe that a higher degree of tram separation from general traffic, on which the higher movement rankings were based, positively influences user perception of streetscape design.

What Do Similar 'Place Ranking' Streetscapes Have in Common?

OMI and OPT streetscapes both have 'low place' rankings, and PCS and ITS streetscapes both have 'high place' rankings. Similar to above, this section documents indicators placed in the same IPA quadrant across these two 'place ranking' streetscape pairs to establish evidence that place ranking has an impact on perception of the indicator. The following list shows indicators that were ranked as either a 'Locational Strength' or 'High Priorities for Improvement' across place ranking streetscape pairs:

- **Minimal Visual Clutter** – 'Locational Strengths' across both 'Low Place' streetscapes, no commonality across 'High Place' streetscapes.

- **Grass, Trees, Landscaping** – 'Locational Strengths' across both 'Low Place' streetscapes, no commonality across 'High Place' streetscapes.

- **Wayfinding Signage** – 'Locational Strengths' across both 'Low Place' streetscapes, 'High Priorities for Improvement' across both 'High Place' streetscapes.

- **Private Vehicle Movement Priority** – 'Locational Strengths' across both 'Low Place' streetscapes, no commonality across 'High Place' streetscapes.

3 of these 4 indicators showed a commonality between one 'place' streetscape pair, all of which were from the 'Form' indicator group. The remaining indicator had opposing commonalities across the place ranking streetscape pairs. 'Wayfinding Signage' had above average importance in both pairs, but was in the 'Locational Strengths' quadrant in both 'Low Place' streetscapes (indicating higher than average performance), and in the 'High Priorities for Investment' quadrant in 'High Place' streetscapes (indicating lower than average performance). These commonalities help to identify how place ranking impacts perception of the indicators.

Research Question 3 Summary

As a whole, the IPA matrices displayed for each of the four streetscape categories (Figures 8.4 through 8.7), along with the comparative summary shown in Table 8.13, provide key insights that help to answer Research Question 3:

> *What changes can be made to tram modernisation planning and design processes in order to achieve better outcomes for streetscape place quality?*

'Shelter from Harsh Weather' was identified as a high priority for improvement across all four streetscape categories. Tram modernisation projects could achieve better outcomes for streetscape place quality by better addressing this deficiency in design.

'Positive Impact of Design' was found to be a high priority for improvement in streetscapes with low 'movement' rankings, but was a locational strength in streetscapes with high 'movement' rankings. Movement ranking is defined by the degree of separation between trams and general traffic. This indicates modernisation project designs should achieve a higher degree of separation between trams and general traffic in order to provide enhanced outcomes for streetscape place quality.

The mitigation of unpleasant sounds was a high priority for improvement in streetscapes with high 'movement' rankings. This potentially alludes to the typically higher traffic volumes within these streetscapes. Tram modernisation projects that aim to achieve improved outcomes for place quality should investigate the potential to include traffic calming measures, along with other noise mitigation strategies.

Survey respondents also indicated it was a high priority for streetscapes with high 'place' rankings to improve wayfinding signage. In these types of streetscapes, tram modernisation projects should include the addition of wayfinding signage where it is not already offered. In locations where some form of wayfinding signage already exists, the community should be engaged on improvement strategies.

It is important to note that not every tram modernisation project will, or needs to, seek enhanced outcomes for place quality in practice. However, when place quality improvement is a designated goal, these improvements should be addressed based on the 'Movement and Place' context of the location at hand.

8.8 Synthesis of Analysis Findings

The various analyses in this chapter are structured based on the queries of specific research questions. In some cases, however, synthesising the results of separate analyses can provide further insight to specific research questions. The following discussion reiterates the queries of each research question addressed in this chapter, and provides a synthesised summary of relevant findings.

Research Question 2a:

> *Are the differences considered within the tram streetscape categories reflected in average user views of streetscape quality?*

The two analyses conducted specifically for Research Question 2a provided construct validity for the methodology applied in Chapter 5 by identifying commonalities between the characteristics of the tram streetscape categories and the way average user scores changed across those categories. The results, however, more strongly validated the 'movement' classification methodology, as both analyses provided validation evidence. Only one of the two analyses provided evidence that validated the 'place' classification methodology.

The 'movement' classification methodology was further validated by the IPA analysis conducted for Research Question 3. The analysis showed users identified 'Positive Impact of Design' as a high priority for improvement in streetscapes with low 'movement' rankings, but as a locational strength in streetscapes with high 'movement' rankings. This displays evidence that 'movement' ranking had a positive impact on user perception of streetscape design quality, and further validates the methodology applied to classify streetscapes by 'movement' rankings in Chapter 5.

Research Question 2b:

> *Of the three identified thematic groups of place performance indicators, does a particular group have an outsized influence on overall place quality?*

The analysis conducted specifically for Research Question 2b identified the 'Feeling' indicator group as having the highest impact on overall rating of place quality across all four streetscape categories. This was based on the average overall score of the indicator group having a higher correlation to 'Overall Rating of Location' than average scores of the other two indicator groups.

The two analyses conducted for Research Question 2c explored impacts of the individual place quality indicators within each group. Four indicators within the 'Feeling' group were designated as one of the ten most important indicators based on average user score. 'Safe to Travel Through', an indicator within the 'Feeling' group, was ranked as the most important indicator across all four streetscape categories. Additionally, seven indicators within the 'Feeling' group were one of the ten most highly correlated to 'Overall Rating of Location'. 'Overall Pleasantness', an indicator within the 'Feeling' group, was the most highly correlated indicator across all four streetscape categories. These results provide further insight to answer Research Question 2b, by identifying 'Feeling' indicators as highly important to users and strongly correlated to 'Overall Rating of Location'.

Research Question 2c:

> *Which specific place performance indicators (within each of the three thematic groups) are most relevant to overall place quality?*

Across all four streetscape categories, 'Safe to Travel Through' had the highest average importance score. Additionally, 'Overall Pleasantness' showed the highest correlation to 'Overall Rating' of location across all four streetscape categories. These two place quality indicators are therefore the most relevant to overall place quality across the entire tram network, regardless of streetscape category.

The IPA analysis conducted to answer Research Question 3 found that users ranked 'Shelter from Harsh Weather' as a top priority across all four streetscape categories. This provides some additional insight for Research Question 2c, by documenting that improving the provision of shelter across the network would be a useful investment to increase overall place quality.

Research Question 2d:

> *Does the change from legacy to modernised tram streetscapes bring elements that are perceived as adding to and/or depleting place quality?*

Tram modernisation was found to have a statistically significant positive impact on 14 of 16 'Form' indicators (88%), 5 of 12 (42%) 'Function' indicators, and 4 of 13 (31%) 'Feeling' indicators. Of all 41 place quality performance indicators, the only one where tram modernisation was only found to have a statistically significant negative impact was 'Presence of Community Services'. Some relevant contextual information was provided that may help explain this finding.

The IPA analysis conducted to answer Research Question 3 also found relevant information in regard to an increase in 'movement' ranking that often occurs as part of tram modernisation. 'Positive Impact of Design' was a high priority for improvement in streetscapes with low 'movement' rankings, but was a locational strength in streetscapes with high 'movement' rankings. Therefore, in cases where tram modernisation projects increase 'movement' ranking, place quality will be improved

by achieving a higher 'Positive Impact of Design'. However, tram modernisation projects that increase 'movement' ranking need to be cautious of a potential increase in 'Presence of Unpleasant Sounds', as this was designated as a high priority for improvement in streetscapes with high 'movement rankings.

Research Question 3:

> *What changes can be made to tram modernisation planning and design processes in order to achieve better outcomes for streetscape place quality?*

'Shelter from Harsh Weather' was identified as a high priority for improvement across all four streetscape categories. Tram modernisation projects could achieve better outcomes for streetscape place quality by addressing this deficiency in design.

However, it is also worth reiterating the relevant findings of Research Question 2d. Of the 41 place quality performance indicators analysed in the survey, tram modernisation was found to positively impact 23 (56%) to a statistically significant degree. 'Overall Rating of Location' was also significantly positively impacted by tram modernisation. Lastly, 'Presence of Community Services' was the sole indicator found to be negatively impacted by tram modernisation to a statistically significant degree.

