Novice riders use of Powered-Two-Wheelers for commuting: insight using the Theory of Planned Behaviour

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Abstract

Globally the rapid growth of motorisation is creating increasing concerns that affect urban mobility and amenity. Increased motor vehicle ownership and use in urban areas, particularly in developed countries including Australia, has led to the increase of vehicle congestion, elongating travel times and the need to provide more parking facilities in already crowded urban areas. While considerable research attention has been focussing on the challenges associated with increasing private car travel in urban areas, relatively little research has been conducted on the use of alternative motorised forms of private personal transport, specifically motorcycles and motor scooters collectively referred to as Powered-Two-Wheel (PTW) vehicles.

The aim of this research was to develop understanding of the parameters contributing enormously to the use of PTW for commuting, particularly by novice riders who have recently taken up riding. In this context, many studies, which have sought to engage PTW riders in travel related research, as opposed to road safety research, have struggled to recruit participants. An explicit dimension of this research was to examine the effectiveness of strategies designed to maximise the recruitment and retention of study participants. The empirical results highlight the value of using reminders along with a prize draw with one high value prize rather than a number of lower value prizes. Higher recruitment of younger riders was achieved using a professionally designed postcard with a Quick Response Code (QR code), which provided direct access to the survey web site for respondents using a Smartphone. Results of this research provide valuable insight into the range of techniques, which can be used to increase response rate in the researches aiming to recruit PTW riders.

In this research, the extent to, which novice riders commute using a PTW has been analysed through the lens of the Theory of Planned Behaviour. Data collected in a panel survey of novice riders in Victoria, Australia was used to develop a model of commuting by the use of PTW. Attitudinal parameters along with the advantages associated with the use of PTW for commuting were found to explain 55 percent of the variation in the travel behaviour of respondents. Social norms were not found to have a significant effect on the extent to, which novice riders used a PTW for commuting. Results of this research provide new and valuable insights into the researches aiming to develop travel mode choice models, travel assignment models and PTW safety models.

Declaration

I (Babak Amani Jordehi), 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.

Babak Amani Jordehi
06-2016

Publications during enrolment

- Amani Jordehi, B., Rose, G., Johnson, M., “Self-Reported Use of Safety Gear by Riders of Powered-Two-Wheel Vehicles in Victoria, Australia”, Transportation Research Board, Washington D.C., 2015.
- Amani Jordehi, B., Rose, G., “Characteristics and motivations of PTW learner riders in Victoria, Australia”, Transportation Research Board, Washington D.C., 2014.
- Amani Jordehi, B., Rose, G., Thompson, R. G., “Motorcycle and Motor Scooter Use in Victoria, Australia”, Transportation Research Record, Washington D.C., 2013.
- Amani Jordehi, B., Rose, G., Thompson, R. G., “Understanding Characteristics of Learner Riders of Powered-Two-Wheelers in Melbourne, Australia”, World Conference of Transportation Research, Brazil, July 2013.
- Rose, G., Thompson, R. G., Amani, B., “Understanding Ownership and Use of Powered Two Wheelers in Melbourne”, Australian Transport Research Forum, Perth, Australia, September 2012.

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Chapter 1. Introduction

Globally the rapid growth of motorisation is creating increasing concerns that affect urban mobility and amenity. Increased motor vehicle ownership and use in urban areas particularly in developed countries including Australia (Tollman and Rose 2008; United Nations, Bureau International des Expositions et al. 2011) has led to the increase of vehicle congestion, elongating travel times and the need to provide more parking facilities in already crowded urban areas (Tollman and Rose 2008; United Nations, Bureau International des Expositions et al. 2011; Delbosc and Rose 2013). In the research literature, the motor vehicles, particularly the private passenger cars, have been the focus of main attention in the context of their mobility (Sperling and Gordon 2010). In comparison, relatively little research has been conducted on the use of alternative motorised forms of private personal transport, specifically relating to motorcycles, motor scooters and mopeds, collectively referred to as Powered-Two-Wheel (PTW) vehicles (Victoria Government 2012). Particularly when there has been a rapid growth in the sales of road motorcycles in recent years (17.3% between 2010 and 2014) (FCAI 2014), which are more likely to be used for utilitarian transport than ATVs and off-road motorcycles whereas for the same period of time the rate of sale for passenger cars decreased by almost 10 percent (ABS 2015). It emphasises the need for paying greater attention to the use of this mode of travel (PTW). This is a largely unknown aspect as the major areas of PTW research attention, internationally and particularly in Australia, has been largely in the context of their safety (Christie and Harrison 2001; Harrison and Christie 2005; Ibrahim and Sukardi 2011; Barbani, Pierini et al. 2012; French, Gumus et al. 2012; Otte, Jansch et al. 2012; Crundall, van Loon et al. 2013; Barbani, Baldanzini et al. 2014) and to smaller extent to their environmental impacts (Chiou, Wen et al. 2009) and riders' protective clothes (Pierini 2005; Pierini 2009). The opportunities PTW vehicles could present as an urban transport mode have not been investigated in detail (Rose 2009).

However, the safety focus on PTW research is not surprising; given that compared with other road user groups, PTW riders are over represented in crash statistics both in Australia and internationally (De Rome and Stanford 2006; Gkritza 2009; De Rome, Ivers et al. 2011). From an environmental performance perspective, the focus has primarily been on exhaust emissions (Vasic and Weilenmann 2006; Chiou, Wen et al. 2009). While PTWs produce more CO, NO_x and HC emissions in comparison with gasoline powered passenger cars, their CO_2 emissions has been far lower than gasoline passenger cars when CO_2 emission produced by gasoline passenger cars has been a big concern for environmentalist (Vasic and Weilenmann 2006). With this focus on safety and environmental impact of PTWs, considerably less research effort has been devoted to examine the potential use of PTW in terms of urban mobility, particularly considering that both the safety and environmental impacts of PTWs are functions of their use.

Every year in Victoria, Australia over 16,000 people participate in riding training courses, undertake theoretical exams and on-road riding tests to obtain their motorcycle riding learner permit,

but their underlying motivations to obtain a riding permit is not clear. The growing utilitarian use of PTWs (Haworth 2012), in coincidence with growth in PTW sales and decrease in car sales, might be an underlying reason for obtaining a motorcycle riding permit. But the underlying reasons of PTW use and its pattern of use are not clear, particularly as increasing utilitarian use of PTWs is more likely accompanied with their greater share in the urban traffic, which would defiantly have safety and environmental implications.

Therefore, this research focused to identify the underlying reasons motivating individuals to ride a PTW and to understand their riding travel behaviour. The behaviour studied explored the commuter use of PTWs quantified in the form of the proportion of commuting travel days when a PTW was used as the predominant mode of travel. The results of this research provide new and valuable insights into the range of parameters influencing PTW usage pattern, which are not explored in the PTW literature and consequently relevant transport models. There is a capacity to use these research findings in the researches aiming to develop travel mode choice models, travel assignment models and PTW safety models.

Empirical international research has identified the advantages of PTW for urban mobility compared with other transport modes. An economic evaluation by Kopp (2011) explored the effect of growth in PTW traffic (measured in vehicle/km) to the community as their share in traffic increased by 36 percent between 2000 and 2007. Both the costs (e.g. crash, injury, running costs) and benefits (e.g. saving travel time) of using PTWs in the community were investigated. It was reported that shifting to PTW use from car and public transport in Paris, would result to time savings of €293 million, but would respectively increase owners' usage costs and accident costs by €49 million and €49 million along with the estimated negative consequences of air pollution of €22.6. In addition, the negative impact of welfare of the government revenue changes would be €4.7 million. Therefore, in general, there would be benefit for the community by the value of €168 million (Kopp 2011).

In addition, the space on the road required for a motorcycle interpreted as the Passenger Car Equivalence (PCE) is less than a passenger car (Leong, Ibrahim et al. 2006; Lee, Polak et al. 2010) resulting in a lower impact on urban congestion relative to other motor vehicles in the traffic stream. Pena et al. (2014) found that PCE of motorcycles decreases by increase in passenger cars density on the road, as the consequence of filtering by motorcyclists. In the stable traffic the average PCE was found to be 0.29 (lower than traditional PCE of motorcycles used in Colombia, 0.5), whereas in an unstable flow the average PCE of motorcycles obtained was 0.05. This indicates that the impact of motorcycles on the traffic congestion is negligible and motorcycles have a benefit to the traffic and society giving the chance to the riders to pass the congested traffic and keep moving (Pena and Bocarejo 2014). Although bicycles require even less space, but PTWs are motorized vehicles and so they have the advantage of travelling longer distances at higher speed with the capacity to carry a pillion passenger. In comparison with public transport (e.g. bus or train), PTWs have the advantage of being a private vehicle providing the user with independence and more travel flexibility (Kopp 2011). With these

advantages, riders who manage their exposure to potential risk, are likely to find travel advantages associated with use of a PTW in urban areas (Haworth 2012). Given the potentially positive role, PTWs can play in urban mobility and the need for evidence to inform transport public policy, it is important to understand the motivations for PTW licence attainment and use. To address this need, this study focused at the beginning of PTW use, that is the motivations for licensure and PTW use by novice riders. The term 'novice rider' refers to people who have recently obtained a motorcycle riding learner permit or a motorcycle riders' licence[1] (VicRoads 2015).

In addition, focusing on novice riders in this study provided the chance to explore better their motivations and riding travel behaviour of a potentially more homogenous sub-group while their riding motivations and their PTW usage patterns may differ from other groups of riders. The literature recognises the value of market segmentation in developing deeper understanding of somewhat more homogenous sub-groups of the population (Greengrove 2002). Novice riders are one segment of the population of Powered-Two-Wheel (PTW) riders, which also includes long-time riders and returning riders (those who have returned to riding a motorcycle after a break) (Jamson and Chorlton 2009).

Apart from understanding PTW novice riders' motivations and travel behaviour, the evidence indicates it is more difficult to engage PTW riders in research surveys because their response rates are typically half that obtained in travel surveys of the general public (Wigan 2002; 2004; Harrison and Christie 2005). Inclusion of incentives (Seethaler and Rose 2006; Tollman and Rose 2008) and reminders (Kanuk and Berenson 1975; Brennan 1992; Richardson, Elizabeth et al. 1995; Stopher 2012) along with the development of more persuasive communication techniques (Groves, Cialdini et al. 1992; Cialdini 1993) are largely recommended in the literature to engage participants in the study. In the PTW literature, incentives and reminders were the predominant techniques to encourage participants (Christie and Harrison 2003; Voas, McKnight et al. 2007; VicRoads 2009; Gneezy, Meier et al. 2011; Stopher 2012) but there has been little systematic evaluation of the effectiveness of these different approaches on the recruitment and retention of participants in PTW rider studies.

In addition the persuasive communication techniques have rarely been employed in the PTW research however, they have been practiced in different transport researches (Seethaler and Rose 2006; Schrammel, Busch et al. 2013). Therefore, maximising PTW rider recruitment and retention was explored in this study and how the findings contribute to knowledge about engaging PTW novice riders in future research.

[1] Based on Victorian motorcycle licencing rules (VicRoads 2015), the term 'novice rider' refers to individual who obtained their motorcycle learner permit within the last 15 months or who have held their motorcycle riding licence for less than one year.

1.1. Study aim

The aim of this research was to develop understanding of the riding intentions and actual travel behaviour of novice riders. The behaviour studied, explored the utilitarian use (commuting use) of PTWs according to the proportion of commuting travel days when a PTW was used by each individual as the predominant mode of travel.

This study was undertaken in Victoria, Australia located on the south eastern corner of the Australian mainland and is home to about 5.5 million people who reside in about 2.1 million households (Australian Bureau of Statistics 2010). Melbourne, the state's capital is the largest city in the state with a metropolitan population of about 4.1 million (Department of Transport 2008).

In this context a range of parameters providing insight into novice riders' socio-demographic characteristics, motivations, attitudes, perceptions and preferences are potentially relevant. Therefore, this research, identified a range of parameters and explored their relationship with novice riders' riding intentions and behaviours.

The other aspect of this study was to identify recruitment strategies, which could best encourage riders to participate in the research. Therefore, different recruitment strategies including different method of contact and reply (hard copy or professionally designed postcard with QR code) and different values of incentives were examined in a systematic method. QR code stands for (Quick Response code), which is a machine-readable optical barcode and contains information like as survey on-line link.

1.2. Thesis Outline

The structure of this thesis and the relationships between the chapters is illustrated in Figure 1.1. This thesis is divided into two major components: framing the research; and research results and their interpretations (shown on the right hand side of Figure 1.1).

1.2.1. Framing the research

The first thesis component frames the research. Beyond this introductory chapter, chapter 2 presents a review of the literature and identifies the main knowledge gaps. Based on those knowledge gaps, the research aim and key research questions, in the context of novice riders, were developed. Chapter 3 presents the research questions, study design and the theoretical framework, which underpinned this study, namely the Theory of Planned Behaviour (TPB).

1.2.2. Research results and their interpretations

The second thesis component includes the next six chapters, which presents the research results. Chapter 4 presents an analysis of existing available data on PTW use in Victoria, Australia including

household travel survey and licencing data. Outcome of this chapter provided initial insights into PTW riders' characteristics and their patterns of PTW ownership and the findings from this chapter informed the design of focus group discussion topics and interview questions. Chapter 5 presents analyses of the data from the focus groups and interviews to develop a broad picture of novice riders' motivations, perceptions and attitudes towards riding a PTW. Based on the findings from chapters 4 and 5, a panel survey was designed to explore in greater detail novice riders' motivations and expectations along with their actual patterns of PTW ownership and use.

As anticipated, recruitment and retention of novice riders in this study was a major challenge. In chapter 6 strategies used to maximise participants recruitment and retention in the panel survey are discussed. The effectiveness of different strategies, incentives and difficulties encountered are critically considered. Chapter 7 presents the main survey results including analyses of riders' attitudes, characteristics and perceptions as well as their intentions and behaviours. Chapter 8 builds deeper understanding of novice riders' behaviours by drawing on the Theory of Planned Behaviour (TPB). Structural Equation Modelling (SEM) was used to analyse the behaviour of novice riders and identify the relationship between novice riders' motivators, attitudes, preferences and riding experiences with their riding intentions and PTW usage pattern. The results demonstrate the value of exploring novice riders' behaviour through the lens of TPB.

Finally, chapter 9 details the research conclusions drawn from the study and outlines potential future research directions.

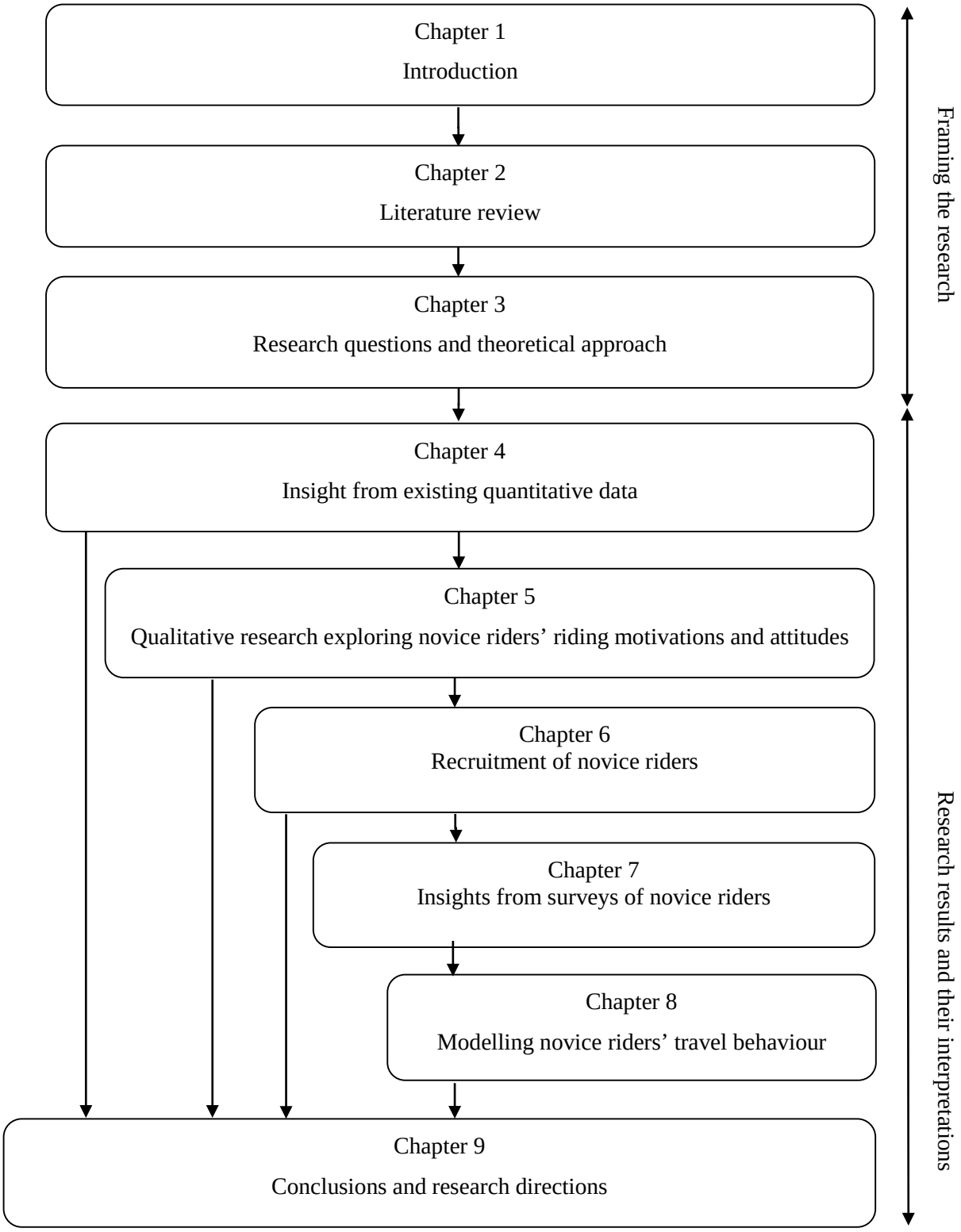


Figure 1. 1. Thesis outline

Chapter 2. Literature review

As identified in Chapter 1, there is potential for Powered-Two-Wheelers (PTW) to improve urban mobility. However, the underlying reasons of owning and using PTWs varies considerably worldwide and they may not be similar in the Australian context.

In East Asian countries, poor urban and land-use planning, a strong preference towards private vehicle but often limited income and inequitable income distribution are all potentially parameters encouraging people to ride a PTW (Sanko, Dissanayake et al. 2006; Prabnasak and Taylor 2008). Moreover traffic congestion and uncompetitive public transport services besides not giving safety the same priority as in developed countries are other motivating parameters (Hsu, Dao et al. 2003).

In East Asian countries, PTW is a preferred mode of travel across low income families (Nagai, Fukuda et al. 2003; Lai and Lu 2007; Leong and Sadullah 2007; Prabnasak and Taylor 2008; Priyantha Wedagama 2009) whereas in developed countries like US, Canada and Holland, PTW riders belong to a higher than average income category (Bates 2000; Motorcycle Industry Council 2009) (Lai and Lu 2007) reflecting differences in the underlying purposes of PTW use across those countries.

The major PTW trip purposes in East Asian countries (Hsu, Dao et al. 2003; Sanko, Dissanayake et al. 2006; Prabnasak and Taylor 2008) and European countries such as Greece (Yannis, Golias et al. 2007) are mostly for commuting, going shopping and school. These trips mostly happen during the weekdays and daytime, instead of night or weekend trips. PTW is more likely to be used as a tool for the purpose of mobility and recreational use is less important. But in countries like US and Canada the most common reason is touring and recreation, which has produced a trend towards higher engine sizes PTWs (Haworth 2012).

Considering that little is known about people's motivations to gain a motorcycle licence or parameters that motivated them to ride a PTW, particularly as novice riders in Australia, the relevant PTW literature of worldwide is studied. Therefore, through an exploratory approach a wide range of studies conducted in both developing and developed countries were identified to explore parameters, which potentially motivated people to ride a PTW and would help to understand their riding travel behaviour. However, the underlying reasons motivated people to own and ride in different countries varies considerably and they may not be the same as in Australia, but identifying those parameters would provide the opportunity to examine them in the Australian context.

The databases and search engines employed to identify the available PTW research and publications included Google and Google scholar and Monash university library search engines (e.g. Compendex, Engineering village and Scopus). In addition, the references of the identified publications were used to find out the other publications relevant to this research. The keywords employed included different combinations of the following words, which were used to identify English language publications both peer and non-reviewed, which were, relevant to the context of this study:

1. Motorcycle,
2. Motor scooter,
3. Moped,
4. Powered-Two-Wheel (PTW) vehicles,
5. Ownership,
6. Use,
7. Motivations,
8. Riders,
9. Novice riders,
10. Recruitment,
11. Retention,
12. Incentives and so on.

Majority of the publications studied were peer-reviewed. Few non-reviewed literature studied mainly included the reports prepared for the Victorian government authorities looking at the context of PTW ownership and use aspects.

In this chapter, the review of the literature starts with exploring the literature related to potential parameters influencing PTW ownership and use. Next, the literature about engaging study participants employing different approaches including incentives, reminders and persuasive communication techniques are studied. Finally, the knowledge gaps are identified and the scope of this research study is introduced.

2.1. Potential parameters influencing PTW ownership and use

In this section, different parameters that have been identified influenced individuals' PTW ownership and usage patterns are discussed. First the review of the literature to identify the potential parameters influencing PTW ownership and use, started by exploring the global perspective of PTW ownership and use. But as limited insight existed to provide a global perspective of PTW use across different countries, reviewing the literature focused to explore their global perspective of PTW ownership. In this context, identifying the global position of PTW ownership in Australia in comparison with other countries, could provide insight into the potential parameters that motivated people to ride a PTW, which varied across different countries resulted to different patterns of PTW ownership.

2.1.1. Global perspective of PTW ownership, a reflection of PTW ownership and use popularity

PTW ownership rates vary widely worldwide. Countries with the highest numbers of PTWs including China (approximately 100 million), India (approximately 40 million) and Indonesia (approximately 30 million) followed by Thailand, Vietnam and Japan (Roger 2008). Worldwide there

are in average 33 mopeds and motorcycles per 1000 persons (Roger 2008). As shown in Table 2.1, the top eight countries all have ownership levels in excess of 100 per 1000 persons while Australia is ranked 115th with 18 per 1000 persons (Worldmapper 2002). PTW vehicle ownership in Australia (18) is similar to that in Chile (18), US (17), New Zealand (21), the Netherlands (25) and the UK (28).

Table 2.1. Countries ranked in terms of mopeds and motorcycles ownership (Worldmapper 2002)

World Rank	Country	PTWs per 1000 persons
1	Malaysia	238
2	Greece	220
3	Thailand	174
4	Cambodia	134
5	Italy	125
6	Japan	106
7	Mauritius	104
8	Switzerland	102
9	Uruguay	101
10	Latvia	95
…	…	…
115	Australia	18

Figure 2.1 presents the spatial distribution of vehicle ownership per capita round the world. This illustration, sourced from Worldmapper (2002) where a collection of world maps in, which countries are resized according to values of a range of variables are provided (such as number of cars, persons, diseases, education levels, etc.) and colours refer to countries. The two components of Figure 2.1 show the contrast between the number of mopeds and motorcycles per 1000 persons (Figure 2.1a) and car ownership (Figure 2.1b). The exaggerated size of China, India and South East Asian countries in Figure 2.1a highlights their very high levels of moped and motorcycle ownership. In contrast, when car ownership is considered (Figure 2.1b), it is the US, Europe, Japan and to smaller extent to Australia, which stands out. Reviewing the literature revealed that In Japan, car and PTW ownership are positively correlated while in Thailand, Malaysia and the US, car ownership is negatively correlated with PTW ownership (Leong and Sadullah 2005; Lai and Lu 2007; Yun, Liu et al. 2013).

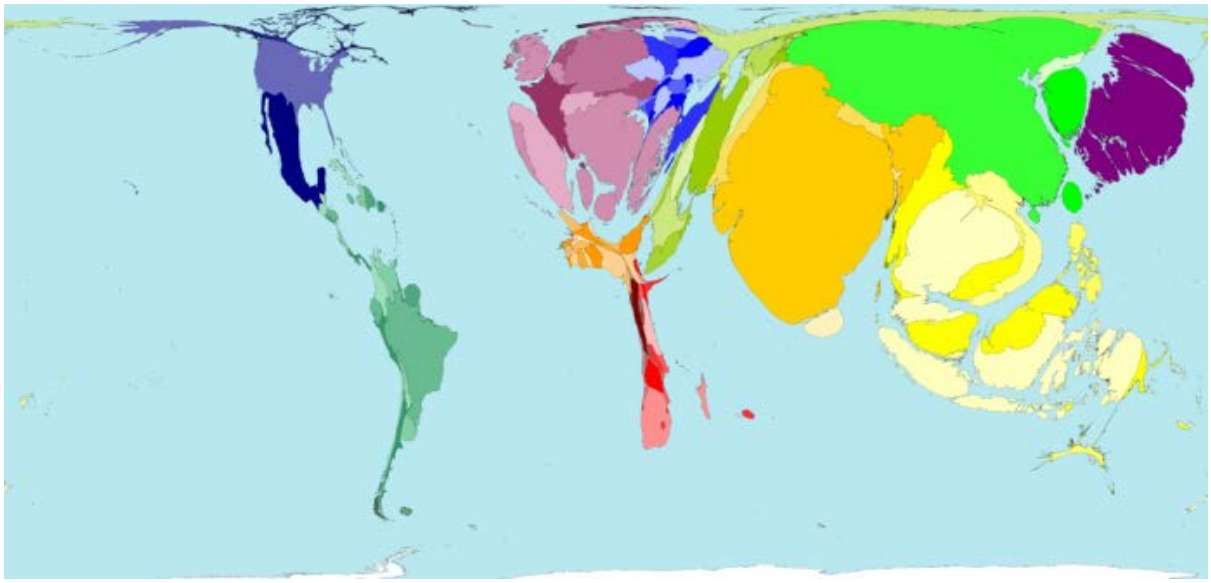


Figure 2.1.a. Mopeds and motorcycles per capita (Worldmapper 2002)

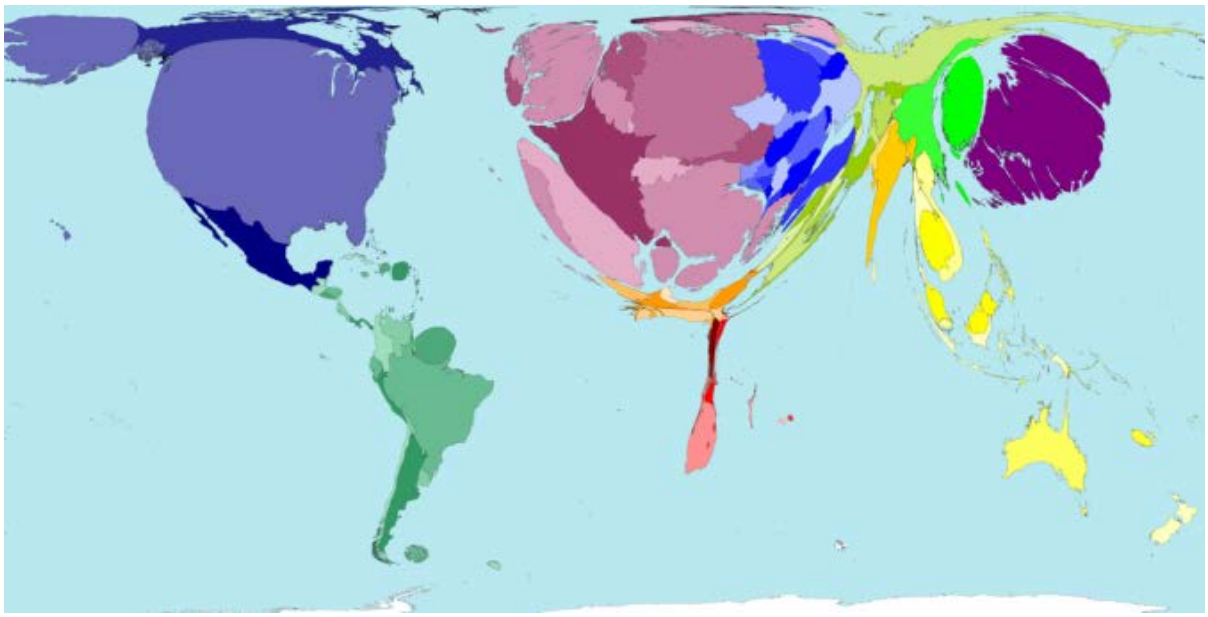


Figure 2.1.b. Passenger cars per capita (Worldmapper 2002)

Figure 2.1. Spatial distribution of vehicle ownership per capita round the world (colours refer to countries)

In Australia, in overall PTW sales (excluding mopeds) increased by 5.4 percent between the 2010 to 2014 (FCAI 2014). The increase in sale of road motorcycles for the same period of time was faster than the broader group of PTWs (17.3% versus 5.4%) (FCAI 2014), which was in coincidence with decrease in the sale of passenger cars by almost 10 percent (ABS 2015).

However, the PTW sales reported in the Federal Chamber of Automotive Industries (FCAI) included only the sale of new PTWs whereas the novice riders might be more interested in second hand

motorcycles. Therefore, an analysis of registered motorcycles was undertaken however, the type of PTWs were not distinguished in the data. It is found that the number of PTWs registered each year sourced from Australian Bureau of Statistics (ABS 2015) stood relatively similar between 2010 and 2014 (36017 for 2010 versus 35422 for 2014). In this context, the more rapid increase in the sale of new road motorcycles in comparison with other type of PTWs when the rate of registered PTWs between 2010 and 2014 stood relatively constant, might indicate the greater sale of road motorcycles than other type of PTWs. Haworth (2012) suggested that increased motor scooter and moped sales in Australia may be due to increasing use of these vehicles for utilitarian use rather than recreation. Increased ownership and integrated daily use may contribute to some growth in the social acceptability of riding a PTW as a mode of transport. The level of popularity or acceptance of riding PTWs in a society can be taken as an indicator of the underlying "social norms" in the favour of riding a PTW. Given the wide variation of PTW ownership and use globally, it is to be expected that the extent to, which it is considered socially normal to ride a PTW varies considerably round the world and can impact the extent of PTW ownership and use. It is expected that greater rate of PTW ownership in countries such as China, India, Indonesia than in the countries like as Australia, is associated with higher level of social acceptance of PTW use in those countries. In this context, the greater acceptance to ride a PTW as a mode of travel in a society, could be an indication of the positive social norm towards the PTW use in that community, playing the role of a motivator rather than discouraging people to ride a PTW.

Social norms represent behaviour that is common in a society (Fujii and Garling 2003; Bogers, Viti et al. 2005; Hensher and Puckett 2007; Svensson 2009) and have been shown to affect individuals' behaviour (Anable 2005). In this context, the sense of belonging to a community such as a club or family tradition has been found to have a strong influence on behaviour (Oakil, Ettema et al. 2011). A study exploring the motivations of people to ride a PTW in US identified that a high proportion of novice riders were encouraged by their friends to ride a PTW (Lee, Pino et al. 2013). In the Australian context, perhaps that the high publicity about Bikie Gangs has produced a strong reaction against PTW – or maybe that has added to the attraction of the mode by people who do not like to conform to the prevailing social norm. However, the role of family or friends in motivating or discouraging people to ride a PTW might be more significant than the role of publicity in a society.

Apart from the role of community and the family in motivating people to ride a PTW, the advantages associated with the use of PTWs in comparison with other modes of travel would attract people to use PTWs. In the next section, the advantages of PTW use in comparison with the other modes of travel and in particular to cars (as the main alternative of private motor vehicle) and to smaller extent to public transport are discussed.

2.1.2. Advantages associated with the use of PTWs

Lower purchase and running costs associated with the use of PTWs as opposed to other private motor vehicles have found to be a significant motivator to use a PTW as opposed to other private motor vehicles. A UK study found that motivations underlying PTW purchase and use decisions have changed over time from the 1950's to the 1990's from concerns about independence and use of PTW to undertake leisure trips to the concerns about running costs of PTWs and avoid congestion (see Table 2.2) (Jamson and Chorlton 2009). Those running costs could range from fixed costs including registration fees or insurance costs to the variable costs including fuel cost, parking fees, toll charges and so on.