This indicates that, all things considered, users view tram modernisation projects as generally improving a majority of place quality indicators, as well as their overall rating of the location, with comparatively few negative impacts as measured by this survey. In summary, existing practice in regard to tram modernisation has been shown to improve place quality. The modernisation planning and design process, therefore, does not necessarily need to change in order to achieve better outcomes for streetscape place quality; however, addressing the 'High Priorities for Improvement' identified in IPA analysis would allow for further enhancements to the improvements in overall place quality that tram modernisation projects already achieve.

8.9 Chapter Summary

This chapter has presented the results of the 'Streetscape Amenity Survey' through various analysis strategies structured by the Research Questions outlined in Chapter 4. The analyses presented in this chapter found that users tended to rank streetscapes in a way that validated the movement and place classifications developed in Chapter 5. It also documented that the 'Feeling' group of place quality indicators tended to be most correlated to overall rating of location.

The top 10 most important place quality indicators, by average score, for each streetscape category were documented, as well as the 10 indicators most highly correlated to overall rating of the location. 'Safe to Travel Through' was documented as the most important indicator, on average, across all four streetscape categories. 'Overall Pleasantness' was the most highly correlated indicator to overall rating of location across all four streetscape categories.

Tram modernisation was found to have a statistically significant positive impact on 14 of 16 'Form' indicators (88%), 5 of 12 (42%) 'Function' indicators, and 4 of 13 (31%) 'Feeling' indicators. Tram modernisation was also shown to have a significant positive impact on overall rating of location. The analysis also found evidence that historical concerns of potential negative impacts of tram modernisation projects were unfounded in the actual results of completed projects. For example, tram modernisation was shown to have a positive impact on 'Private Vehicle Movement Priority'. In general, tram modernisation was found to have many positive impacts on place quality performance indicators, and little-to-no negative impacts.

Lastly, Importance-Performance Analysis (IPA) enabled identification of how the tram modernisation planning and design process can change in order to achieve better outcomes for streetscape place quality. 'Shelter from Harsh Weather' was identified as a high priority for improvement across every tram streetscape category; a key takeaway in answering Research Question 3. Additionally, 'Positive Impact of Design' was categorised as 'High Priorities for Improvement' in 'Low Movement' streetscapes, but as 'Locational Strengths' in 'High Movement' streetscapes. The finding suggests that higher degrees of tram separation from general traffic, on which the higher movement rankings were based, positively influences user perception of streetscape design.

This chapter is the final chapter in Section B of the thesis, where the methodology and applied strategy of 'Classification and Measurement' was documented. Section C begins the conclusion of the thesis, with Chapter 9 using the information presented in this chapter to make policy recommendations on how tram modernisation processes can change to be a tool for streetscape place quality improvement

Section C:

Implications and Recommendations

STOP

9 DISCUSSION AND CONCLUSIONS

This chapter begins Section C of the thesis. It concludes the research by summarising the content, findings, and implications of the eight chapters presented in Sections A and B. The chapter begins with a review of the research objectives as stated in Section A, and includes a discussion of contributions to knowledge made in addressing the objectives throughout Section B. The key findings of the research are summarised through a list of implications for the future direction of tram modernisation and streetscape design in Melbourne. Lastly, a critical assessment of the applied methodology provides recommendations on how to build upon this thesis in future research projects.

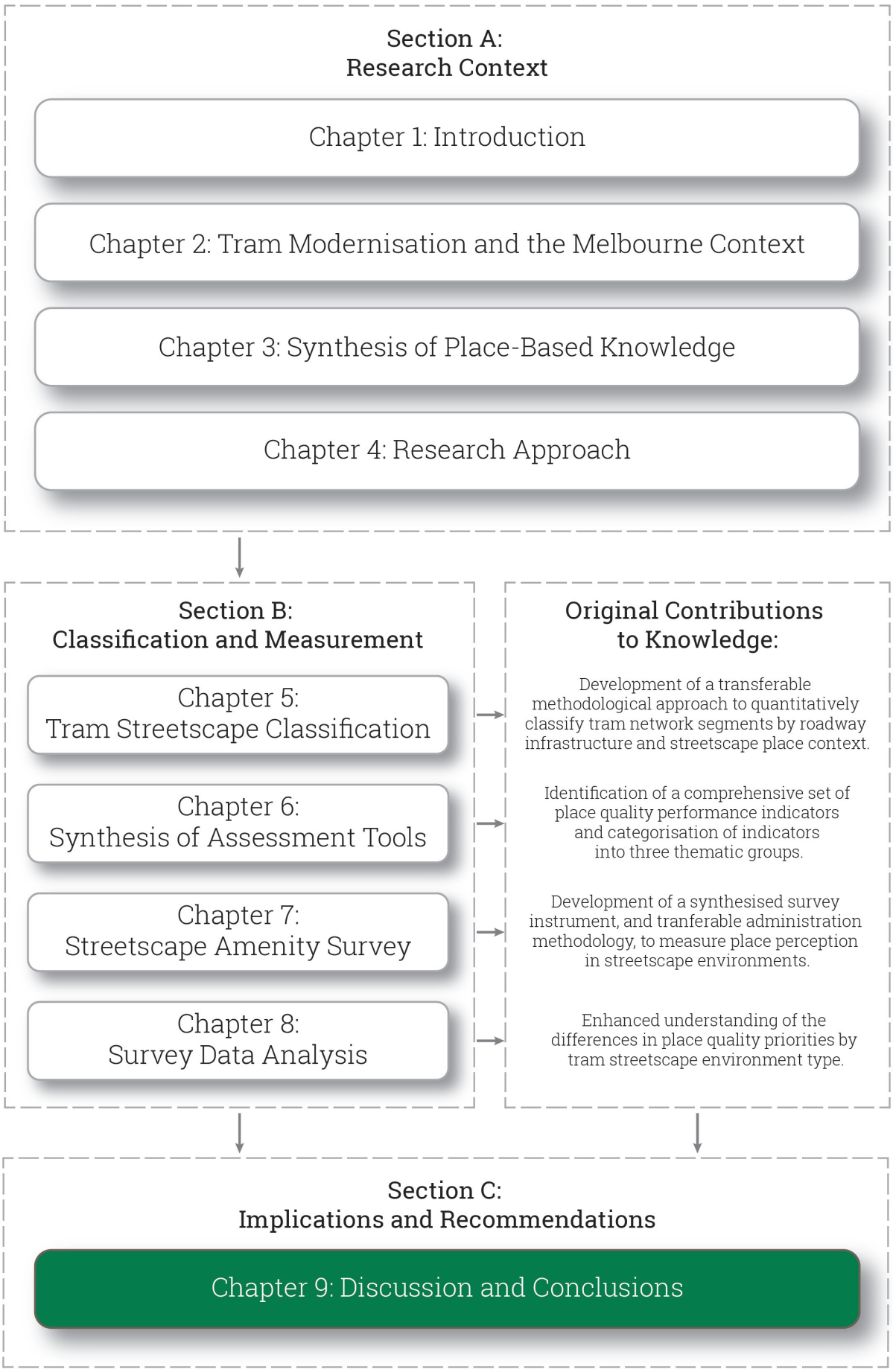

Figure 9.1 – Position of Chapter 9 in the Thesis Structure

9.1 Summary of Aims, Methods, Findings, and Contributions

The overarching aim of the research presented in this thesis is to:

Explore user perception of place quality in the streetscape and enhance understanding of how it may be impacted by various tram infrastructure design schemes.

This aim was addressed through the following Research Objectives:

1. Delineate Variations in Tram Streetscape Environment Characteristics

2. Understand User Perception of Streetscape Place Quality

3. Identify Impacts of Tram Modernisation on Streetscape Place Quality

Additionally, four gaps in place-based knowledge were identified in Section A:

1. Common agreement exists on the notion that tram infrastructure can catalyse and complement broader improvements to overall place quality. But there is a lack of consensus regarding application of improvements across unique sites with differing contexts and needs, as well as methods of measuring impacts.

2. Three 'place perspectives' were identified through synthesis of existing knowledge, based on specific place quality indicators that researchers tend to focus on. However, no comprehensive methodological strategy for analysing all aspects of place quality was identified in existing research outputs.

3. There is a limited amount of research addressing linkages between transport-based design and subjective perceptions of place quality.

4. No studies were identified that measured impacts of tram infrastructure modernisation strategies on user perceptions of streetscape place quality.