Table 2.2. Changes in motivations for PTW purchase and use from 1950's to 1990's (Jamson and Chorlton 2009)

1950s, 1960s, 1970s	1980s	1990s
Independence	Independence	Running Cost
Trip purpose	Trip purpose	Congestion
Leisure	Leisure	Style
	Style	Image
		Speed

It seems that in recent decades economic parameters are considered important by new riders motivating them to ride a PTW. There has been a greater preference to ride mopeds and motor scooters than other types of PTWs as they are mainly associated with the lower engine size capacity and consequently lower fuel and maintenance costs than other type of motorbikes (Jamson and Chorlton 2009). In addition the lower engine size of motorbikes may also be associated with lower registration and insurance costs (VicRoads 2015). Therefore, the preference to ride lower engine capacity motorbikes could reflect riders' stronger desire to reduce their personal travel costs relative to the option of driving a car.

Several studies have investigated the importance of travel cost in the decision to use a PTW. In most South East Asian countries, respondents considered PTWs running costs and in particular parking fees at low or no cost, as important motivators for PTW use (Prabnasak and Taylor 2008; Kepaptsoglou, Milioti et al. 2011). In a study conducted in Queensland, Australia, respondents stated the running cost of mopeds and motor scooters as an important motivator to choose them over other modes of transport. Even their lower running cost was regarded important to choose them over the public transport (Blackman and Haworth 2010) probably due to considering the fare of public transport high along with other parameters. In the US, the lower purchase price and running costs of PTWs were found influence the use of PTWs (Lee, Pino et al. 2013).

Fuel prices and parking availability have been found to influence PTW purchase and use (Coxon 2002; Jamson and Chorlton 2004; Tuan and Shimizu 2005; Blackman and Haworth 2010). Any significant increases in road-use charges like tolls is expected to stimulate the demand for PTWs (Duffy and Robinson 2004). This demonstrates that one reason to choose a PTW as a mode of transport is to reduce personal travel costs.

PTW use is also commonly associated with less travel time than other modes of travel. The time efficiency dimension included both the ease of parking and the ability to negotiate through congested traffic (Wigan 2002). PTW rider's ability to manoeuvre through traffic can save travel time (Hsu, Dao et al. 2003; Leong and Sadullah 2007; Priyantha Wedagama 2009; Kepaptsoglou, Milioti et al. 2011). Wigan (2002) reported that the use of PTWs in Victoria, Australia, reflects the fact that these vehicles offer comparable or superior speed to a car with potentially lower operating costs. The superior performance of PTWs in the context of travel time compared with public transport were also identified as significant motivator for PTW use (Wigan 2002). Coxon (2002) reported that most riders value their time in a different way to other road users and they are less likely to wait for a bus or train. Time and convenience emerged as large concerns for the motor scooter riders who had a 'desire for convenience and particularly freedom of movement (Coxon 2002).

2.1.3. Socio-demographic characteristics

In addition to the social norms and advantages associated with the use of PTWs, individuals' socio-demographic characteristics (e.g. income, age and gender) seem to influence their decision to ride a PTW and its use. However, the influence of these parameters varies considerably from country to country. For instance, the impact of income has been found to vary in different countries, even when the PTWs purchase and maintenance costs are lower than cars (Nagai, Fukuda et al. 2003; Lee, Pino et al. 2013). In South East Asian countries, PTW buyers are predominantly from low and medium income groups (Priyantha Wedagama 2009). Low income is an important determinant of PTW ownership preference over a car (Nagai, Fukuda et al. 2003; Lai and Lu 2007; Prabnasak and Taylor 2008) even when multiple PTW purchases are involved (Leong and Sadullah 2007; Priyantha Wedagama 2009). But in the US, PTW riders belong to a higher than average income category (Motorcycle Industry Council 2009). In the US, income did not define PTW ownership, rather it influenced the type of PTW owned (Bates 2000). In most developed countries, rising income is associated with increasing car ownership with substitution from PTW to car at higher income levels (Sillaparcharn 2007; Kepaptsoglou, Milioti et al. 2011). However, increasing income in most developing countries is associated with increase in both car and PTW ownership (Leong and Sadullah 2005; Lai and Lu 2007).

Reviewing the literature identified that PTW ownership pattern varies by the age, which can reflect changes in the PTW use by the age of riders. In South East Asian countries, PTW ownership is prevalent among younger age groups (Hsu, Dao et al. 2003; Sanko, Dissanayake et al. 2006). In Athens,

Greece, people aged between 24 and 34 years were more likely to own PTWs with ownership less likely among people aged between 35 and 64 years (Kepaptsoglou, Milioti et al. 2011). In UK those people who were in the 25 to 50 years age bracket were more likely to own a PTW (Burge, Fox et al. 2007). Age was also important in understanding variations in PTW use. In Greece, the total distance driven by cars and motorcycles initially rises with the age of the driver (rider) but then declines in older age groups (Kepaptsoglou, Milioti et al. 2011).

Gender is found as an important parameter influencing individuals' PTW use. In most South East Asian countries families with a male primary income earner had much higher annual distance ridden on PTWs (Jou, Kou et al. 2005). Males in Greece and the UK were more likely to own a PTW compared with females (Burge, Fox et al. 2007; Kepaptsoglou, Milioti et al. 2011). A study in New South Wales, Australia, found that novice riders were more likely to be male and employed full-time (De Rome, Ivers et al. 2010). Males were also reported to have higher annual PTW riding distance than females in the studies undertaken in New South Wales and Victoria (Wigan 2002; Harrison and Christie 2005).

In some countries, family size is correlated with PTW ownership and use. In Malaysia and Taiwan larger families are less likely to own and use a PTW (Hsu, Tsai et al. 2007; Leong and Sadullah 2007). In contrast in Indonesia, larger families are associated with higher level of PTW ownership and greater annual distance ridden (Priyantha Wedagama 2009; Priyantha Wedagama 2009). While family size is associated with different patterns of PTW ownership and use in some countries, its importance has not been explored in the context of developed countries like Australia.

Residential location has also been associated with PTW ownership and use. In the UK, people who lived outside metropolitan areas were more likely to own a PTW. In contrast, in Greece, people who lived in the suburbs and low density areas were less likely to own and use a PTW (Burge, Fox et al. 2007; Kepaptsoglou, Milioti et al. 2011).

Therefore, socio-demographic characteristics of the individuals ranging from their income and car ownership to their age, gender and residential location have been identified as influencing PTW ownership and usage patterns.

Apart from the role that socio-demographic characteristics plays on the PTW ownership and use pattern mainly explored in the PTW literature, it seems that individuals' attitudinal characteristics influences their PTW ownership and usage patterns.

2.1.4. Individuals' attitudinal characteristics towards riding a PTW

There is a growing area of research, which seeks to understand the role of a range of personal and attitudinal parameters in vehicle choice decisions and consequently their use. These parameters could include lifestyle, convenience, freedom, attitudes to the environment, concerns over vehicle safety, self-image and enjoyment (Choo and Mokhtarian 2004; Andersson 2005; Johansson-Stenman

and Martinsson 2006; Koppel, Charlton et al. 2008; Plax, Kearney et al. 2008; Jamson and Chorlton 2009). However, the growing understanding of the impact of such parameters are mainly focused in the context of vehicle purchasing decisions rather than their use, which is either largely restricted to cars. But identifying those parameters would provide insight into the range of parameters might influence on the usage pattern of different vehicles, in particular PTWs as the main focus of this study. Limited literature was identified, which sought to understand the importance of attitudinal parameters in decisions to ride a PTW as a mode of transport particularly in the context of novice riders.

While attributes of a mode such as its travel time and travel costs as discussed earlier (Anable, Lane et al. 2006; Galdames, Tudela et al. 2011) are found to be important in choosing the mode of travel, it is clear from the literature that riding a PTW is not simply a logistical transport choice in the context of all PTW riders. Coxon (2002) stated that parameters associated with lower PTWs running costs such as fuel efficiency, which are often mentioned by riders as rational first responses to questions about why they ride are likely to mask more emotional motivations. Beyond these functional parameters, the emotional motivations, what Coxon (2002) calls the 'allure of riding', relate to rider's sense of image and style (Calabrese 1996; Jamson and Chorlton 2009; Chen and Chen 2011). Coxon's study of motor scooter riding in inner Sydney reported that the growing phenomenon of motor scooter riding was about more than just a way to get from A to B and cannot be explained solely through the traditional transport models exploring modes and trips characteristics. For instance, the style was an important parameter for motor scooter users to ride a PTW. They liked to be seen and stand out because of their riding style and were more likely to flout road safety guidelines that leathers and gloves should be worn (Coxon 2002). Their riding style could probably reflect their self-perception towards riding a PTW, which might say what they want that vehicle and their style say about them.

Concerns over the safety of riding PTW may be a discouragement to take up riding (Hsu, Dao et al. 2003; Hsu, Tsai et al. 2007). However, the increased use of PTW in South East Asian countries could be as a result of differences in their perceptions of safety. PTW riders in South East Asian countries do not typically give safety the same priority as in most developed countries. Yet at an individual level, risks associated with riding do not always act as a discouraging parameter. Rather for some people their perception and attitudes towards the risks of riding are a potential motivator.

Some PTW riders derive enjoyment from the risk they face (Broughton and Stradling 2005). Broughton et al. (2005) divided riders to three categories of risk-averse, risk-acceptance and risk-seeker riders. They found that risk seekers enjoyed riding at high levels of perceived risk and were more interested to ride due to the risk the face (Broughton and Stradling 2005), which can be more attributed to recreational trips and to smaller extent to commuting trips. People with an increased propensity for risk or the thrill of riding (Coxon 2002) are more likely to be attracted to motorcycling (Horswill and Helmen 2003; Tunnicliff 2006). However, there are authors that believe riding a PTW cannot be enjoyable as it is associated with high level of risk regarded it as an "extremely risky venture" (Bellaby and Lawrenson 2001).

Furthermore, an individuals' values and emotions towards riding a PTW can also influence their PTW ownership and usage pattern (Stringer 1981; Ben-Akiva, Walker et al. 2002). Studies have reported a sense of the excitement of riding (Haworth 2012) like thrilling and impressing others (Watson, Tay et al. 2003). In the US, PTW riders were more attracted to the thrill of PTW riding and the freedom that it offered than to its lower costs (Lee, Pino et al. 2013). In the UK and Australia, the enjoyment of riding a PTW has been identified as a significant parameter in motivating people to ride a PTW (Burge, Fox et al. 2007; Blackman and Haworth 2010). Coxon (2002) contrasted safety with the 'buzz' parameter produced when riders view each journey as an adrenalin fuelled adventure stimulated by the sensation of speed. Riders spoke of a perceived heightened state of awareness and alertness, a 'high' or 'buzz', which comes from riding; and riders rode for the journey rather than the destination. The sense of enjoyment from using the PTW is usually characterised by the sense of freedom, heightened awareness and engagement in taking risky activities (Blackman and Haworth 2010). It is reported that regardless of trip purpose, the time spent riding a PTW is usually regarded by riders as enjoyable (Burge, Fox et al. 2007).

In the context of PTW environmental impacts, Blackman et al. (2010) found that PTW riders were not particularly motivated by concerns over environmental impacts. However, those who mentioned environmental parameters alluded to lower fuel consumption and lower vehicle emissions as key considerations.

Therefore, individuals' perception towards riding a PTW seems to influence their PTW ownership and use patterns when their perceptions are influenced by a range of parameters. Those parameters include an individuals' sense of style and image of riding, their risk perception towards PTW riding and their sense of enjoyment and excitement of riding a PTW. Exploring these parameters could provide insight into individual's perceptions towards riding a PTW, which can be interpreted broadly as a presenter and indicator of an individual's 'attitude' towards riding a PTW.

Reviewing the literature identified that along with the parameters identified up to this stage, individuals who had a prior PTW riding experience where more likely to ride a PTW in future. Next section reviews the literature about that context.

2.1.5. Prior PTW riding experience

Individuals with riding experience prior to obtaining their riding permit were more likely to use a PTW as a mode of transport. In the US, Lee et al. (2013) found that across those who had participated in motorcycle riding training courses, over a third (36%) had prior riding experience and novice riders with previous riding experience were more likely to engage in risky riding behaviours (Lee, Pino et al. 2013). In a study of novice riders in New South Wales, Australia, De Rome et al. (2010) reported that 38 percent of participants had ridden a PTW on the road before they had obtained their riding learner permit. These findings suggest that people with prior riding experience might have had a greater sense

of confidence about their ability and control to ride, which could be an indicator of their greater "perceived behavioural control". While prior PTW riding experience may be unlicensed riding and therefore, previous experience could be a marker for risk taking or willingness to violate rules or could be legal off-road riding, it potentially means that novices have better skills.

Perceived behavioural control refers to an individuals' perception of the ease or difficulty along with their confidence to perform a behaviour, in this study, PTW use. Consequently, perceived behavioural control is dependent upon the resources available and the situations people are in, previous experiences and the relative advantages of performing the task (Ajzen 1991; Bamberg, Ajzen et al. 2003). In the context of this study, the relative advantages of performing a task could refer to the advantages associated with the use of PTWs in comparison with other modes of transport. As PTWs advantages provided the riders the opportunity to reduce their personal travel costs. Perhaps individuals with a greater perceived behavioural control towards riding a PTW are more likely to ride a PTW.

After drawing on the literature to identify the parameters influencing people's decision to ride a PTW and their PTW use, the next section reviews the literature of PTW study participant recruitment including persuasion, incentives and retention.

2.2. Challenges of recruitment in PTW research

A challenge associated with many research projects is recruiting sufficient participants to be able to model and study the behaviour of interest. Recruitment has presented a major issue in previous PTW studies with PTW riders particularly reluctant to participate in research studies. Internationally, response rates for PTW ownership and use research have ranged from 5.6 percent in Taiwan (Chiou, Wen et al. 2009; Wen, Chiou et al. 2012),, 20 percent in the UK (Jamson and Chorlton 2009) to 87 percent in Malaysia (Leong and Sadullah 2007) and 88 percent in Taiwan (Chen and Chao 2011). Response rates have been higher for safety focused PTW research internationally, ranged from 65 percent in UK (Conner, Lawton et al. 2007) to 80 percent in Taiwan (Chen and Chen 2011) and 87-92 percent in Iran (Aghamolaei, Tavafian et al. 2011; Schrammel, Busch et al. 2013).

Similar challenges are evident in Australian studies as again safety focused research achieved higher response rates ranged from 31 percent (Tunnicliff, Watson et al. 2012) and 37 percent in NSW (Harrison and Christie 2005) to 66 percent in NSW (De Rome, Ivers et al. 2011). Whereas for PTW ownership and use studies, the highest response rates obtained in Australian context were 45-49 percent in Victoria (Haworth and Mulvihill 2003; Richardson and Richardson 2009) and the minimum of 15 percent in another study reported for Victoria (Wigan 2002). The wide range of rate of responses across different studies could represent the impact of different recruitment approaches employed in those researches along with parameters, which might be attributed to the countries where the surveys were undertaken. The next section discusses the range of approaches employed in the literature to recruit

PTW riders in the PTW researches. First, the influence of difference contact approach are explored. Then the importance of incentives and reminders are discussed.

2.2.1. Recruitment methods

Table 2.3 presents the rate of response and the particular recruitment strategy used across different PTW studies worldwide. However, in those studies, the details are not always provided to enable the stated response rates to be checked or to confirm that they have been calculated correctly. In Table 2.3, the studies are classified on the basis of the method of data collection followed by the country of study and response rates. As can be seen in the Table 2.3 many studies reported the number of respondents but not all of them reported either the size of the target population or the response rate of the study.

As highlighted by Table 2.3, regardless of the country where the study was conducted, interview surveys had the highest response rates of about 90 percent (Leong and Sadullah 2007; Aghamolaei, Tavafian et al. 2011; Mehri, Mazloomy et al. 2011). In addition, studies when individuals were asked to complete the survey on the spot, had mixed but also generally good response rates. In Australia, De Rome et al. (2010; 2011) and in US, Lee et al. (2013) had reported the contact spot to the riders at the rider training centres. In UK, Broughton et al. (2005) reported the contact spot at the racing track, whereas in Taiwan the participants were recruited randomly on the street (Hsu and Lin 2007).

The response rates achieved in these studies varied from 51 percent in US (Lee, Pino et al. 2013) and 66 percent in Australia (De Rome, Ivers et al. 2011) up to as high as 85 percent in Australia (De Rome, Ivers et al. 2010) and 88 percent in Taiwan (Hsu and Lin 2007; Chen and Chao 2011). Therefore, in the studies, which respondents were contacted directly (e.g. face to face interaction), either in the form of interviews or asking them to fill the survey on the spot, high response rates were achieved.

When the above-mentioned methods (interviews and recruiting individuals from the target group to complete the survey on the spot) achieved a reasonably good response rates, the response rates for studies employing self-completed questionnaires mailed to the target group was lower. It varied from almost 6 percent (Chiou, Wen et al. 2009; Wen, Chiou et al. 2012), 15 percent (Wigan 2002) and 31 percent (Tunnicliff 2006; Jamson and Chorlton 2009; Tunnicliff, Watson et al. 2012) to up to 49 percent (Haworth and Mulvihill 2003; Harrison and Christie 2005; Richardson and Richardson 2009). However, this wide range of response rates could have been largely as the consequence of difference in the use of reminders, incentives and the context of study (studying PTW safety versus PTWs ownership and use). As discussed earlier, studies focusing on PTW ownership and use had obtained lower response rates than other PTW studies particularly the studies in the context of safety. In the studies conducted in Taiwan (Chiou, Wen et al. 2009; Wen, Chiou et al. 2012), Australia (Wigan 2002) and UK (Jamson and Chorlton 2009), focused on the PTW ownership and use, the response rate of 6-20 percent, which was lower than other studies was obtained. The lower rates of responses could probably have been

obtained due to not using incentives or reminders in those researches, as their use was not reported in those studies. However, in another study (Tunnicliff, Watson et al. 2012) were the use of incentives and reminders were not either reported the higher response rate (31%) was reported probably due to the safety focus of the research rather than PTW ownership and use. Finally the studies, which had employed either incentives or reminders achieved the highest response rates ranging from 37 percent (Harrison and Christie 2005) up to as high as 49 percent (Haworth and Mulvihill 2003; Harrison and Christie 2005; Richardson and Richardson 2009).

In Australia the most frequently used method for recruiting PTW riders into research studies has been posted hard copy surveys (Wigan 2002; Haworth and Mulvihill 2003; Harrison and Christie 2005; Tunnicliff 2006; Richardson and Richardson 2009; Tunnicliff, Watson et al. 2012). The response rates in those studies was calculated from the number of survey questionaries mailed to a proportion of the population of the study. In those studies the details of the main population of the study and the respondents extent of representativeness of the population of the study was not discussed. In this context, as a couple of those studies had reported low response rates, it might raise serious questions about the impact of non-response bias in those studies, but the authors did not discussed about that issue.

A few of the PTW studies, which mainly focused on novice riders recruited them on the spot. The response rate obtained in those studies ranged between 51 percent in the US (Lee, Pino et al. 2013) and 66 percent (De Rome, Ivers et al. 2011) to 85 percent (De Rome, Ivers et al. 2010) in Australia. In the PTW researches where the survey questionnaires were mailed to the target group the rate of response obtained has not been distinguished for novice riders and their likelihood to reply the mailed survey has not been reported in the literature.

Next the use of different techniques to increase the response rates in the literature are discussed.

Table 2.3. Data collection method and number of respondents in PTW studies

Data/method	Country category	Location (Reference)	Overall context	No. of respondents /Follow up respondents	Rate of response/ Follow up rate	Studied novice riders	Incentives/ Reminders	Further details provided (e.g. Selection criteria, contact method)
Survey/Interview	Developing	Iran (Aghamolaei, Tavafian et al. 2011)	Safety	221	91.7%	Not separated/ specified	Not specified	241 motorcycle riders contacted at petrol stations
		Iran (Mehri, Mazloomy et al. 2011)	Safety	130	87%	Not separated/ specified	Not specified	150 employed motorcycle riders were contacted
		Malaysia 2007 (Leong and Sadullah 2007)	PTW ownership/use	735	86.7%	Not separated/ specified	Not specified	No further detail provided
Survey/ Distributed or completed the questionnaire on the spot	Australia	NSW (De Rome, Ivers et al. 2010)	Previous riding experience	1006	85%	Yes	Not specified	1182 Learner riders were contacted at the rider training centres
		NSW (De Rome, Ivers et al. 2011)	Safety	776	66%	Yes	Not specified	1182 Learner riders were contacted at the rider training centres
	Other developed	US (Lee, Pino et al. 2013)	Riders' attitudes	500	51%	Yes	Not specified	976 survey questionnaires were distributed at the rider training centres
		UK (Broughton and Stradling 2005)	Riders' attitudes	165	Not specified	Not separated/ specified	Not specified	Collected at racing track
	Developing	Taiwan (Chen and Chao 2011)	PTW ownership/use	442	88.4%	Not separated/ specified	Not specified	550 individuals who used private vehicle for commuting were contacted at main city locations (e.g. shopping malls)
		Taiwan (Hsu and Lin 2007)	PTW ownership/use	336	84%	Not separated/ specified	Not specified	400 individuals were randomly contacted on the roadside

Data/method	Country category	Location (Reference)	Overall context	No. of respondents /Follow up respondents	Rate of response/ Follow up rate	Studied novice riders	Incentives/ Reminders	Further details provided (e.g. Selection criteria, contact method)
Survey/Self completed questionnaire was posted	Australia	Victoria (Haworth and Mulvihill 2003)	PTW ownership/use	1948	48.7%	Responses comprised 275 new riders	Reminder was posted two weeks later	4000 holders of Victorian motorcycle licences aged over 30 provided by VicRoads
		Victoria (Richardson and Richardson 2009)	PTW ownership/use	688	45%	Not separated/ specified	Reminder call after two weeks	All motorcycle licence holders identified in the main VISTA07 survey
		NSW (Harrison and Christie 2005)	Safety	2226/794	37%, 44%	Not separated/ specified	Full set of motorcycle protective clothes with helmet	Stratified list provided by NSW roads and traffic Authority comprising of 6000 motorcycle owners covering the NSW
		QLD (Tunnicliff, Watson et al. 2012)	Safety	229	31%	Not separated/ specified	Not specified	738 questionnaire were distributed across those who had participated “rider survivor” public events and a random sample of private company
		QLD (Tunnicliff 2006)	Riders’ attitudes	229	31%	Not separated/ specified	Not specified	738 questionnaire were distributed across those who had participated “rider survivor” public events and a random sample of private company
		Victoria (Wigan 2002)	PTW ownership/use	154	15.4%	Not separated/ specified	Not specified	Tel, mail, direct response survey were undertaken of approximately1000 people (No further detail was provided)

Data/method	Country category	Location (Reference)	Overall context	No. of respondents /Follow up respondents	Rate of response/ Follow up rate	Studied novice riders	Incentives/ Reminders	Further details provided (e.g. Selection criteria, contact method)
	Other developed	UK (Jamson and Chorlton 2009)	PTW ownership/use	1009	20%	Not separated/ specified	Not specified	Stratified list comprising 5300 registered keepers of a PTW provided by UK driver vehicle licencing authority
	Developing	Taiwan (Chiou, Wen et al. 2009)	PTW ownership/use	2536	5.6%	Not separated/ specified	Not specified	45000 questionnaires were posted to motorcycle owners randomly drawn from a stratified list of Taiwan's Vehicle Registration database
		Taiwan (Wen, Chiou et al. 2012)	PTW ownership/use	2536,1134	5.6%, 44.7%	Not separated/ specified	Not specified	45000 questionnaires were posted to motorcycle owners randomly drawn from a stratified list of Taiwan's Vehicle Registration database
		Indonesia (Priyantha Wedagama 2009)	PTW ownership/use	315	Not specified	Not separated/ specified	Not specified	The questionnaires were distributed with the stratified random sampling technique for the households, which own motorcycle
Survey/ No details were provided	Other developed	Greece (Kepaptsoglou, Milioti et al. 2011)	PTW ownership/use	8300	Not specified	Not separated/ specified	Not specified	Collected through an extensive questionnaire based survey in the Athens

Data/method	Country category	Location (Reference)	Overall context	No. of respondents /Follow up respondents	Rate of response/ Follow up rate	Studied novice riders	Incentives/ Reminders	Further details provided (e.g. Selection criteria, contact method)
	Developing	Taiwan (Chen and Chen 2011)	Safety	277	80%	Not separated/ specified	Not specified	350 questionnaires were delivered to individuals who were willing to take part in this survey informed earlier bout the survey (No further detail is provided)
		Thailand (Prabnasak and Taylor 2009)	PTW ownership/use	2484	Not specified	Not separated/ specified	Not specified	Extracted from the Kaen Daily Household Travel Survey 2007 (No further detail is provided)
Simulator	Australia	Victoria (Liu, Hosking et al. 2009)	Safety	49	Not specified	37	Not specified	Recruited from advertisements placed at the Honda Australia Rider Training Centre
	Other developed	UK (Conner, Lawton et al. 2007)	Safety	83	65%	Not separated/ specified	15 pound	128 participants were recruited from a sample of previously volunteered participants in studies using simulator
		UK (Crundall, Stedmon et al. 2013)	Safety	61	Not specified	20	Not specified	No further detail is provided

2.2.2. Incentives

Incentives can motivate potential respondents to participate in surveys and their use is highly recommended in the general literature (Brennan 1992; Cobanoglu and Cobanoglu 2003; Cantor, O'Hare et al. 2008; Dillman, Smyth et al. 2009; Singer and Ye 2013). Similarly, Gneezy et al. (2011) reported that incentives and prize draws could increase response rates but they reported that the effectiveness of incentives is to a large extent dependent on the prize values and number of the prizes. They found that as a general recommendation the value of the incentive is more important than the number of incentives however, there is not a clear rule for the selection of the best amount and number of incentives (Gneezy, Meier et al. 2011). However, a higher value of incentive seems to attract greater number of respondents (Cobanoglu and Cobanoglu 2003; Gneezy, Meier et al. 2011; Singer and Ye 2013).

The PTW literature is largely silent on the use and effectiveness of incentives with little explicit consideration of how to choose the best value or number of incentives to maximise recruitment of motorcyclists for a study. When the use of incentives has been rarely reported in the PTW literature, Harrison et al. (2005) offered a full body motorcycle protective clothes (riding gear) as the incentive prize to increase the survey response rate in a safety focused study. The final response rate achieved from the target group, which the survey questionnaires were mailed to, was about 13 percent (794 out of 6,000).

2.2.3. Reminders

In the context of studies in, which the surveys were either mailed or emailed to the target population, those, which used reminders achieved a higher response rate of close to 50 percent (Haworth and Mulvihill 2003; Richardson and Richardson 2009). In both of those studies, those individuals in the target group who had not retuned the survey, were contacted by phone call or mail to remind them of the survey. However, a high response rate in the study undertaken by Haworth et al. (2003) could probably be attributed the age of target group as they only recruited the individuals who aged greater than 30 years old along with the use of reminders. In a study undertaken by Cull et al. (Cull, O'Connor et al. 2005) the invitees aged between 31 to 54 years old and it was found that younger riders had a higher response rates.

In addition to the study reported by Richardson et al. (2009), the target group was recruited from a list of respondents who had earlier participated in the survey who probably were more likely to do the follow up surveys resulting to high response rates.

The response rates in studies who did not use reminders was lower between 6 percent (Chiou, Wen et al. 2009; Wen, Chiou et al. 2012) and 37 percent (Harrison and Christie 2005), which varied as the consequence of using incentives and other recruitment strategies.

Scott (1961) described follow ups (e.g. reminder) as “the most potent technique yet discovered for increasing the response rate” (p. 164). Using reminders (Kanuk and Berenson 1975; Stopher 2012)

and providing reminders more than once (e.g. two times) have been found to be more useful (Brennan 1992; Stopher 2012). Sending a single reminder was reported to increase the response rate but the impact was not as dramatic as when multiple reminders were employed (Kanuk and Berenson 1975). Richardson et al. (1995) argued that it is much cheaper to send a reminder to potential respondents than replacing them in the sample particularly when it could result in biased responses as well. A study undertaken by Wermuth (1985) examined the influence of different wave of reminders on the response rates. It was found that two wave of reminders seems to be enough in, which the first reminder had the greatest impact, increased the response rate by almost 15 percent, whereas the second reminder increased the response rate by almost 10 percent. The third and fourth reminders only increased the response rate between 5 to 10 percent. Similar results was also reported by Richardson et al. (1993) confirming that the series of reminders in total increased the response rates by almost 30 percent. However, as highlighted in Table 2.3, very few PTW studies conducted in Australia have used reminders.

2.2.4. Persuasion

To further bolster recruitment in this study, in addition to incentives and reminders, other approaches to encourage riders to participate in the study have also been explored in the literature.

Since the late 1960's different strategies has been developed to assist in persuading people to perform a particular task (Seethaler and Rose 2006). Cialdini (1993) reported six different principles, which could increase the likelihood of the target population carrying out a requested task. The Cialdini's six principles of persuasion have been employed across a range of research topics including social marketing (McKenzie-Mohr 2002), changing travel behaviour of individuals (Seethaler and Rose 2006) and change patterns of modal use by individuals (Schrammel, Busch et al. 2013). These principles have also been employed in developing persuasive communications with target population to encourage them to participate in the study (Groves, Cialdini et al. 1992). Therefore, these principles, which are usually referred to as "heuristic rules" (Groves, Cialdini et al. 1992; McKenzie-Mohr and Smith 1999; Cialdini 2001; Seethaler and Rose 2006), are explored and briefly presented here with the scope to employ them in this research. However, not all of those principles might apply to a research, according to its context and target group characteristics. In addition the impact of using, each of these principles individually in comparison with use them collectively has not been explored in the peer-reviewed literature.

1. Reciprocation:

   The principle of reciprocation lies in the human tendency to establish strong social network with others and as Grove et al. (Groves, Cialdini et al. 1992) noted people respond positively to a positive behaviour received. However, authors have highlighted that this would not work as well, if the individual does not receive the incentive as a genuine favour but as a

bribe according to the theory of reactance (Brehm 1966). The incentive is required to be given in advance and unconditionally to act as a genuine favour. In this case it might more likely motivate people to do the task requested particularly when the group is being contacted for the first time (Seethaler and Rose 2006). So this reciprocation rule aims to persuade the target population to do the requested task (e.g. filling out the questionnaires in the context of this study) through establishing a positive network with the target population, which could be done through giving an incentive to them prior to asking them to do a task.

2. Commitment and consistency:

   This principle drives from the human desire to be consistent. Once a task is freely chosen to be done by an individual, the desire to stay in line with its commitments directs the individual to do follow up actions (Cialdini 2001). This tendency could be more powerful if there is a value for the individual to undertake the requested task (Cialdini 1993). It is essential to start by a preliminary commitment to active the process of consistency in participants, which then could be followed by desired tasks (Freedman and Fraser 1966). Therefore, target population can first be invited to conduct a preliminary commitment, which is more likely to be undertaken by them while it would increase the likelihood of performing follow up requested tasks.

3. Social Proof:

   People tend to look to other people to guide their decisions and actions. Seeing social proof that others hold particular attitude, beliefs and behaviours has been found to influence an individuals' attitudes, beliefs and behaviours (Festinger 1954). Individuals are more likely to comply with a request to perform a task when the task is supported by others in the community (Seethaler and Rose 2006). Therefore, emphasizing that the requested task is performed by a group of individuals, which can be a proportion of the target group of study, can increase the likelihood of performing that task by other individuals in the target group.

4. Liking:

   People are more likely to perform a requested task when the request comes from someone they like or who is similar to them in some respect. This similarity could be in their attitude, background or tendencies (Cialdini 1993).

5. Authority:

   This principle highlights that when people make decision about an issue they often follow advice or guidelines stated by knowledgeable sources including professional or relevant authorities (Bushman 1984; Groves, Cialdini et al. 1992).

6. Scarcity:

   Under the scarcity principle an opportunity is likely to be regarded as more valuable when it rarely happens (Mazis 1975). So emphasizing the scarcity of an opportunity to perform

a task could result to increase in the likelihood of performing that task (McKenzie-Mohr 2002; Seethaler and Rose 2006).

2.3. Knowledge gaps

In this review of the literature, two main knowledge gaps were identified.