In order to fulfil Research Objective 1 (Delineate Variations in Tram Streetscape Environment Characteristics), Chapter 5 applied an adapted version of the 'Movement and Place' classification system to Melbourne's tram network. The classification system resulted in four categories of tram streetscapes, which enabled differences in need to be addressed while still providing a level of consistency across the network. It found that 88% of Melbourne's tram network is housed in corridors with low 'place' rankings (P1 through P3). Additionally, 60% of the network was found to have no physical infrastructure separating trams from general traffic (M1 and M2 'movement' rankings). The 'Movement and Place' classification system, and resulting streetscape categories, were incorporated throughout the remaining chapters to ensure findings were representative of the network as a whole. It provides an original contribution to knowledge via the development of a transferable classification methodology that can be applied to other tram networks around the world.

A review of five practice-based toolsets, presented in Chapter 6, addressed part of Research Objective 2 (Understand User Perception of Streetscape Place Quality) by comprehensively documenting performance indicators for consideration in the measurement of user perception of place quality. Performance indicators were classified into three groups, 'Form', 'Function', and 'Feeling' based on thematic aspects the measures consider. Of the 65 total indicators documented in the review, 36 were selected for incorporation into a synthesised measurement approach based on their inclusion in at least two of the reviewed toolsets. This represents an original contribution to knowledge as it is the first known documentation of a comprehensive set of place quality performance indicators in academic research.

Chapter 7 completed fulfilment of Research Objective 2 by applying the comprehensive set of indicators within a survey instrument designed to measure user perception of place quality in tram streetscapes. Five additional indicators were included in the survey to specifically measure aspects of tram infrastructure modernisation, addressing Research Objective 3 (Identify Impacts of Tram Modernisation on Streetscape Place Quality). Respondents ranked the importance and performance of each indicator, a methodological strategy known as Importance Performance Analysis (IPA) that was

identified in Chapter 3. Video Elicitation Methodology was also incorporated to give respondents an 'in-person' experience via an online survey that enabled them to virtually visit and rank two survey sites. The survey instrument, and the methodology applied in administering it, are an original contribution to knowledge as it is the first known strategy to comprehensively measure the subjective perception of place quality in a streetscape environment. Documentation of the survey administration methodology enables replication of the study in future research projects.

Analysis of the survey results in Chapter 8 brought a conclusion to Research Objective 3 by identifying the impacts of tram modernisation on streetscape place quality. It found that users rank modernised tram streetscapes as significantly higher performing for roadway and footpath design elements ('Form' indicator group) in comparison to legacy tram streetscapes. They were also perceived to be cleaner and more well-kept than legacy tram streetscapes. The top 10 most important indicators, by average score, for each streetscape category were documented, as well as the 10 indicators most highly correlated to overall user perception of the streetscape.

And lastly, the analysis presented in Chapter 8 sorted indicators amongst four IPA quadrants, 'High Priorities for Improvement', 'Low Priorities for Improvement', 'Locational Strengths' and 'Over-Performing Indicators', for each of the four streetscape categories. A key finding was the identification of 'Shelter from Harsh Weather' as a high priority for improvement across all four streetscape categories. The analysis presented in Chapter 8 resulted in multiple original contributions to knowledge. Primarily, it built on the small amount of existing literature that addresses linkages between transport-based design and subjective perceptions of place quality. Additionally, it is also the first known study to measure impacts of tram infrastructure modernisation strategies on user perceptions of streetscape place quality.

Each of the three research objectives were fulfilled and the overall research aim was met. The four identified gaps in place-based knowledge were addressed, which resulted in the research offering four original contributions to knowledge. Table 9.1 provides a summary of the key outcomes of this thesis, based on their alignment to each of the research objectives and original contributions to knowledge.

Table 9.1 – Summary of Key Findings and Contributions

Research Objective:	Original Contribution to Knowledge:	Key Outcomes and Findings:
1. Delineate Variations in Tram Streetscape Environment Characteristics →	Development of a transferable methodological approach to quantitatively classify tram network segments by roadway infrastructure design and streetscape place context. → (Chapter 5)	• Classification of Melbourne tram network segments into four streetscape categories, enabling differences in need to be addressed while still providing a level of consistency in user experience of the network. • 88% of the tram network is housed in corridors with lower place ratings (P1, P2, and P3) and a low-to-medium estimated average travel distance. • 60% of the tram network has no physical roadway infrastructure separating trams from general traffic (M1 and M2).
2. Understand User Perception of Streetscape Place Quality →	Identification of a comprehensive set of place quality performance indicators and categorisation of indicators into three thematic groups. → (Chapter 6)	• Identification of 65 place quality performance indicators through review of five practice-based measurement toolsets. • Organisation of indicators into three thematic groups, 'Form', 'Function', and 'Feeling', based on categorisation of the elements they measure. • Selection of 36 indicators for incorporation in a synthesised measurement approach based on their inclusion across two or more of the reviewed toolsets.
→	Development of a synthesised survey instrument, and transferable administration methodology, to measure place perception in streetscape environments. → (Chapter 7)	• Incorporation of two methodological strategies (Video Elicitation and Importance Performance Analysis), identified in Chapter 3, to measure the 36 place quality performance indicators selected in Chapter 6. • Selection of 24 survey sites representative of the broader tram network through use of the tram streetscape classifications developed in Chapter 5.
→ 3. Identify Impacts of Tram Modernisation on Streetscape Place Quality →	Enhanced understanding of the differences in place quality priorities by tram streetscape environment type. → (Chapter 8)	• Modernised tram streetscapes are significantly higher ranked for roadway and footpath design elements ('Form' indicator group). • 'Safe to Travel Through' is the most important indicator, by mean score, across each streetscape category and the network as a whole. • 'Overall Pleasantness' is the most highly correlated indicator to overall rating across each streetscape category, and the network as a whole. • 'Shelter from Harsh Weather' is the only indicator deemed a top priority for improvement across all four streetscape categories.

9.2 Implications for Practice

The research presented in this thesis utilised Melbourne, Australia as a case study. More specifically, user perception of streetscape place quality along Melbourne's tram network was examined as well as how various corridor design schemes associated with network modernisation might impact that perception. Since this case study was based on a real-world example, several implications for practice were uncovered in the research which are outlined below.

9.2.1 'Movement and Place' as a Powerful Mechanism for Organised Change and Citizen Empowerment

The first gap in knowledge identified in this thesis was lack of consensus regarding how place quality improvements associated with tram infrastructure can be applied across unique sites with differing contexts and needs. Adapting the 'Movement and Place' framework to classify tram network segments by aspects of roadway infrastructure design and streetscape place context provided the research project with a tool to comprehensively examine place quality across Melbourne's tram network. The four streetscape categories that resulted from the classification process formed the basis of site selection for the primary research, and therefore all results were able to be broken down by these categories.

Engineers have long classified streets based on the role they play in through-movement across the network (Jones et al., 2008). But the addition of place context as a factor within such classification systems is a powerful mechanism to better understand the broader purpose of the street, and facilitates a trend towards integrated transport and land use planning (Jones et al., 2008; Suzuki et al., 2013). A design guidelines document could be developed to detail how user priorities change between each of the four streetscape categories, based on the findings of the 'Streetscape Amenity Survey' detailed in this thesis. The guide would provide planners with a detailed standard of place quality priorities, and how they should be applied across different types of streetscapes, as defined by street users themselves.

This leads to the next point which is that 'Movement and Place' provides a new method to facilitate community-led planning when a change in design is needed (Jones and Boujenko, 2009). In the context of tram modernisation, for example, the 'movement' ranking of the streetscape is often changed through the addition of infrastructure separating trams from general traffic. To prepare for that change, planners can use the 'Movement and Place' classification system to identify examples of other streets that already facilitate this movement ranking in a similar place context. These examples can then be presented as design options in a community engagement workshop and empower citizens to make design choices based on real-world examples they will likely already be familiar with. This type of strategy can facilitate implementation of tram modernisation projects, as previous research suggests public involvement in the design process can lessen the politically sensitive nature of transport projects by giving community members a sense of ownership over the project. (Casello et al., 2015; Jones and Thoreau, 2007; Jones et al., 2009).