2.3.1. Understanding riding motivations and PTW usage pattern of novice riders

There has been an increase in PTWs sale in Australia between 2010 to 2014 (FCAI 2014) perhaps reflecting the greater use of these vehicles for transport (i.e. utilitarian use) rather than recreational use (Haworth 2012). But understanding of the parameters motivating people to own and use a PTW in Australia is very limited. The literature review identified four major categories of parameters (social norms, socio-demographic characteristics, attitudes and perceived behavioural control), which potentially influence individuals' decision to ride a PTW and their patterns of PTW use. While those parameters might not be transferable to Australian context, their extent of effectiveness and collaboration to PTW usage pattern in Australia need to be explored. To address this gap, this research focused to explore the range of parameters, which might have influenced individuals' decision to ride a PTW and their pattern of PTW use in the Australian context.

2.3.2. Recruiting and retention of novice riders

The PTW literature highlights the challenges associated with recruiting and retaining motorcyclists (including novice riders) for research surveys. However, it seems that those who had participated already in the study were more likely to participate in the follow up survey (as a reflection of the underlying principle of "commitment and consistency" discussed earlier in this chapter). As presented in Table 2.3, the rate of response obtained from the follow up surveys were higher than the first questionnaire in different studies reported by Harrison et al. (2005) (44% versus 37%), and Wen et al. (2012) (44.7% versus 5.6%). Therefore, the main concern seems to be recruiting the individuals and to smaller extent to their retention to participate in the follow up surveys. The importance of incentives and reminders to increase the response rates is emphasised in the literature. It is reported that using incentives and reminders can motivate potential respondents to participate in the study (Kephart and Bressler 1958; Scott 1961; Kanuk and Berenson 1975; Brennan 1992). However, there has been little systematic research attention dedicated to examine the effect of different recruitment strategies on response rates of PTW riders. This could include examining both the number and value of incentives. Addressing this knowledge gap is regarded as a priority considering the low survey response rates reported in the PTW literature. To address this gap, this research needs to examine the impact of different recruitment strategies on response rates.

In addition, limited researches had access to the gender, age and residential location details of individuals in the target population of the study making them possible to explore the representativeness of respondents. Therefore, a scope of this study was to access details of the target population of the study, which directed the recruitment approach of this research as discussed later in chapter 6. Then it would be possible to identify the willingness of different individuals to participate in the survey given their details (e.g. gender, age and residential location) as well it would be possible to generalise the analysed data to the target population of the study as discussed later in chapter 6.

2.4. Summary

This chapter presented a review of the PTW literature exploring the parameters influencing PTW use pattern as well as studying the recruitment methods employed in the literature to recruit PTW riders in the research. Two main knowledge gaps are identified including understanding riding motivations and riding behaviour of novice riders; and recruiting novice riders.

In the context of PTW riders motivation to ride a PTW, a range of parameters were identified in the literature potentially influencing individuals' decision to gain a PTW riding permit and ride a PTW. These parameters were grouped into four categories: social norms, attitudes, socio-demographic characteristics and perceived behavioural control. Therefore, the PTW riders' decision to ride a PTW and their pattern of PTW use could be a function of these variables, which can be explored through a range of exploratory parameters identified in the PTW literature (detailed in Table 2.4). However, the importance of these parameters varied across different countries and they may not be transferable to Australian context. So along with those parameters there might also be other parameters that have influenced Australian and in particular Victorian riders motivating them to ride a PTW and influence their PTW usage pattern. Therefore, there has been a need in this research to focus on exploring detailed motivations and attitudes of PTW riders in Victoria to provide a better understanding of the underlying reasons of PTW use and its pattern of use. In this context, studying novice riders' attitudes and perceptions provides insight into the motivations of PTW riders to ride. However, they cannot be fully representative of the broader population of PTW riders while there are people who may not continue riding after obtaining their learner permit.

Table 2.4. Parameters identified through reviewing the PTW literature fitting into each main category

Category	Parameters
Social norms	Family and friends attitudes
	Like to belong into a community (e.g. social club)
Attitudes	Preference towards using private vehicle
	Less safety concern
	Higher risk perception attitude
	Value PTW performance
	Value PTW convenience
	Enjoy the thrill of riding
	Enjoy the freedom of riding
	Enjoy impressing others
	Love independence
	Love image
	Love style
	Value lower PTW travel costs
	Value the travel time
	Might slightly consider environmental issues
Socio-demographic characteristics	Age
	Gender
	Income
	Car ownership
	Family size
	Residential location
Perceived behavioural control	Previous riding experience
	Ability to control PTW
	Running cost of PTW (e.g. Fuel, Tax, Toll, Parking)
	Travel time of PTW
	Purchase price of PTW
	Maintenance cost of PTW

Apart from the parameters influencing PTW use, recruiting of PTW riders in research studies has been a major challenge identified in the literature. There has not been a systematic approach that has examined different recruitment strategies including incentives and reminders to increase the response rates.

Therefore, this research study has addressed these two gaps in the literature to contribute to our understanding of the motivations for PTW licence attainment and PTW use and how future research studies might maximise PTW research participants.

In the next chapter, the research questions and study design that were used to explore these two knowledge gaps are presented. Chapter 3 also discusses the theoretical approach utilised to address each of those research questions and outlines each stage of the study design.

Chapter 3. Research questions and theoretical approach

This chapter, which is structured in five sections, lays the theoretical foundations for the thesis. The first section discusses the research questions, which have guided the research. The second section presents the theoretical framework selected to address the aim and research questions and details the rationale for selecting the particular theoretical framework that underpins this study. In the third section, the approach employed to estimate the parameters of the underlying theoretical model is discussed. The fourth section details the study design and the sequence of stages involved in undertaking this research project and presents a matrix of the research questions and the study components to highlight the insight provided by each segment of the research. The final section presents a summary of this chapter.

3.1. Research questions

As discussed in chapter 1, the aim of this research is to develop understanding of the riding intentions and actual travel behaviour of novice riders. The behaviour studied explored the commuting use of PTWs quantified in the form of the proportion of commuting travel days when a PTW was used as the predominant mode of travel by novice riders. In this context a range of parameters providing insight into novice riders' socio-demographic characteristics, motivations, attitudes, perceptions and preferences are potentially relevant. The relationship between those parameters with the novice riders' travel behaviour could be represented by a model, which could either explain variations in novice riders' travel behaviour. The three research questions (RQ) that were developed to direct this study towards its aim were:

RQ1: What are novice riders' characteristics, motivations and attitudes towards ownership and use of PTWs in Victoria?

RQ2: How can novice riders be engaged (e.g. examining different recruitment strategies) in surveys given the low response rates in previous studies?

RQ3: To what extent do differences in characteristics, attitudes and motivations of novice riders explain variations in their riding travel behaviour?

3.2. Theoretical approach

The review of the PTW literature (Chapter 2) revealed that social norms (SN), attitudes (AT), socio-demographic (SD) characteristics and perceived behavioural control (PBC) of PTW riders vary across different countries and across individuals. It is likely that these parameters have contributed to different PTW riding behaviours nationally and worldwide. The Theory of Planned behaviour (TPB) as a theoretical framework relating SN, AT and PBC to behaviour, is increasingly being applied in the literature as a successful tool to explain differences in humans' behaviour (Fishbein and Ajzen 1975;

Ajzen and Fishbein 1980; Ajzen 1991; Notani 1998; Armitage and Conner 2001). TPB assumes that the stated intention by individuals is a highly proximal predictor of behaviour (Armitage and Conner 2001). In this theory the three categories of variables SN, AT and PBC, as highlighted in Figure 3.1 and interpreted in Table 3.1, are postulated to explain human intention and behaviour. In this model, the socio-demographic characteristics are not defined as a separate category as they are believed to influence on SN, AT and PBC (Ajzen 1991).

The TPB has been applied in a range of PTW studies including motorcycle riders' safety, riders' risk perception and riders travel mode choice (Chen and Chen 2011; Yao, Wu et al. 2011; Özkan, Lajunen et al. 2012; Guillen, Ishida et al. 2013). This research has employed the TPB for the first time to explore novice riders' travel behaviour.

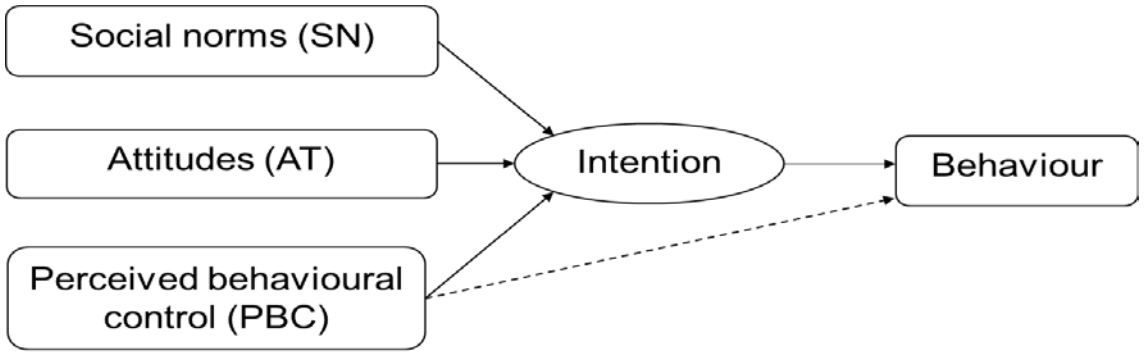


Figure 3.1. Theory of Planned Behaviour (Ajzen 1991)

Table 3.1. Interpretation of components of Theory of Planned Behaviour

Variables	Interpretation
Social Norms (SN)	SN reflects the influence of common culture in a society (Fujii and Garling 2003; Anable 2005; Bogers, Viti et al. 2005; Hensher and Puckett 2007; Svensson 2009) and the perceived social pressure and degree of an individual's agreement or disagreement to perform a specific behaviour (Ajzen 1991).
Attitude (AT)	AT reflects the degree of favourability and attitudinal perception to perform a behaviour by an individual, AT explored the psychological parameters of individual that influence the behaviour (Atkinson 1964; Ajzen 1991).
Perceived Behavioural Control (PBC)	PBC reflects the expectancy level of an individual to successfully execute a behaviour (Atkinson 1964) and the perceived ease or difficulty of performing the behaviour and the relative advantages of performing the task (Ajzen 1991; Bamberg, Ajzen et al. 2003).

3.3. Operationalising the Theory of Planned Behaviour

The TPB provides a powerful lens through, which to examine novice riders' travel behaviour. But the theory needs to be operationalised through a model in order to use it to analyse and explore novice riders' behaviour and identify the parameters, which influence that behaviour. The model chosen must satisfy two criteria. First, it should be able to examine the relationship between all the variables. Second the model should follow a structure making it possible to analyse latent variables (, which in this study include SN, AT and PBC), through measurable explanatory parameters. As latent variables are not directly measurable, they need to be defined in the model based on other measurable parameters.

In this context, Structural Equation Modelling (SEM) has been a successful statistical tool satisfied the two main criteria to estimate the parameters of the underlying TPB model (Van Den Putte and Hoogstraaten 1997). SEM can be used to examine the significance of the relationships between different categories of explanatory variables in the model and it provides the capacity to analyse latent (unobservable) variables through observed variables (Ullman 2001; Schreiber, Stage et al. 2006). The traditional approach to model the TPB has been using hierarchical regression (Parker, Manstead et al. 1992; Tunnicliff 2006; Nwokeji 2007; Watson, Tunnicliff et al. 2007; Ghahremani, Niknami et al. 2012), but SEM has a unique advantage of presenting model estimates in a graphical layout, which is very easy to understand and follow (Pallant and Tennant 2012). SEM has also been popular to estimate models based on the TPB in a range of transport studies exploring individuals' travel behaviour (Golob 2003), ride comfort on high-speed railways (Lee, Jin et al. 2009) and motorcyclists speeding behaviour (Chen and Chen 2011). Therefore, SEM was chosen to operationalise the framework of the TPB in order to understand novice riders' behaviour (commuting use of PTWs).

3.4. Study design

The research project comprised three phases encompassing a total of five distinct stages. This structure was designed to enable the study to address the aim of the research through the research questions and to use the new knowledge from each stage to inform the subsequent stages. Figure 3.2 illustrates the research design.

In the review of the literature (Chapter 2), it was identified that the knowledge of novice riders' motivations, attitudes and travel behaviour is very limited. In Phase 1 initial insight into those parameters was developed starting from a point where a very limited insight existed. Also, the literature review identified significant challenges related to engaging participants in PTW studies. In Phase 2, these challenges were directly addressed by examining a range of recruitment and incentive strategies, to maximise the number of respondents. Phase 3 was the analysis of the panel survey data. This final research phase involved the application of descriptive analyses and the development of a behavioural model. The behavioural model provided insight into the parameters, which can explain variations in proportion of commuting travel days undertaken by PTW as the predominant mode of travel by novice riders.

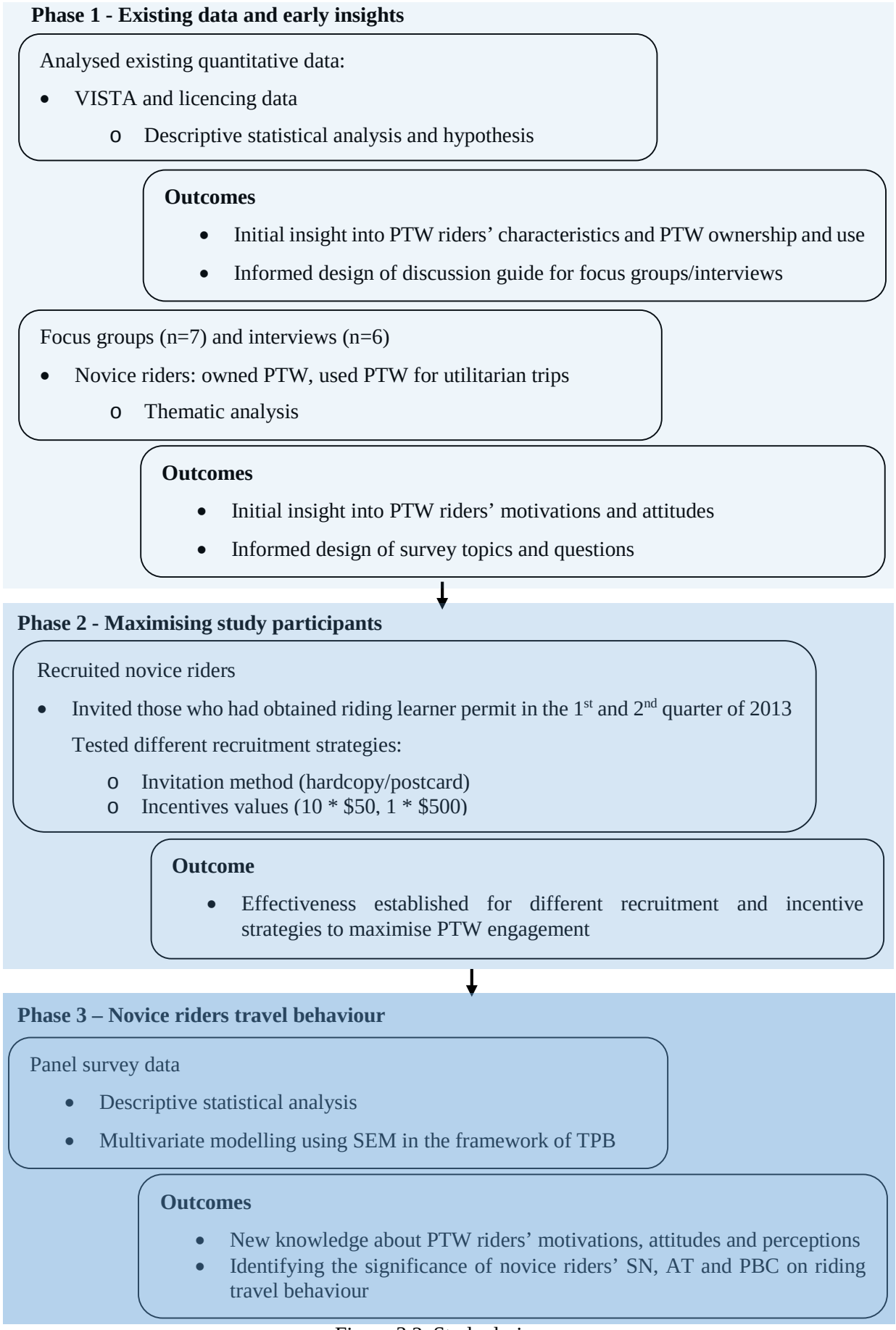


Figure 3.2. Study design

Table 3.2 (next page) identifies how the research questions are addressed in each of the three research phases. The table includes the research questions, the study phases, the data sources used and the outcomes of each phase. An overview of the methods employed to achieve those outcomes to address the three research questions are also identified. The three phases of the study are outlined below. More detailed explanations of each phase are provided in the chapters, which follow.