9.2.2 'Importance Performance Analysis' to Measure Impacts of Change

Building on 'Movement and Place' as a mechanism to facilitate organised change, another gap in knowledge was the lack of consensus on how to measure impacts of place quality improvement strategies. The research presented in this thesis applied a combination of Importance Performance Analysis (IPA) and streetscape categories to measure how changes in the environmental context of streetscapes impacted user perception of place quality. In practice, IPA can also be used in a longitudinal study to assess the impacts of improvement initiatives at one site. For example, a survey such as the 'Streetscape Amenity Survey' instrument developed in this thesis could be administered before and after a tram modernisation project takes place. This would provide a clear indication of the impacts the project had on user perception of streetscape place quality.

9.2.3 Tram Modernisation as Part of a Broader Enhancement of Streetscape Design

The research presented in this thesis found that, under all three definitions of 'modernisation', modernised tram streetscapes were ranked higher than legacy tram streetscapes for the following place quality indicators:

- Pedestrian Comfort
- Public Seating
- Minimal Visual Clutter
- Cyclist Comfort
- Public Transport Movement Priority
- Comfortable Public Transport Stop
- Accessible Public Transport Boarding
- Landmarks/Reference Points
- Grass, Trees, Landscaping
- Wayfinding Signage
- Universal Accessibility
- Private Vehicle Movement Priority
- Comfort of Crossing
- Overall Positive Impact of Design
- Appears Clean/Well-Kept

Essentially, the research has shown that users view modernised tram streetscapes as containing a higher quality design than legacy tram streetscapes. This builds on previous research which has shown modernised tram streetscapes to be safer than their legacy counterparts (Naznin et al., 2016). Additionally, modernised tram streetscapes received a significantly higher 'Overall Rating of Location' than legacy tram streetscapes. This suggests that the higher design quality of modernised tram streetscapes resulted in users perceiving them as higher quality places overall.

These findings present a new opportunity for the way in which tram modernisation could be framed to the public. As detailed in Chapter 2 of this thesis, the Disability Discrimination Act of 1992 laid the foundation for subsequent regulation calling for level-access public transport boarding across Australia. While the regulation itself is not necessarily mentioned in tram modernisation project announcements, the majority of the conversation is typically centred around adding a level-access boarding platform. The findings of this research suggest it may be more effective to present tram modernisation as one piece of a broader enhancement to overall streetscape design. Survey respondents perceived modernised tram streetscapes as performing better for pedestrians, bicyclists, public transport users, and car drivers; in other words, while the primary purpose of tram modernisation is to improve the way the streetscape functions for trams, it often results in better outcomes for all users of the street. Perhaps emphasising the improvements that tram modernisation brings to all users, at least in cases where the design of a particular project makes this demonstrably true, can help to alleviate the politically challenging nature of modernisation projects.

9.2.4 Tram Modernisation Should Be Within the First Stage of Local Redevelopment Plans

A key conclusion of Chapter 5 (Tram Streetscape Classification) was that higher levels of existing place quality complicate the ability to undertake tram modernisation projects. This is primarily due to locations with higher place quality tending to have higher numbers of stakeholder groups with different, and often competing, priorities for streetscape design. The concept was central to naming the 'Movement and Place' streetscape categories, particularly in regard to the 'Politically Challenging Streetscapes' category, where 'place' is ranked relatively high and 'movement' is ranked relatively low. In these streets, the relatively high number of stakeholder groups has complicated the ability to bring tram modernisation projects to fruition.

This provides a basis to suggest that in locations where redevelopment strategies are planned and legacy tram services exist, tram modernisation should be prioritised to occur in the first stage of the plan's implementation. This will provide enhanced locational accessibility in advance of the arrival of new residents and businesses, and will encourage them to make more sustainable transport choices. It will also result in implementation of streetscape designs that, as noted above, this research project has shown users perceived to be of a higher quality. Existing literature has shown that light rail projects are more likely to be successful when paired with broader revitalisation strategies (Cervero, 1984; Priemus and Konings, 2001; van der Bijl et al., 2018). The findings of this research build on that by suggesting tram modernisation projects are more likely to be politically feasible if they occur in the first stage of those broader strategies. It also simply makes sense for tram modernisation to be a first stage of broader redevelopment plans, as previous studies have shown light rail can act as a catalyst for private investment (Cervero and Duncan, 2002; Knowles and Ferbrache, 2016).

9.2.5 Tactical Measures for Improvement

In addition to the previous four implications for practice that are more strategic in scope, a few tactical measures were identified regarding specific ways tram modernisation projects could improve streetscape place quality.

One of these was the identification of 'Shelter from Harsh Weather' as a user-defined priority for improvement across all four streetscape categories. This indicates that corridors across Melbourne's tram network, regardless of streetscape category or presence of modernised infrastructure, are not meeting user expectations in providing shelter from harsh weather. Previous research has shown the quality of the waiting environment to be highly prioritised in street-based public transit modes (Ewing, 2000; Tyrinopoulos and Antoniou, 2008). This finding builds on that by identifying the provision of shelter for weather protection as a primary performance indicator of overall waiting environment quality. The tram network is in a unique position to address this, since many stop precincts across the network provide shelter for waiting passengers. Current shelter designs should be studied to analyse their effectiveness in providing protection from harsh weather conditions, and the addition of shelter at stops that do not already provide it should be prioritised. Additionally, in locations where foot traffic and/or 'place' ranking warrant it, tram stop shelters could be expanded for enhanced integration with the broader public realm. An example shelter design that accomplishes this goal is displayed in Figure 9.2.

Figure 9.2 – Tram Shelter Integrated with the Broader Public Realm in Strasbourg, France

Photo taken by Siegfried Lettko – written permission of use obtained.

The research also found that the two streetscape categories with high 'movement' rankings were associated with unpleasant sounds. High movement streetscapes are more likely to be wider thoroughfares with higher levels of general traffic, and previous research has shown these characteristics increase noise pollution (Houston et al., 2016). Tram modernisation plans should investigate implementing traffic calming strategies in order to facilitate local-access traffic at lower speeds, and encourage through-traffic to move to alternative routes. Aside from addressing unpleasant noise, these mitigation strategies would also likely increase tram corridor safety (Ewing and Dumbaugh, 2009). Where corridor width is abundant, side-running tram tracks could be explored as an option to segregate pedestrians from the roadway. An example that incorporates both of these strategies is shown in Figure 9.3. A footpath, tram stop and tram right-of-way are all on the left-hand side of the streetscape, while a narrow, one-way lane facilitates local access for general traffic on the right-hand side. There is also a landscaping strip and second footpath adjacent to the general traffic lane which is not displayed in this image.

It should not, however, be ignored that streetscapes with high movement rankings are also more likely to have higher levels of tram traffic. It is possible that this, in addition to the higher levels of general traffic, contributes to the unpleasant sounds identified by users. Rail noise absorption technology, planted track and/or green sound barriers, as well as any other possible mitigation strategies should be explored for their ability to address this potential issue.

Figure 9.3 – Side-Running Tram Corridor and Stop Environment in Gold Coast, Australia

Source: Keolis Downer

Two separate pieces of evidence were uncovered identifying strategies for tram stop precincts to better position themselves as a gateway to the locations they serve, based on 'place' ranking. In the two streetscape categories with high 'place' rankings (typically municipal main/high streets and major metropolitan boulevards) users identified 'Wayfinding Signage' as a top priority for improvement. This aligns with previous research that shown information to be a high priority for users at major public transport interchanges (Hernandez et al., 2016). In high 'place' locations, the tram stop precinct should offer the opportunity to familiarise streetscape users with an environment they may perceive as complex and intimidating. While wayfinding signage is often already provided in these locations, it is likely that the signs were lost amongst high levels of activity and therefore were not noticed by survey respondents. Placement, sizing, and other criteria of the signs could be studied to address this problem. Additionally, technology offers the possibility of providing an enhanced wayfinding service to users. Figure 9.4 shows an interactive wayfinding screen where users can obtain customised navigation options.

Figure 9.4 – Interactive Wayfinding Screen at a Los Angeles Metro LRT Station

Source: Los Angeles Metro

In the two streetscape categories with low 'movement' rankings (typically residential streets and neighbourhood shopping strips) users identified 'Presence of Community Services' (libraries, parks/recreation spaces, post offices, schools, etc.) as a top priority for investment. Community services are long-term infrastructure investments that are not needed at every stop, but their identification as a top priority in low 'place' streetscapes indicate users value having these services in neighbourhood-level tram corridors. The tram network should be analysed to identify segments where these services already exist but there is not currently a stop nearby. Those segments should then be prioritised for either a new stop or the relocation of a nearby existing stop. This would enhance the ability for neighbourhood-based tram stop precincts to act as a gateway to the surrounding community.

9.2.6 Summary of Implications for Practice

Five key implications for practice were identified by the research presented in this thesis, as discussed in this subsection. These are summarised below:

1. The 'Movement and Place' classification system is a powerful mechanism for government to facilitate citizen empowerment in the planning and design process.

2. 'Importance Performance Analysis' is a key tool for analysing existing streetscape place quality, as well as the longitudinal impacts of any improvement initiatives.

3. Modernised tram streetscapes were found to have a higher quality of design for pedestrians, bicyclists, public transport, and private vehicles. They were also found to be higher quality locations in general, based on change in overall user rating. Tram modernisation projects should therefore be positioned to the public as one part of a comprehensive strategy to improve the functional design of the broader streetscape.

4. In locations where redevelopment strategies are planned, tram modernisation should be prioritised to occur in the first stage of the plan's implementation. This will provide enhanced locational accessibility in advance of the arrival of new stakeholder groups, and will encourage them to make use of more sustainable transport infrastructure.

5. Tactical measures regarding how tram modernisation can improve streetscape place quality through specific improvement initiatives were also identified:

   a. The provision of shelter should be improved across all Melbourne tram streetscapes.

   b. Unpleasant sounds are associated with 'High Movement' streetscape categories. Mitigation strategies were suggested and should be investigated.

   c. Two findings offered insights to how tram stop precincts can better position themselves as gateways to the surrounding community, based on respective 'place' context.

9.3 Critique and Implications for Future Research

Methodological limitations were documented in various stages of this project. Three primary critiques of the applied methodology, as well as implications of those critiques for future research, are discussed below.

9.3.1 Limitations of Quantitatively Classifying Place Context

The research presented in this thesis developed five 'place types' as part of adapting the 'Movement and Place' framework to Melbourne tram network streetscapes. This involved quantitative analysis of detailed land use characteristics and using the information obtained from the analysis to estimate average distance people travel to reach the tram network segment. The result was five 'place types' (Local, Neighbourhood, Municipal, Regional, and State) defined based on the effect of the available destinations on estimated visitor catchment area.

The 'place types' were one half of each network segment's 'Movement and Place' ranking, with the other half being 'movement type'. These combined classifications formed the basis of the four 'Movement and Place' streetscape categories. As discussed in Chapter 8, the 'Streetscape Amenity Survey' contained direct measurements of aspects considered within the place classification system. However, streetscape types with comparable place types received statistically significant differences in rank of these direct measurements, indicating that survey respondents did not necessarily see the similarities in place context as determined by the classification system.

This observation emphasises the difficulty of quantitatively classifying place context in a way that reflects subjective perceptions across unique sites. It also raises the question of whether it is preferable to investigate user place perception prior to developing a classification system, so that such a system can be informed by more subjective, contextually-sensitive information (Hui et al., 2018; Zemp et al., 2011). An 'Importance Performance Analysis' investigation prior to classification would allow cross-site similarities in user-determined 'importance' ranking of place quality performance indicators to form the basis of place classification. This would enable users to define place context classification groups based on similarities in which place quality performance indicators were prioritised across groups of sites. Future studies could explore this as a possibility, as well as analyse whether user-determined importance rankings validate existing place classification systems.

9.3.2 Trade-Offs Required to Measure Place Quality in a Comprehensive Manner

The lack of a comprehensive strategy to measure overall place quality, as opposed to focusing on one or a few related indicators, was identified as a major gap in academic research in the early stages of this project. The research presented in this thesis filled that gap by incorporating multiple methodological approaches discovered in the literature review to measure a synthesised set of place quality indicators. However, it also offers insight into the practicality of measuring place quality in a comprehensive manner. The 'Streetscape Amenity Survey' asked users to rank the importance and performance of 41 place quality indicators, resulting in 82 questions that respondents answered for two survey sites (164 questions in total between the two sites). This was in addition to questions gathering respondent demographic information, and the roughly one-minute videos respondents watched for each of the two survey sites they ranked.

In short, comprehensively measuring user perception of place quality is a complex and time-consuming task. The large number of performance indicators meant that measuring them had to be simplified to save time. This is why assumptions must be made for some of the findings, such as the association between 'High Movement' streetscape categories and 'Unpleasant Sounds'. To limit the length of the survey, respondents could only indicate the presence of unpleasant sounds and were not given a space to state what they felt was the cause of those sounds. It is suggested that future research should still seek to measure user perception of place quality in a more comprehensive manner, but that this is also followed up with further, more detailed exploration of any identified issues. Qualitative primary research with a focus on the views and preferences of a smaller sample may be an appropriate way to accomplish this.

9.3.3 Constraints of 'Video Elicitation' as a Methodological Strategy

Due to the geographically-sprawling nature of Melbourne's tram network, the 'Streetscape Amenity Survey' incorporated videos to provide respondents with an in-person experience and chance to rank two survey sites from different streetscape categories. The video recording process followed a strict methodology that was designed to reflect the pedestrian experience of each site in a comparable, but unbiased, manner.

The survey results provided clear indication that respondents saw differences in design context ('Form' indicator group) between streetscape categories. To a somewhat lesser extent, differences in place context ('Function' indicator group) were accounted for as well. The last indicator group, 'Feeling', included twelve questions designed to measure change in subjective user perception between streetscape categories. For example, respondents were asked to indicate whether they felt safe spending time in the site they viewed, and whether it seemed welcoming to people of all cultural groups. Changes in the mean scores of indicators within this group between streetscape categories were mostly determined to be statistically insignificant. It is highly likely that survey respondents felt they could not properly gauge the subjective nature of these indicators solely through seeing video recordings of locations they may have little in-person experience with.

Future research could consider the possibility of facilitating in-person analysis strategies such as an intercept survey or structured site visits with a focus group. However, the limitations of these strategies should also be acknowledged. In the case of an intercept survey, for example, the sample will only include people that the researcher(s) encounter in the location. This excludes potentially insightful opinions of those who don't currently have a pre-existing need or desire to be in the location, which has been cited as a critical gap in public transport amenity research (De Gruyter et al., 2019). All methodological strategies will have certain limitations and these should be considered based on the specific context of the project at hand.

9.3.4 Limited Statistical Analysis of the 'Streetscape Amenity Survey'

It is acknowledged that only a limited statistical analysis of the 'Streetscape Amenity Survey' is presented in this thesis, and that there is great potential for further analysis to be done. For example, differences in place priorities between various demographic groups could be explored. Regression analysis could be incorporated to explore relationships between specific place quality indicators. This could potentially help answer additional questions that arose in the analysis, such as whether higher levels of general traffic or higher levels of tram traffic were the cause of unpleasant sounds being associated with 'high movement' streetscape categories.

The scope of the analysis strategy, as presented in Chapter 8, was specifically designed to answer the stated research questions and therefore meet the overall aim of the thesis. Any further analysis of the survey data that builds upon this scope can be accomplished in future inquiries.

9.3.5 Summary of Critique and Implications for Future Research

Critiques of the methodological approach applied in this research project resulted in four key suggestions for future research directions:

1. The limitations of quantitatively classifying place context through a detailed land use analysis strategy were discussed. Classifying place context via cross-site similarities in user-determined 'importance' ranking of place quality performance indicators is suggested as one possibility for future research to address this problem.

2. Comprehensively measuring user perception of place quality is a highly complex task that requires analysis of a large number of performance indicators. Any future studies of a similarly comprehensive nature should plan for follow up projects to explore identified issues in a more detailed manner.

3. The use of Video Elicitation Methodology to analyse complex built environments has its limitations, particularly in regard to measuring subjective and experiential topics. Future research projects should consider whether in-person site visits may better accommodate the specific topics they wish to examine.

4. A limited statistical analysis of 'Streetscape Amenity Survey' data is presented in this thesis and this is acknowledged as a limitation. The analysis accomplished meeting the scope of the research aim, but suggestions were made on how further analysis of the survey data could build upon this scope to obtain enhanced insights.