Table 3.2. Overview of novice rider research: research questions, data sources and insights provided in each component of the research

Research questions	Study compounds				
	Phase 1 – existing data and early insights		Phase 2 – maximising study participants	Phase 3 – Novice riders travel behaviour	
	Data collection and analysis				Modelling
	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
	Household Travel Survey Data and Licencing data	Focus group and interviews	Novice rider' Panel Survey		
RQ1: What are novice riders' characteristics, motivations and attitudes towards ownership and use of PTWs in Victoria?	Insight into PTW ownership and usage patterns	Identify riders motivations/ intentions for using a PTW		Identify patterns of PTW ownership and use among novice riders	
RQ2: How can novice riders be engaged in surveys given the low response rate in previous studies?			Test different recruitment and incentive strategies		
RQ3: To what extent do differences in characteristics, attitudes and motivations of novice riders explain variations in their riding travel behaviour?		Insight into attitudes, intentions and behaviour of PTW riders		Identify strongest motivators to ride resulting from different behavioural intentions	Test the effectiveness of novice riders social norms, attitudes and perceived behavioural control on their behavioural intentions and consequently behaviour
Theoretical framework: Theory of Planned Behaviour	Initial insight into the behaviour dimension	Initial insights: social norms, attitudes, perceived behavioural control		Overview of social norms, attitudes, perceived behavioural control	In-depth understanding of relationships between social norms, attitudes, and perceived behavioural control

3.4.1. Phase 1 - Existing data and early insights

Phase 1, comprising two stages, was designed to provide initial insight into characteristics, the attitudes, motivations and travel behaviour of novice riders, starting from the point where a very limited insight existed. These two stages included:

3.4.1.1. Phase 1, Stage 1 - Existing data analysis: travel survey, licencing and registration data

The literature review (Chapter 2) highlighted the lack of research on novice riders. Therefore, as a starting point, the research focused on gaining insight from existing sources of data in an effort to develop an appreciation of the local nature of PTW rider characteristics and the general nature of their travel behaviour (use of PTW).

However, in the existing PTW data, novice riders were not distinguished from the rest of the population of PTW riders, focusing on the broader population of PTW riders, was a valuable step. This step provided initial insight into PTW riders' socio-demographic characteristics and their patterns of PTW ownership and use. These findings were valuable as they would to an extent state novice riders' socio-demographic characteristics and their patterns of PTW ownership and use.

In this stage, existing data sets, which were accessible and relevant in the context of the study, were explored through statistical analysis and developing logistic regression models. The Victorian Integrated Survey of Travel and Activity (VISTA) 2007-2008 and Victorian Government licencing data were analysed to identify demographic characteristics of PTW riders in Victoria and explore their patterns of PTW ownership and use.

3.4.1.2. Phase 1, Stage 2 - Qualitative insights: Focus groups and interviews

Efforts to develop logistic regression models using existing data in Stage 1 found that they had poor ability to explain the variability in the pattern of PTW ownership and use across PTW riders. This possibly could be as the consequence of lack of parameters reflecting underlying attitudes and motivations of PTW riders. To develop initial insight into those parameters and assist in developing a survey of novice riders, qualitative research was undertaken. This took the form of focus group discussions and interviews with novice riders.

Focus groups and interviews are a highly effective method for exploring motivations and attitudes particularly in areas when little prior knowledge is available (Gill, Stewart et al. 2008). This is particularly relevant in the context of novice riders. These methods have been employed in market research since the 1940s and have since expanded to become valuable qualitative research techniques (Zeller 1986; Gill, Stewart et al. 2008). In recent years, qualitative research techniques have seen increased application in transport research (Kannan, Bose et al. 2011; Beukers, Bertolini et al. 2012; Dill and Rose 2012; Owen, Hogarth et al. 2012).

By undertaking focus groups and interviews, this stage provided a qualitative picture of the attitudes, motivations, intentions and travel behaviour of novice riders. This was an important early stage as there is very little scientific research about the relevance of those parameters for novice riders to ride a PTW in an Australian context and particularly in relation to Victorian riders.

3.4.2. Phase 2 - Maximising study participants

Phase 2 had one stage with the aim of maximising the total number of respondents for the panel survey conducted in Phase 3.

3.4.2.1. Phase 2, Stage 3 - Recruitment and retention: maximising the number of respondents

The literature highlights that PTW riders, including novice riders, are reluctant research participants (Wigan 2002; Jamson and Chorlton 2004; Harrison and Christie 2005) and this reluctance presents a significant challenge in recruitment and retention. The review of the literature identified different approaches, which have the potential to achieve higher response rates including incentives, reminders (Gneezy, Meier et al. 2011; Stopher 2012) and persuasive commutation approaches (Cialdini 1993).

In this stage, different recruitment and incentive strategies identified in the literature were examined to explore their effectiveness in maximising the number of respondents and also their retention in a panel survey. The data in this study was collected in a panel survey comprised two surveys due to two main reasons.

The surveys explored novice riders' usage patterns of PTWs (proportion of commuting travel days that PTWs were used as the predominant mode of travel). The survey questions were designed to collect details about attitudinal characteristic of novice riders such as their willingness to ride a PTW in different riding situations and their perception of risk associated with riding in different situations. But to obtain a clear view of the novice riders' riding attitudes and perceptions; and compare their PTW usage pattern to the other modes of transport, it would be necessary to collect that sort of data at the time it is expected that novice riders feel confident to ride their PTW as a commuting mode of travel. As far as novice riders are more experienced in riding a PTW, they would have a better understanding about their riding motivations and attitudinal characteristics and perception of risk towards the use of a PTW and collected data would provide an actual picture of their PTW usage pattern. Therefore, the study questions were split into two surveys in, which the second survey explored novice riders PTW usage pattern (riding behaviour), their attitudinal characteristic, social norms and other parameters and it was sent to the novice riders at the latest possible time considering the time frame of this research (in average 14 months after they had obtained their riding learner permit).

The second reason that directed this research to use the panel survey was the strategy to move majority of questions to the second survey lied under the recruitment approach employed in this research. It is reported that once individuals freely choose to get involved in a task (e.g. fill a survey), the desire to stay in line with its commitments, encourage them to do follow up actions (Cialdini 2001). Therefore, it is expected that retaining respondents to participate in the follow up surveys would be easier than getting them involved in the study for the first time. Accordingly, the majority of the questions were moved to the second questionnaire, so the first survey was designed to look small and easy to respond with the scope to recruit greater number of novice riders.

3.4.3. Phase 3 – Novice riders travel behaviour

Phase 3, the final phase, comprised two stages designed to explore the impact of social norms, attitudes and perceived behavioural control on novice riders' travel behaviour drawing on a specially designed panel survey. Bespoke surveys can provide deep insight into the behaviour of interest and are an established research method (Richardson and Richardson 2009; Chen and Chao 2011; De Rome, Ivers et al. 2011; Tunnicliff, Watson et al. 2012; Lee, Pino et al. 2013). As discussed earlier, in this study a panel survey comprising two waves was designed to provide insight into the new knowledge to understand novice riders' travel behaviour.

3.4.3.1. Phase 3, Stage 4 - Novice rider' Panel Survey: descriptive analysis

In this stage, panel surveys were used with two cohorts of novice riders to capture rich data from respondents covering their motivations, perceptions and travel behaviour. Initial insight was obtained through undertaking descriptive statistics analysis and cross tabulating of the data collected form survey 1 and survey 2. This served as a pre-curser to the multivariate model development.

3.4.3.2. Phase 3, Stage 5 - Novice rider' Panel Survey: in-depth modelling

This last stage of the research involved developing a model consistent with the framework of TPB to examine the strength of the relationship between novice riders' motivations and attitudes with their riding behaviour. As discussed earlier the riding behaviour in this study was defined as the proportion of commuting travel days when a PTW was used as the predominant mode of travel. Developing a SEM based on the framework of TPB provided a rigorous approach for understanding the riding behaviour of novice riders. SEM provided the capacity to explain the SN, AT and PBC of novice riders towards their riding behaviour and identify the parameters, which have influenced these latent variables. In addition, the significant of relationships between novice riders' SN, AT and PBC

and their riding behaviour and the extent they can explain variations in the individuals' riding behaviour are explored.

3.5. Summary

In this chapter, the research questions, theoretical framework and methodological approach have been outlined and the rationale for their selection in this doctoral research is provided. Table 3.2 illustrated the research questions and the methodologies and data used in order to address each of those research questions through a three phases of the study comprising five stages. As discussed earlier, the first phase addressed the first and third research questions. In the second phase, different recruitment strategies were tested to address the second research question. In the third phase, the panel survey was designed to address the first and third research questions through analysing, cross tabulating and finally modelling the panel survey data in the framework of the TPB. The following chapter addresses stage 1 of phase 1 and focuses on exploring patterns of PTW ownership and use by drawing on existing Victorian data.

Chapter 4. Stage 1: Insight from existing quantitative data

In the review of the literature (Chapter 2), it was identified that the knowledge of novice riders' motivations, attitudes and intentions to ride a PTW and about their PTW usage pattern is very limited. Given the lack of novice rider research, the broader population of the PTW riders were the focus of attention in this chapter. Existing quantitative data was analysed to explore current patterns of PTW ownership and use in Victoria, starting from the point where very limited knowledge existed in the literature. Investigating the broader population of PTW riders provided an opportunity to develop some initial understanding about the novice riders' context. Findings from the analysis of existing data were then used to inform the next stage of the research, undertaking focus groups and interviews by novice riders.

As discussed in chapter 1, the second thesis component discusses the research results starting from chapter 4. The analysis in this chapter contributes to inform the next stage of the research at chapter 5, which will continue towards addressing the first research question that underpins this research.

The data, which was accessible and relevant was the Victorian Integrated Survey of Travel and Activity (VISTA) 2007-2008 and PTW licencing data collected (for 30 June 2012) in Victoria, Australia by VicRoads, the state government road authority. The data sources were used to explore PTW ownership and use in Victoria (Table 4.1).

Table 4.1. Data used to explore patterns of PTW ownership and sue

Data	PTW ownership	PTW use
VISTA 2007-2008	✓	✓
PTW licencing data	✓	

4.1. PTW ownership

The VISTA 2007-2008 data and PTW licencing data analysed, provided insight into the demographic characteristics of PTW rider and their relationship with the PTW ownership pattern in Victoria, Australia.

4.1.1. Insights from VISTA 2007-2008 data

The Victorian Integrated Survey of Travel and Activity (VISTA) 2007-2008 is a household travel survey that was conducted between May 2007 and June 2008 in the state of Victoria, Australia. The VISTA survey was delivered to randomly selected households in metropolitan Melbourne and regional centres, which covered 85 percent of the Victorian population (Victoria Government 2014).

17,115 households with a response rate of 46 percent completed the survey capturing details of 130,411 trips.

Of the 17,115 households who completed the VISTA 2007-2008 survey, only 712 households (4.1%) reported owning a PTW. In average the households who had a PTW, owned 1.14 PTWs, reflecting the high proportion (87 percent) who owned only one PTW from the 712 households. This was an early indication of the low rate of owning and using PTWs in Victoria and perhaps indicated a lack of popularity.

Responses from VISTA were attributed to the household and it was not possible to distinguish, which individual owned the PTW. In some households, no one had a riding permit but the household had PTW(s), while in other households more than one person had a riding permit and it was not clear who owned the PTW(s) (Table 4.2). Therefore, the next section has examined the relationship between household characteristics that were collected in the VISTA questionnaire (, which included only household socio-demographic details) and their pattern of PTW ownership rather than individuals' details.

Table 4.2. Number of households' riding permit owners versus number of households' PTWs

		Number of PTWs per household			
		No PTW	1 PTW	2+ PTWs	Total
Number of PTW riding permit owners per household	No one	15287	95	9	15391 (89.9%)
	1 person	1043	472	46	1561 (9.1%)
	2+ persons	73	55	35	163 (1%)
	Total	16403 (95.8%)	622 (3.6%)	90 (0.6%)	

4.1.1.1. Income

Analysing the VISTA 2007-2008 data revealed that PTW ownership in a household is associated with the household income. Households with greater income were more likely to own a PTW (Figure 4.1). From the VISTA data, PTW ownership pattern and household income had a statistically significant relationship as the chi-square p (= 0.00) calculated, was less than 0.05.

This pattern differs from other developed countries like Greece where increasing income is usually associated with a reduction in the likelihood of owning a PTW (Kepaptsoglou, Milioti et al. 2011). In East Asian countries like Thailand and Indonesia, PTW owners were predominantly from low and medium income groups rather than being from high income groups (Sillaparcharn 2007; Priyantha Wedagama 2009).

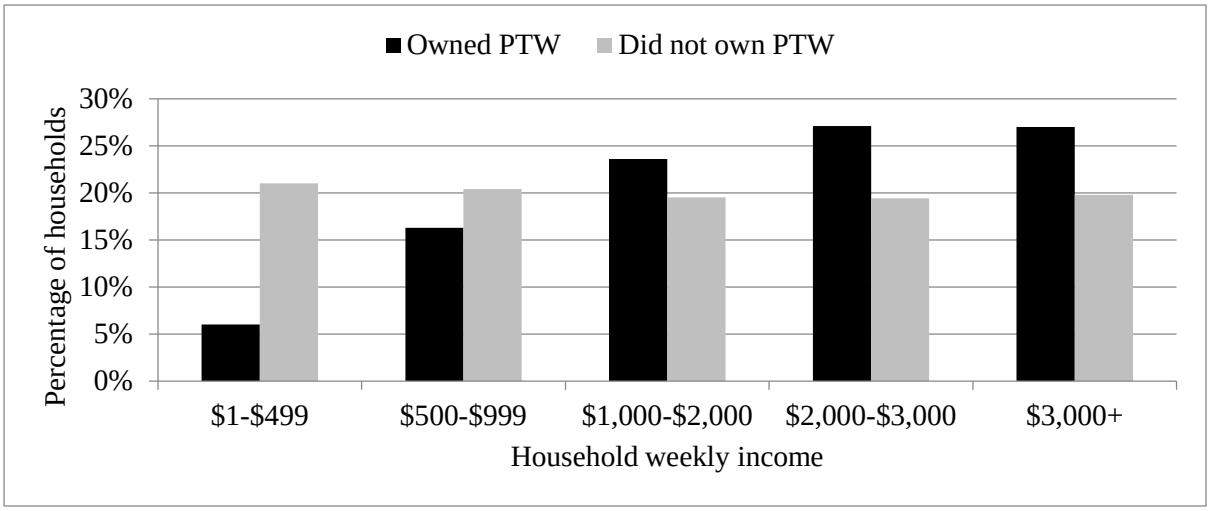


Figure 4.1. PTW ownership and household income (VISTA)

4.1.1.2. Vehicle ownership

Passenger car ownership also influenced the pattern of PTW ownership (Figure 4.2). Households that owned two or more passenger cars were slightly more likely to own a PTW (44.5% versus 38.8%), whereas lower proportion of households who owned one car, had a PTW (42.8% versus 48.3%). From the VISTA data, PTW ownership pattern and household passenger car ownership level had a statistically significant relationship as the chi-square p (= 0.01) calculated, was less than 0.05.

It is found that majority of PTW owners (87.3%) owned a car, perhaps reflecting that for PTW riders; PTW has been an additional option to travel. There might be substation between car and PTW to undertake different trips, which is not clear in the existing data.