9.4 Concluding Statement

This thesis has explored user perception of place quality in tram streetscapes. It has provided an enhanced understanding of how perception of streetscape place quality is impacted by various tram infrastructure design schemes; and suggestions for the future direction of Melbourne's tram network modernisation program were made based on the findings. Addressing these suggestions will allow Melbourne to capitalise on a once-in-a-generation opportunity for the dramatic revitalisation of metropolitan, municipal, and neighbourhood streetscapes afforded to the region through the tram network modernisation process.

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Appendix A: Streetscape Amenity Survey

MONASH University

Explanatory Statement

EXPLANATORY STATEMENT

MUHREC Project ID: 17732

Project Title: Streetscape Amenity Survey

Graham Currie	**Matthew Diemer**
Department of Civil Engineering	PhD Candidate
03 9905 5574	0421 109 489
graham.currie@monash.edu	matthew.diemer@monash.edu

You are invited to take part in this study, which is part of a PhD Project currently underway at Monash University. Administration of the study is being completed in conjunction with IPSOS Australia. As per IPSOS Australia policy you will be reimbursed for your time, at a rate of 200 points, if you complete the survey. Participants who do not qualify for the survey will be reimbursed at a rate of 5 points. Finally, participants who start the survey but do not complete it will not receive any points.

Please read this Explanatory Statement in full before deciding whether or not to participate in this research. If you would like further information regarding any aspect of this project, you are encouraged to contact the researchers via the phone numbers or email addresses listed above.

What does the research involve?

The aim of this research project is to analyse amenity performance in streets and their surrounding environments. It also aims to identify any commonalities in how users rank the importance of specific amenity elements.

If you consent to participate in the research, you will be asked to watch videos displaying the environment of various streets and then answer questions gauging your reaction to what you saw. In total, it should take no more than 30 minutes of your time.

Why were you chosen for this research?

You were chosen for this research because you are a resident of inner Melbourne.

Consenting to participate in the project and withdrawing from the research:

Participation in this study is voluntary. The consent process involves checking a 'yes' or 'no' box to indicate whether or not you give your consent at the end of this explanatory statement. You have the right to withdraw from further participation at any stage, along with the possibility to withdraw any answers you provide.

Possible benefits and risks to participants:

This research project has the potential to better inform public decision makers of how community members view best practice in street amenity. If significant commonalities are found in the way that users prioritise street amenity elements, the research can benefit the community through the development of design principles and priorities for street upgrades.

No risks have been identified in participating in this project. In the unlikely chance that any of the questions cause you discomfort you can exit the survey without finishing it or submitting your answers.

Confidentiality:

The main findings of this research will be published as part of a PhD thesis, and are also likely to be published in peer-reviewed journals. However, no personal information is collected in the surveying process so you will not personally be linked to any of the information you provide.

Storage of the Data:

The data will be securely stored on a Monash University PC, in an office with secured entry.

Results:

Please contact the researchers listed at the top of this statement if you'd like to be informed of the results of this research.

Complaints:

Should you have any concerns or complaints about the conduct of the project, you are welcome to contact the Executive Officer, Monash University Human Research Ethics Committee (MUHREC):

Executive Officer
Monash University Human Research Ethics Committee (MUHREC)
Room 111, Chancellery Building D,
26 Sports Walk, Clayton Campus
Research Office
Monash University VIC 3800

Tel: +61 3 9905 2052
Email: muhrec@monash.edu
Fax: +61 3 9905 3831

Thank you,

Graham Currie

I have been asked to take part in the Monash University research project specified above. I have read and understood the Explanatory Statement and I hereby consent to participate in this project.

- ○ I hereby consent to participate in this project.
- ○ I do not give my consent to participate in the project.

Demographics

I identify as:

- ○ Male
- ○ Female
- ○ Other
- ○ Prefer Not to Say

Please select your age group:

- ○ Younger than 18
- ○ 18 - 19
- ○ 20 - 29
- ○ 30 - 39
- ○ 40 - 49
- ○ 50 - 59
- ○ 60 - 69
- ○ 70 - 79
- ○ 80 years or more

What is your current employment status?

- ○ Working Full-Time (38 hours or more per week)
- ○ Working Part-Time (37 hours or less per week)
- ○ Away from Work (on Paid Leave, Maternity Leave, etc.)
- ○ Student (and not working at least Part-Time)
- ○ Unemployed

What is your total yearly income?

- ○ No Income
- ○ $1 - $25,999 per year
- ○ $26,000 - $51,999 per year
- ○ $52,000 - $77,999 per year
- ○ $78,000 - $103,999 per year
- ○ $104,000 or more per year

Please select the council area your household is located in:

What type of device are you completing this survey on?

- ○ Desktop or Laptop Computer
- ○ Mobile Phone
- ○ Tablet
- ○ Other

Start of Survey Info

Please read the following information. It will help you understand how to provide responses to the survey:

In this survey, the word **street refers to**: both the roadway and footpath, any amenities within them, and the design and utilisation of adjacent buildings and open spaces.

The following pages will present videos of **two different types of streets**. You'll be asked to view each video three times, paying specific attention to different aspects each time.

After each viewing, you'll read a list of **characteristics that may or may not be present in the video**. You'll then be asked to rank:

- The importance of this characteristic to you, generally, regarding **the type of street** shown in the video.
- The performance of this characteristic in **the specific street** shown in the video.

It is important to remember that **not all streets serve the same purposes and your responses to the questions may differ** between the two streets you are asked to analyse.

Video #12

The video below this text shows the experience of walking through a location.

Please watch the video at full-screen, with your sound on, **paying specific attention to the design of the location - particularly characteristics of the building frontages, footpath, and roadway**.

The following statements discuss design characteristics that may or may not be displayed in the street shown in the above video. Use the prompts below to state:

- The importance of the design element for **the type of street** shown in the video.

	Importance to you generally, **in this type of street**:				
	Not Important at All	Of Little Importance	Of Average Importance	Very Important	Absolutely Essential
This type of street ...should be comfortable to walk through.	○	○	○	○	○
...should contain landmarks or other easily recognisable reference points.	○	○	○	○	○
...should be designed for private vehicles to move freely with minimal delay.	○	○	○	○	○
...should provide opportunities to comfortably cross the roadway on foot.	○	○	○	○	○
...should make boarding public transport vehicles easily accessible to all, regardless of any personal mobility impairments.	○	○	○	○	○
...should incorporate design strategies that make it a more pleasant space overall.	○	○	○	○	○
...should be free of visual clutter.	○	○	○	○	○
...should have grass, trees, or other landscaping/plantings.	○	○	○	○	○
...should be comfortable to ride a bike through.	○	○	○	○	○
...should provide a comfortable space to wait for public transport services.	○	○	○	○	○
...should be designed for public transport vehicles to move freely between stops with minimal delay.	○	○	○	○	○
...should provide shelter from harsh weather conditions.	○	○	○	○	○
...should have signs that help people find their destination.	○	○	○	○	○
...should be easily accessible to all, regardless of any personal mobility impairments.	○	○	○	○	○
...should include a diverse mixture of building types (residential, commercial, public/open space, etc.).	○	○	○	○	○
...should provide public benches or other seating spaces not associated with a business.	○	○	○	○	○

Please re-read the statements, this time using the prompts below to state:

- Your level of agreement with the statement, for the performance of **the specific street** shown in the video.

	Your agreement with **this specific street's performance**:				
	Strongly Disagree	Slightly Disagree	Neither Agree or Disagree	Slightly Agree	Strongly Agree

	Your agreement with **this specific street's performance**:				
	Strongly Disagree	Slightly Disagree	Neither Agree or Disagree	Slightly Agree	Strongly Agree
This specific street ...is comfortable to walk through.	○	○	○	○	○
...provides a comfortable space to wait for public transport services.	○	○	○	○	○
...is designed for private vehicles to move freely with minimal delay.	○	○	○	○	○
...provides shelter from harsh weather conditions.	○	○	○	○	○
...is free of visual clutter.	○	○	○	○	○
...is easily accessible to all, regardless of any personal mobility impairments.	○	○	○	○	○
...provides public benches or other seating spaces not associated with a business.	○	○	○	○	○
...is comfortable to ride a bike through.	○	○	○	○	○
...incorporates design strategies that make it a more pleasant space overall.	○	○	○	○	○
...is designed for public transport vehicles to move freely between stops with minimal delay.	○	○	○	○	○
...provides opportunities to comfortably cross the roadway on foot.	○	○	○	○	○
...has grass, trees, or other landscaping/plantings.	○	○	○	○	○
...includes a diverse mixture of building types (residential, commercial, public/open space, etc.).	○	○	○	○	○
...has signs that help people find their destination.	○	○	○	○	○
...contains landmarks or other easily recognisable reference points.	○	○	○	○	○
...makes boarding public transport vehicles easily accessible to all, regardless of any personal mobility impairments.	○	○	○	○	○

Please re-watch the video at full-screen, with your sound on, this time **paying specific attention to potential destinations/activities that you might choose to travel to this type of location for**.

The following statements list destinations/activities that might be the reason someone would travel to the street shown in the video. Please read them and use the prompts below to provide your input on the following criteria:

- The importance of this destination/activity being present to you, generally, **regarding the type of street** shown in the video scene.

	Importance to you generally, **in this type of street**:				
	Not Important at All	Of Little Importance	Of Average Importance	Very Important	Absolutely Essential
This type of street ...should have space where small groups could meet or spend time outside/in public areas.	○	○	○	○	○
...should have space (residential and/or commercial) that would accommodate persons of various financial levels.	○	○	○	○	○
...should have space for outdoor play and recreation.	○	○	○	○	○
...should have outdoor café/dining space.	○	○	○	○	○
...should have various sizes of residential space (i.e. apartments, attached town homes, detached homes).	○	○	○	○	○
...should have destinations that fulfil multiple purposes (i.e. entertainment-based AND service-based).	○	○	○	○	○
...should have destinations with attractive signage or other displays along the building frontages.	○	○	○	○	○
...should have space where community events/activities (i.e. markets, club meetings, community gardening, etc.) could occur.	○	○	○	○	○
...should have businesses that are locally-owned and/or unique to the area.	○	○	○	○	○
...should have community services (i.e. a post office, library, community centre, etc.)	○	○	○	○	○
...should have destinations that make it an attractive place to spend time/money.	○	○	○	○	○
...should have various sizes of commercial space (i.e. small shops/cafés, medium size markets/restaurants, big box chain stores).	○	○	○	○	○

Please re-read the statements, this time using the prompts below to state:

- Your level of agreement with the statement, for the performance of **the specific street** shown in the video.

	Your agreement with **this specific street's performance**:				
	Strongly Disagree	Slightly Disagree	Neither Agree or Disagree	Slightly Agree	Strongly Agree
This specific street ...has space where small groups could meet or spend time outside/in public areas.	○	○	○	○	○
...has outdoor café/dining space.	○	○	○	○	○
...has destinations that fulfil multiple purposes (i.e. entertainment-based AND service-based).	○	○	○	○	○

	Your agreement with **this specific street's performance**:				
	Strongly Disagree	Slightly Disagree	Neither Agree or Disagree	Slightly Agree	Strongly Agree
...has space where community events/activities (i.e. markets, club meetings, community gardening, etc.) could occur.	○	○	○	○	○
...has businesses that are locally-owned and/or unique to the area	○	○	○	○	○
...has destinations that make it an attractive place to spend time/money.	○	○	○	○	○
...has community services (i.e. a post office, library, community centre, etc.)	○	○	○	○	○
...has various sizes of commercial space (i.e. small shops/cafés, medium size markets/restaurants, big box chain stores).	○	○	○	○	○
...has space for outdoor play and recreation.	○	○	○	○	○
...has destinations with attractive signage or other displays along the building frontages.	○	○	○	○	○
...has various sizes of residential space (i.e. apartments, attached town homes, detached homes).	○	○	○	○	○
...has space (residential and/or commercial) that would accommodate persons of various financial levels.	○	○	○	○	○

Please re-watch the video at full-screen, with your sound on, this time **paying specific attention to how you feel about the environment it shows**.

The following statements ask about your individual perception of the street. Please read them and use the prompts below to provide your input on the following criteria:

- The importance of this perception to you, generally, **regarding the type of street** shown in the video.

	Importance to you **generally, in this type of street**:				
	Not Important at All	Of Little Importance	Of Average Importance	Very Important	Absolutely Essential

	Importance to you **generally, in this type of street**:				
	Not Important at All	Of Little Importance	Of Average Importance	Very Important	Absolutely Essential
This type of street ...should be clean and well kept.	○	○	○	○	○
...should be welcoming to people of all income levels.	○	○	○	○	○
...should be a pleasant location overall.	○	○	○	○	○
...should be a safe location to travel through.	○	○	○	○	○
...should be an interesting and/or unique location.	○	○	○	○	○
...should be a safe location to spend time.	○	○	○	○	○
...should be a location for social activity to occur.	○	○	○	○	○
...should act as a hub for a specific cultural group.	○	○	○	○	○
...should be welcoming to people of all ages and cultural groups.	○	○	○	○	○
...should represent Australian heritage/culture.	○	○	○	○	○
...should be a location to visit for entertainment.	○	○	○	○	○
...should be a location to visit for personal business or shopping.	○	○	○	○	○
...should generally be free from unpleasant sounds.	○	○	○	○	○

Please re-read the statements, this time using the prompts below to state:

- Your level of agreement with the statement, for the performance of **the specific street** shown in the video.

	Your agreement with **this specific street's performance**:				
	Strongly Disagree	Slightly Disagree	Neither Agree or Disagree	Slightly Agree	Strongly Agree
This specific street ...is clean and well kept.	○	○	○	○	○
...acts as a hub for a specific cultural group.	○	○	○	○	○
...is an interesting and/or unique location.	○	○	○	○	○
...is generally free from unpleasant sounds.	○	○	○	○	○
...is a location where social activity occurs.	○	○	○	○	○
...represents Australian heritage/culture.	○	○	○	○	○
...is a pleasant location overall.	○	○	○	○	○
...is a location to visit for entertainment.	○	○	○	○	○
...is a safe location to spend time.	○	○	○	○	○
...is a location to visit for personal business or shopping.	○	○	○	○	○
...is a safe location to travel through.	○	○	○	○	○
...is welcoming to people of all ages and cultural groups.	○	○	○	○	○
...is welcoming to people of all income levels.	○	○	○	○	○

Please indicate your overall perception of the specific street shown in the video:

- ○ Strongly Negative
- ○ Slightly Negative
- ○ Neutral
- ○ Slightly Positive
- ○ Strongly Positive

Use the space below if you'd like to provide any supplementary information on your response to the above question:

You have reached the mid-point of the survey.

Please press next to repeat the process for one more location.

Video #19

The video below this text shows the experience of walking through a location.

Please watch the video at full-screen, with your sound on, **paying specific attention to the design of the location - particularly characteristics of the building frontages, footpath, and roadway**.

The following statements discuss design characteristics that may or may not be displayed in the street shown in the above video. Use the prompts below to state:

- The importance of the design element for **the type of street** shown in the video.

	Importance to you generally, **in this type of street**:				
	Not Important at All	Of Little Importance	Of Average Importance	Very Important	Absolutely Essential
This type of street ...should be comfortable to walk through.	○	○	○	○	○
...should provide shelter from harsh weather conditions.	○	○	○	○	○
...should provide opportunities to comfortably cross the roadway on foot.	○	○	○	○	○
...should incorporate design strategies that make it a more pleasant space overall.	○	○	○	○	○
...should make boarding public transport vehicles easily accessible to all, regardless of any personal mobility impairments.	○	○	○	○	○
...should contain landmarks or other easily recognisable reference points.	○	○	○	○	○
...should be designed for private vehicles to move freely with minimal delay.	○	○	○	○	○
...should provide public benches or other seating spaces not associated with a business.	○	○	○	○	○
...should include a diverse mixture of building types (residential, commercial, public/open space, etc.).	○	○	○	○	○
...should have grass, trees, or other landscaping/plantings.	○	○	○	○	○
...should be comfortable to ride a bike through.	○	○	○	○	○
...should have signs that help people find their destination.	○	○	○	○	○
...should be free of visual clutter.	○	○	○	○	○
...should provide a comfortable space to wait for public transport services.	○	○	○	○	○
...should be easily accessible to all, regardless of any personal mobility impairments.	○	○	○	○	○
...should be designed for public transport vehicles to move freely between stops with minimal delay.	○	○	○	○	○

Please re-read the statements, this time using the prompts below to state:

- Your level of agreement with the statement, for the performance of **the specific street** shown in the video.