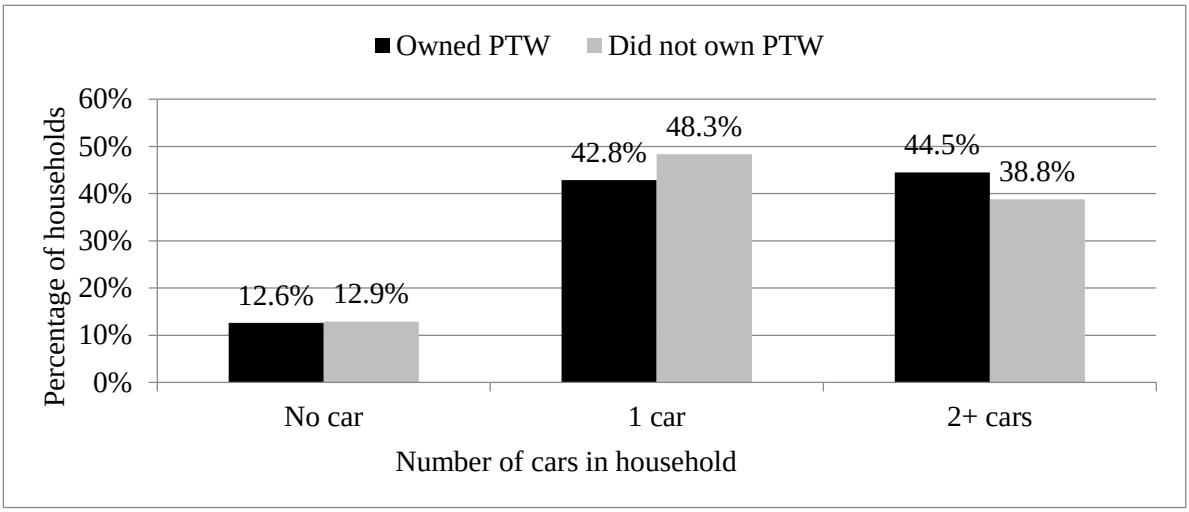


Figure 4.2. PTW ownership and household car ownership (VISTA)

In addition to cars, those households, which owned one or more four-wheel-drive (4WD) vehicles were more likely to own a PTW relative to households, which did not own a 4WD vehicle (Figure 4.3). Almost a third (29.1%) of household that owned a PTW had reported owning 4WD vehicle(s) while only 17.9 percent of those who did not own PTW had reported having 4WD vehicle(s). From the VISTA data, PTW ownership pattern and household 4WD vehicle ownership pattern had a statistically significant relationship as the chi-square p (= 0.00) calculated, was less than 0.05. This could possibly mean that they were riding trail bikes with the 4WD used for accessing to the place of recreation; however, it was not able to examine this assumption, as the type of PTWs was not collected in the VISTA 2007-2008 data.

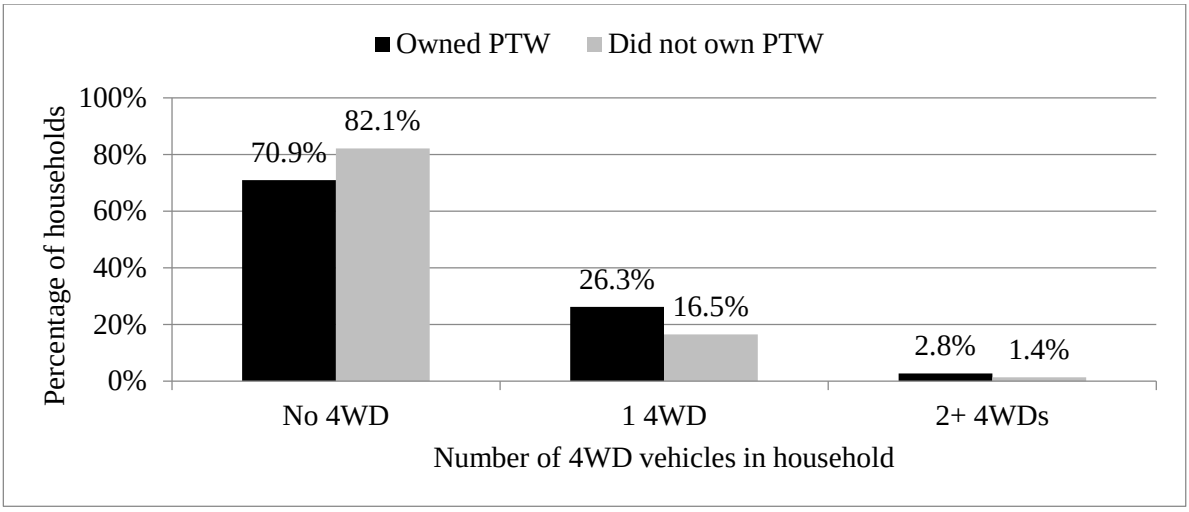


Figure 4.3 PTW ownership and household 4WD vehicles ownership (VISTA)

In addition, the pattern of PTW ownership was correlated with the number of adult bicycles owned in the household. The likelihood of owning a PTW grew in households with one or more adult bicycles (Figure 4.4). Almost three quarters (21.5% $_{1\ bicycle}$ + 52.4% $_{2+\ bicycles}$ = 73.9%) of households who own a PTW also owned adult bicycle(s) while only less than half (47.9%) of those who did not own PTW reported having adult bicycle(s). From the VISTA data, PTW ownership pattern and household number of adult bicycles had a statistically significant relationship as the chi-square p (= 0.00) calculated, was less than 0.05.

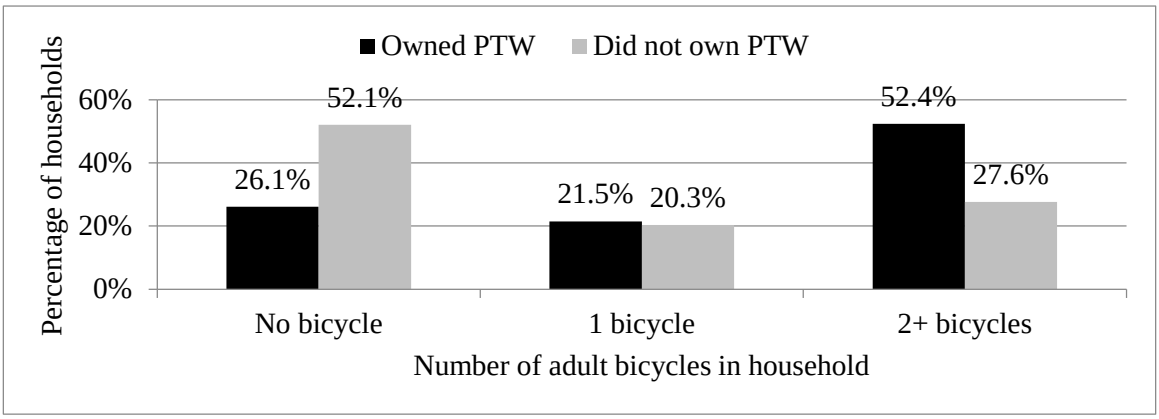


Figure 4.4. PTW ownership and household adult bicycle ownership (VISTA)

4.1.1.3. Household structure

In the VISTA 2007-2008 data, households comprising "couple with kids" were slightly more likely to own a PTW while single person households were less likely to own a PTW (Figure 4.5). From the VISTA data, PTW ownership pattern and household structure had a statistically significant relationship as the chi-square p (= 0.00) calculated, was less than 0.05.

This pattern differs from what was observed in the UK where London motorcyclists were marginally more likely to be single or were living with a partner (Jamson and Chorlton 2004).

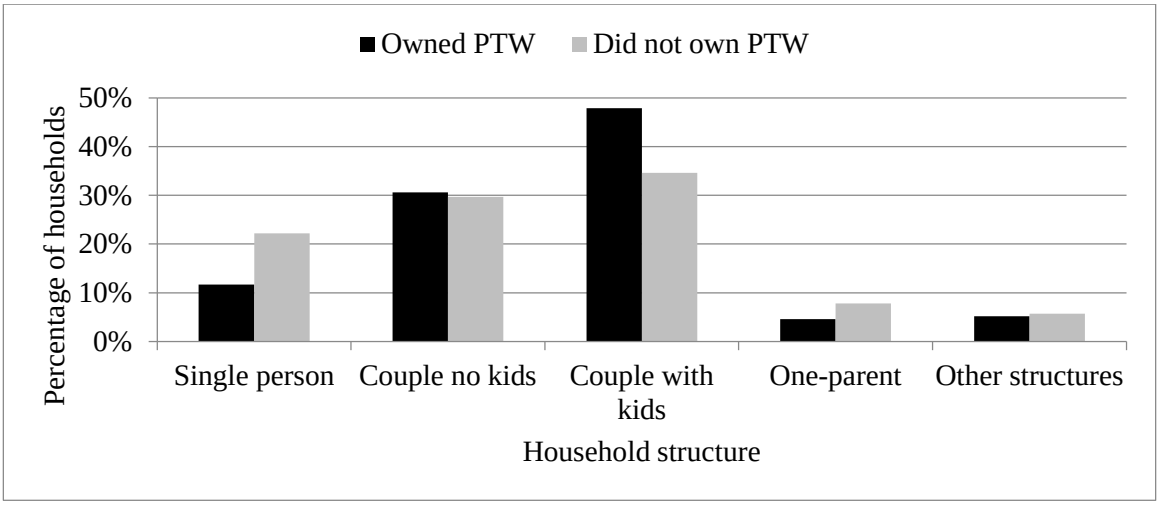


Figure 4.5. PTW ownership and household structure (VISTA)

4.1.1.4. Age

As it was not clear in the VISTA 2007-2008 who owned each PTW in the household, the average age of household was examined. It is found that PTW ownership was dependent upon the average age of adults in the household (Figure 4.6). Households with the average age of adults between 25 and 54 were more likely to own a PTW in comparison with others. From the VISTA data, PTW

ownership pattern and household average age of adults had a statistically significant relationship as the chi-square p (= 0.00) calculated, was less than 0.05.

This pattern is relatively similar to what was reported in UK where London motorcyclists were slightly younger than the rest of the population and comprised slightly greater proportion of people in the age group between 30 and 45 years old (Jamson and Chorlton 2004).

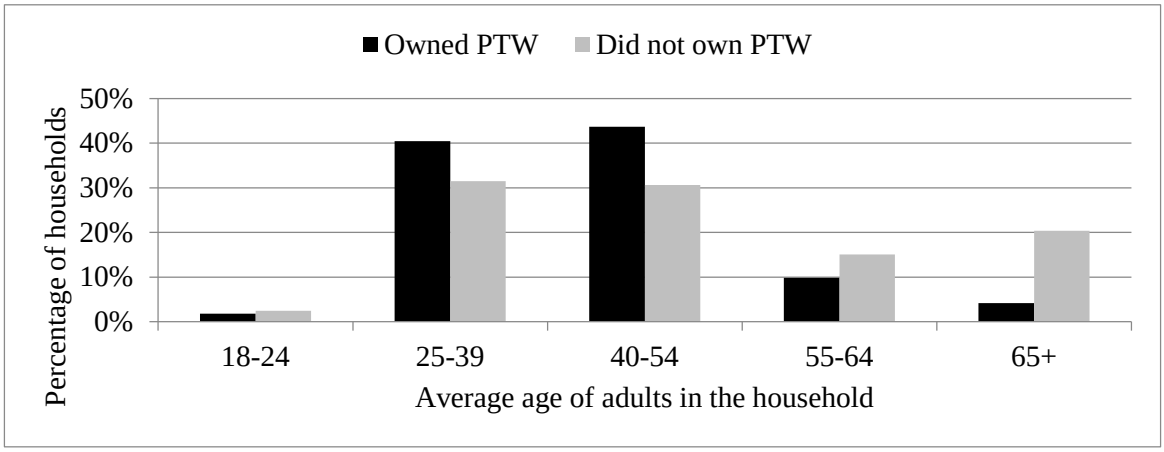


Figure 4.6. PTW ownership and average age of adults in the household (VISTA)

4.1.1.5. Residential location

Households' residential location also influenced the pattern of PTW ownership. Households in non-metropolitan or regional suburbs were more likely to own a PTW than those in the Melbourne metropolitan area (43.7% versus 32.8%) (Figure 4.7). Non-metropolitan residents more likely to own a PTW might reflect their greater intention to ride a PTW for recreation or off road riding including on private property. From the VISTA data, PTW ownership pattern and household residential location had a statistically significant relationship as the chi-square p (= 0.00) calculated, was less than 0.05.

Similarly in the UK, people who lived outside metropolitan areas were more likely to own a PTW (Burge, Fox et al. 2007). In contrast, in Greece, people who lived in the suburbs and low density areas were less likely to own a PTW (Kepaptsoglou, Milioti et al. 2011).

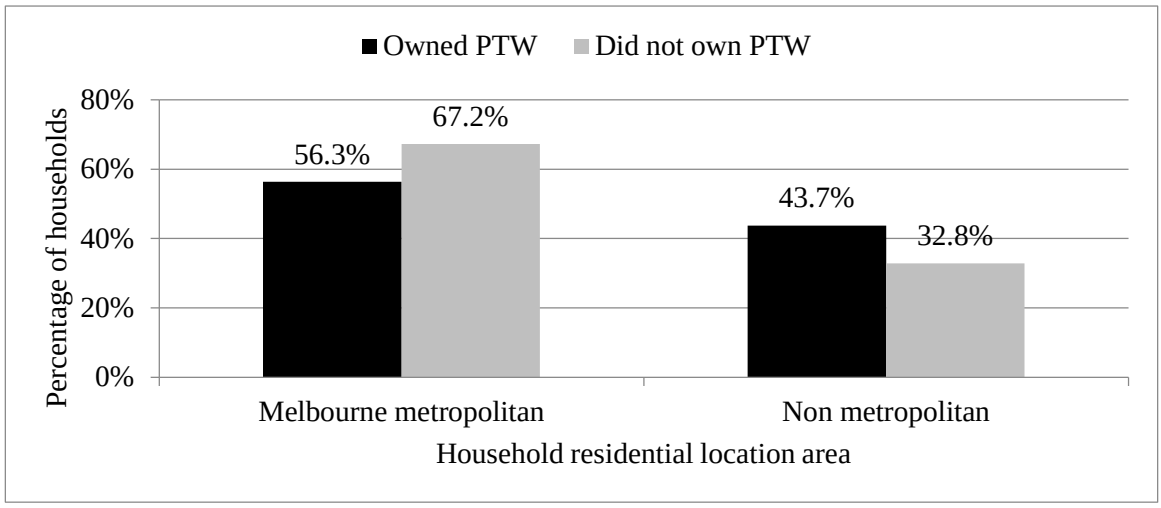


Figure 4.7. PTW ownership pattern and household residential location (VISTA)

4.1.1.6. Insight from modelling the PTW ownership pattern

In this section the extent to, which the pattern of household PTW ownership can be explained by socio-demographic parameters and number of vehicles owned except PTW, is explored using a logistic regression model. Logistic regression, a popular model of discrete outcomes, uses a model of the following form:

$$y_i = \frac{e^u}{1+e^u} \quad (1)$$

where y_i is the probability of outcome i (in this case, the household owns a PTW) and u is a linear function of the explanatory variables:

$$U = A + B_1X_1 + B_2X_2 + \ldots. + B_kX_k \quad (2)$$

With A a constant, B_j the coefficients and X_j the explanatory variables (with j taking values from 1 to k). Taking natural logs of equation (1) yields:

$$\ln(\frac{y_i}{1-y_i}) = A + \sum(B_j X_{ij}) \quad (3)$$

This equation describes the probability of an observation being in one group compared with being in another group. In this study, the dependent variable was household PTW ownership with two outcomes: “Household owned a PTW” or “Household did not own a PTW”. SPSS was used to calibrate a range of models. The model with the best overall performance identified six statistically significant variables as presented in Table 4.3. The global test of the null hypotheses (B = 0), testing the model with a constant only, against the model with six predictors was significant (χ^2= 325.079, df = 9 and p <0.001). This omnibus test of model coefficient is computed using the chi-square test statistic as the difference between the log likelihood ratio of the full model and the constant only model χ^2= 2[-

LL(all)-(-LL(0))]. The model including the predictors performed significantly better than the constant only model and the null hypothesis must be rejected.

Table 4.3. Parameter estimates*

Parameters	Parameter definition	Exp(B)	Sig.	95% confidence interval for Exp(B)	
				Lower bound	Upper bound
Intercept	--		.000		
Household income	Coded 1 to 5 as follows: $1-$499 (1) $500-$999 (2) $1,000-$2,000 (3) $2,000-$3,000 (4) $3,000+ (5)	1.099	.007	1.026	1.177
Passenger cars	Continuous	1.007	.049	.894	1.122
Adult bicycles	Continuous	1.362	.000	1.291	1.438
4WD vehicles	Continuous	1.337	.001	1.135	1.574
Average age of adults	Coded 1 to 5 as follows (Incremental): 18-24 yrs (1) 25-39 yrs (2) 40-54 yrs (3) 55-64 yrs (4) 65+ (5)	.738	.000	.677	.804
Household structure**	Coded 1 to 4 as follows (Classification): Single person (1) Couple no kids (2) Couple with kids (3) One-parent (4)				
		1.097	.663	.723	1.665
		1.578	.015	1.094	2.275
		1.181	.048	.829	1.682
		.819	.420	.504	1.331

* The reference category is “Not to own a PTW”

**The reference category is other household structures

Table 4.3 includes the exponent of the parameters [Exp (B)], which is called the odds ratio. The odds ratio provides insight into the strength of the relationship between each explanatory variable and owning a PTW when the reference category was “Not to own a PTW” in this model.