	Your agreement with **this specific street's performance**:				
	Strongly Disagree	Slightly Disagree	Neither Agree or Disagree	Slightly Agree	Strongly Agree

	Your agreement with **this specific street's performance**:				
	Strongly Disagree	Slightly Disagree	Neither Agree or Disagree	Slightly Agree	Strongly Agree
This specific street ...is comfortable to walk through.	○	○	○	○	○
...incorporates design strategies that make it a more pleasant space overall.	○	○	○	○	○
...includes a diverse mixture of building types (residential, commercial, public/open space, etc.).	○	○	○	○	○
...provides a comfortable space to wait for public transport services.	○	○	○	○	○
...has signs that help people find their destination.	○	○	○	○	○
...provides opportunities to comfortably cross the roadway on foot.	○	○	○	○	○
...is comfortable to ride a bike through.	○	○	○	○	○
...provides public benches or other seating spaces not associated with a business.	○	○	○	○	○
...makes boarding public transport vehicles easily accessible to all, regardless of any personal mobility impairments.	○	○	○	○	○
...provides shelter from harsh weather conditions.	○	○	○	○	○
...contains landmarks or other easily recognisable reference points.	○	○	○	○	○
...is designed for public transport vehicles to move freely between stops with minimal delay.	○	○	○	○	○
...has grass, trees, or other landscaping/plantings.	○	○	○	○	○
...is free of visual clutter.	○	○	○	○	○
...is designed for private vehicles to move freely with minimal delay.	○	○	○	○	○
...is easily accessible to all, regardless of any personal mobility impairments.	○	○	○	○	○

Please re-watch the video at full-screen, with your sound on, this time **paying specific attention to potential destinations/activities that you might choose to travel to this type of location for**.

The following statements list destinations/activities that might be the reason someone would travel to the street shown in the video. Please read them and use the prompts below to provide your input on the following criteria:

- The importance of this destination/activity being present to you, generally, **regarding the type of street** shown in the video scene.

	Importance to you generally, **in this type of street**:				
	Not Important at All	Of Little Importance	Of Average Importance	Very Important	Absolutely Essential
This type of street ...should have space where small groups could meet or spend time outside/in public areas.	○	○	○	○	○
...should have various sizes of commercial space (i.e. small shops/cafés, medium size markets/restaurants, big box chain stores).	○	○	○	○	○
...should have community services (i.e. a post office, library, community centre, etc.)	○	○	○	○	○
...should have various sizes of residential space (i.e. apartments, attached town homes, detached homes).	○	○	○	○	○
...should have destinations that fulfil multiple purposes (i.e. entertainment-based AND service-based).	○	○	○	○	○
...should have businesses that are locally-owned and/or unique to the area.	○	○	○	○	○
...should have destinations that make it an attractive place to spend time/money.	○	○	○	○	○
...should have space for outdoor play and recreation.	○	○	○	○	○
...should have destinations with attractive signage or other displays along the building frontages.	○	○	○	○	○
...should have space (residential and/or commercial) that would accommodate persons of various financial levels.	○	○	○	○	○
...should have space where community events/activities (i.e. markets, club meetings, community gardening, etc.) could occur.	○	○	○	○	○
...should have outdoor café/dining space.	○	○	○	○	○

Please re-read the statements, this time using the prompts below to state:

- Your level of agreement with the statement, for the performance of **the specific street** shown in the video.

	Your agreement with **this specific street's performance**:				
	Strongly Disagree	Slightly Disagree	Neither Agree or Disagree	Slightly Agree	Strongly Agree
This specific street ...has space where small groups could meet or spend time outside/in public areas.	○	○	○	○	○
...has community services (i.e. a post office, library, community centre, etc.)	○	○	○	○	○
...has destinations with attractive signage or other displays along the building frontages.	○	○	○	○	○

	Your agreement with **this specific street's performance**:				
	Strongly Disagree	Slightly Disagree	Neither Agree or Disagree	Slightly Agree	Strongly Agree
...has destinations that fulfil multiple purposes (i.e. entertainment-based AND service-based).	○	○	○	○	○
...has various sizes of commercial space (i.e. small shops/cafés, medium size markets/restaurants, big box chain stores).	○	○	○	○	○
...has destinations that make it an attractive place to spend time/money.	○	○	○	○	○
...has space for outdoor play and recreation.	○	○	○	○	○
...has outdoor café/dining space.	○	○	○	○	○
...has space (residential and/or commercial) that would accommodate persons of various financial levels.	○	○	○	○	○
...has various sizes of residential space (i.e. apartments, attached town homes, detached homes).	○	○	○	○	○
...has businesses that are locally-owned and/or unique to the area	○	○	○	○	○
...has space where community events/activities (i.e. markets, club meetings, community gardening, etc.) could occur.	○	○	○	○	○

Please re-watch the video at full-screen, with your sound on, this time **paying specific attention to how you feel about the environment it shows**.

Survey Video 19

The following statements ask about your individual perception of the street. Please read them and use the prompts below to provide your input on the following criteria:

- The importance of this perception to you, generally, **regarding the type of street** shown in the video.

	Importance to you **generally, in this type of street**:				
	Not Important at All	Of Little Importance	Of Average Importance	Very Important	Absolutely Essential

	Importance to you **generally, in this type of street**:				
	Not Important at All	Of Little Importance	Of Average Importance	Very Important	Absolutely Essential
This type of street ...should be clean and well kept.	○	○	○	○	○
...should act as a hub for a specific cultural group.	○	○	○	○	○
...should generally be free from unpleasant sounds.	○	○	○	○	○
...should be a location to visit for entertainment.	○	○	○	○	○
...should be a location for social activity to occur.	○	○	○	○	○
...should represent Australian heritage/culture.	○	○	○	○	○
...should be a location to visit for personal business or shopping.	○	○	○	○	○
...should be a pleasant location overall.	○	○	○	○	○
...should be welcoming to people of all income levels.	○	○	○	○	○
...should be a safe location to travel through.	○	○	○	○	○
...should be welcoming to people of all ages and cultural groups.	○	○	○	○	○
...should be an interesting and/or unique location.	○	○	○	○	○
...should be a safe location to spend time.	○	○	○	○	○

Please re-read the statements, this time using the prompts below to state:

- Your level of agreement with the statement, for the performance of **the specific street** shown in the video.

	Your agreement with **this specific street's performance**:				
	Strongly Disagree	Slightly Disagree	Neither Agree or Disagree	Slightly Agree	Strongly Agree
This specific street ...is clean and well kept.	○	○	○	○	○
...is a pleasant location overall.	○	○	○	○	○
...is a location where social activity occurs.	○	○	○	○	○
...is welcoming to people of all ages and cultural groups.	○	○	○	○	○
...is a safe location to travel through.	○	○	○	○	○
...is a location to visit for entertainment.	○	○	○	○	○
...is an interesting and/or unique location.	○	○	○	○	○
...is generally free from unpleasant sounds.	○	○	○	○	○
...is a location to visit for personal business or shopping.	○	○	○	○	○
...represents Australian heritage/culture.	○	○	○	○	○
...is a safe location to spend time.	○	○	○	○	○
...acts as a hub for a specific cultural group.	○	○	○	○	○
...is welcoming to people of all income levels.	○	○	○	○	○

Please indicate your overall perception of the specific street shown in the video:

- ○ Strongly Negative
- ○ Slightly Negative
- ○ Neutral
- ○ Slightly Positive
- ○ Strongly Positive

Use the space below if you'd like to provide any supplementary information on your response to the above question:

Transport Mode Questions

The following questions ask about your primary mode of transport. Please answer based on the mode used to cover the most distance in your most typical journey.

The primary mode of transport I use on my commute to work/school is:

- ○ Train
- ○ Tram
- ○ Bus
- ○ Walking
- ○ Bicycle
- ○ Car (as Driver)
- ○ Car (as Passenger)
- ○ Other
- ○ Unemployed and Not Studying

The primary mode of transport I use for general travel is:

- ○ Train
- ○ Tram
- ○ Bus
- ○ Walking
- ○ Bicycle
- ○ Car (as Driver)
- ○ Car (as Passenger)
- ○ Other

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