It is found that households with higher income level, greater number of passenger cars or 4WD vehicles or bicycles were more likely to own a PTW. However, as the average age of adults in a household increased the likelihood of owning a PTW decreased. Finally, household structure was associated with PTW ownership with the structures of “couples with kids” and “couples without kids”, respectively 57 percent and 18 percent more likely to own a PTW compared with households with other structures.

The parameters listed in Table 4.3 had a statistically significant association with household PTW ownership as the overall performance of the model in terms of percent correctly predicted was good. But the goodness of fit measure was inflated because a lot of households in the VISTA 2007-2008 data did not own a PTW and the model had classified majority of household as did not own a PTW. The logistic regression model only classified 13.4 percent of those households, which owned a PTW correctly. This could possibly be due to a lack of attitudinal variables as well as parameters associated with underlying motivations of PTW ownership and use. Those other parameters were not included in the VISTA 2007-08 survey.

While the VISTA 2007-08 provided initial insight into the relationships between some households’ characteristics and PTW ownership at the household level, the licencing data analysed in the next section, provided insight into the relationship between PTW ownership pattern and individuals’ characteristics.

4.1.2. Insight from licencing data

In Victoria, people who intend to ride a PTW on the road must obtain a motorcycle riding licence. To obtain a riding licence, the first step is to obtain a learner permit. The learner permit lets motorcycle riders to ride legally on-road and exercise PTW riding before taking their riding licence exams. The learner permit is only valid for 15 months. Once someone obtains a learner permit, they must wait a minimum of three months before attempting to obtain their riding licence. They then have a 12 month time window to obtain their riding licence or their learner permit expires and they have to apply for a learner permit (VicRoads 2015).

The state road authority (VicRoads) is custodian of the state’s registration and licencing data. However, the storage of that data was outsourced to a private sector IT firm in the 1980’s. On a periodic bases data from the licencing data bases is provided to another government agency, the Transport Accident Commission (TAC). The TAC is a Victorian government-owned organisation that manages the payment for treatment and benefits of people injured in road transport crashes. After the TAC received the licencing data from the VicRoads, they then made it available for this research.

The licencing data, accessed through the TAC, contained current PTW licencing data for a single point in time, namely 30 June 2012 and was not merged with the registration data. While the anonymity was preserved, the data was provided at an individual level and included:

1. The number of passenger cars and PTWs registered to an individual,
2. Details of each individual's riding proficiency level (Learners or Full licence) and
3. Limited demographic details including age, gender and residential location.

Licencing data analysis provided initial insight into the PTW ownership pattern and its relationship with the socio-demographic characteristics of individuals. However, the PTW registered to an individual, might be used by another person in the household, which is not clear from the data and can impact the analyses results.

4.1.2.1. Passenger car ownership

It was found that the likelihood of having a PTW increased when an individual owned two or more passenger cars (Figure 4.8). Therefore, in Victoria, having more passenger cars was associated with the greater likelihood of owning a PTW. From licencing data, individuals' PTW ownership pattern and passenger car ownership had a statistically significant relationship as the chi-square p (= 0.00) calculated, was less than 0.05. This pattern was similar to what was reported in the US (Bates 2000) however, differed from what was reported in South East Asian countries including Malaysia (Leong and Sadullah 2005), Taiwan (Lai and Lu 2007) and China (Yun, Liu et al. 2013) where increased passenger car ownership is associated with decrease in the likelihood of owning a PTW.

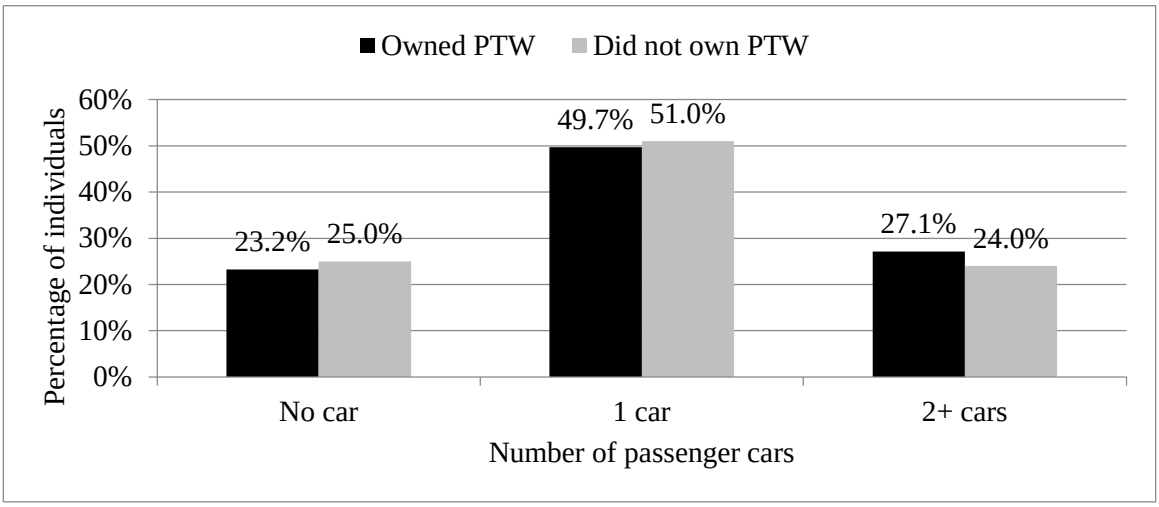


Figure 4.8. PTW ownership pattern and number of passenger cars owned

4.1.2.2. Riding proficiency

It is found that the riding proficiency influences the pattern of PTW ownership. Those PTW riders who had obtained a riding licence were more likely to own two or more PTWs than those who owned a learner permit (3.8% versus 0.9%) (Figure 4.9). It is not surprising as learner permits are valid only for a 15 months' time whereas those who have had riding licence might have had it for a longer period of time and more likely to own two or more PTWs. From licencing data, individuals' PTW ownership pattern and their riding proficiency had a statistically significant relationship as the chi-square p (= 0.00) calculated, was less than 0.05. However, the overall likelihood to own a PTW did not vary significantly by the riding proficiency level.

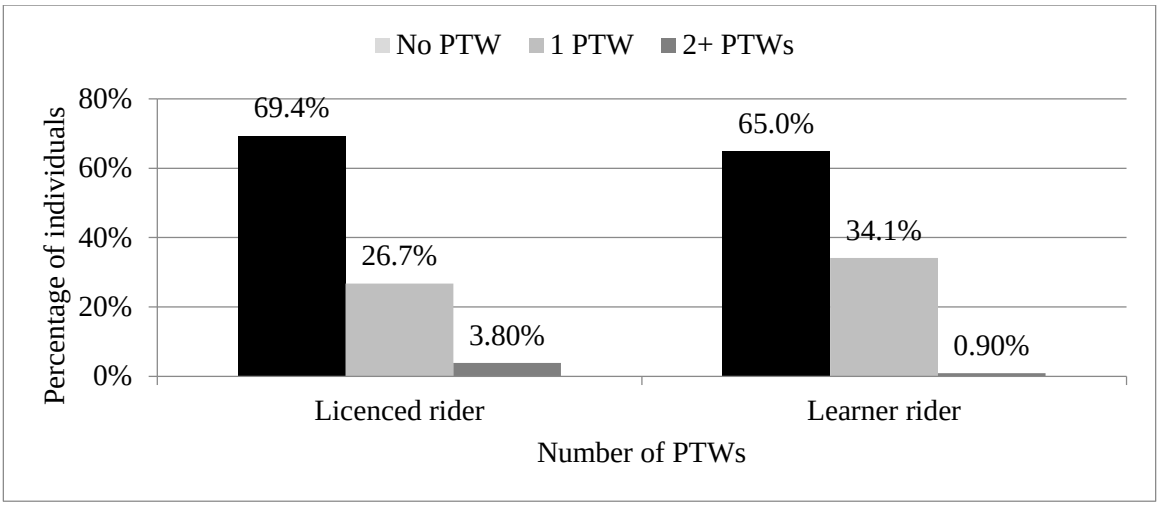


Figure 4.9. PTW ownership pattern and PTW riders' riding proficiency

4.1.2.3. Gender

Through cross tabulating licencing data it was found that males were slightly more likely to own a PTW than not to own a PTW (90.7% versus 87%) whereas females were more likely to not own a PTW than to own a PTW (13% versus 9.35%) (Figure 4.10). This reflects that males are more likely to own a PTW than females. From licencing data, individuals' PTW ownership pattern and their gender split had a statistically significant relationship as the chi-square p (= 0.00) calculated, was less than 0.05. In another study undertaken in Australia, it was found that novice riders were more likely to be male (De Rome, Ivers et al. 2010). Similarly, males, in Greece and the UK were more likely to own a PTW compared with females (Burge, Fox et al. 2007; Kepaptsoglou, Milioti et al. 2011).

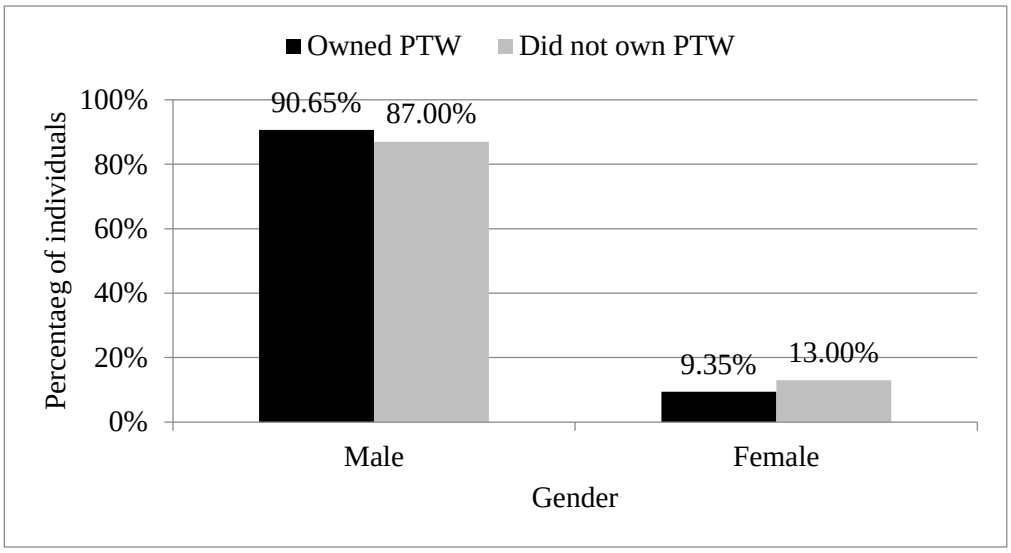


Figure 4.10. PTW ownership by gender

4.1.2.4. Age

In Victoria, an individual must be at least 18 years old to be eligible to obtain a PTW learner permit. In the licencing data individuals aged between 18 and 54 years were more likely to own a PTW (Figure 4.11). From licencing data, individuals' PTW ownership pattern and their age had statistically significant relationship as the chi-square p (= 0.00) calculated, was less than 0.05.

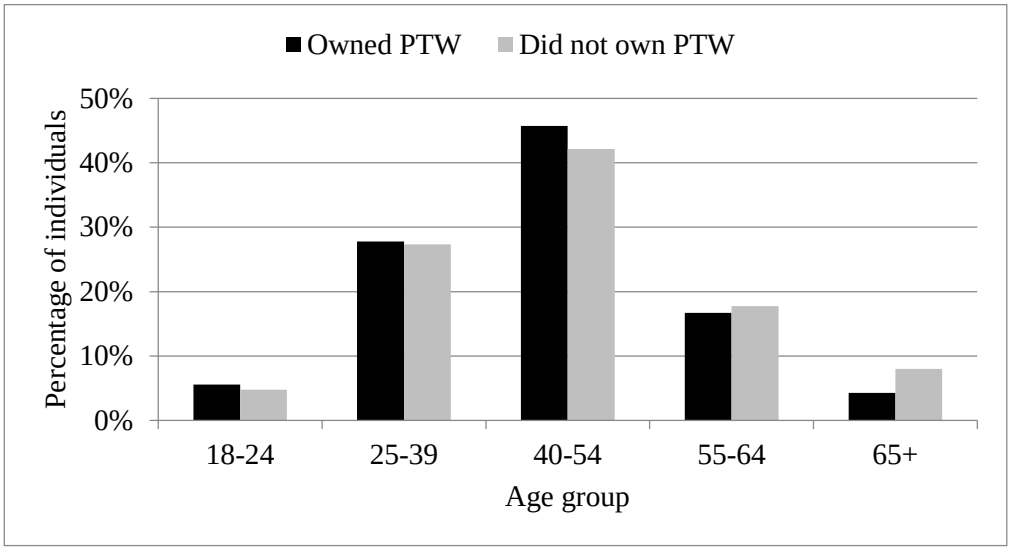


Figure 4.11 PTW ownership by age

On 30 June 2012, the average age of learner riders was 31 years while the average age of licenced riders was 46 years old. Analysing licencing data revealed that in average males were younger

than females (30 versus 33 years) at the time of obtaining their riding learner permit (the age distribution of males and females were significantly different as p value obtained from the t-test equalled to zero, less than 0.05). Therefore, in average, males were more likely to start riding earlier than females.

4.1.2.5. Residential location

Figure 4.12 presents the residential location split of riding permit holders considering their pattern of PTW ownership. It is found that residential location did not influence the pattern of PTW ownership of riding permit holders (Figure 4.12). From licencing data, individuals' PTW ownership pattern and their residential location were not significantly dependent as the chi-square p (= 0.12) calculated, was greater than 0.05. This is in contrast with the VISTA 2007-2008 data, which showed households in non-metropolitan areas were more likely to own a PTW. Because in VISTA data, there were households who did not own a riding permit, but they had a PTW, which they are not included in the licencing data as licencing data only collected details of riding permit holders.

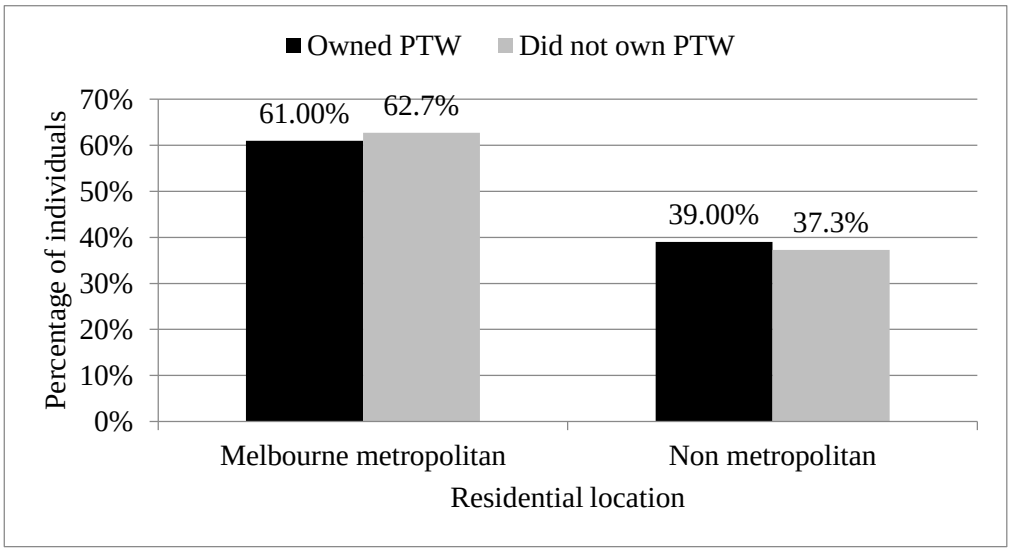


Figure 4.12. PTW ownership pattern by residential location of individuals with a PTW riding permit

In this section, the VISTA 2007-2008 data and licencing data were employed to provide insight into the patterns of PTW ownership in Victoria.

4.2. PTW use

In the VISTA, in addition to capturing the number of vehicles in the household, the trip details on a given day for all the household members were collected. Therefore, next section used the VISTA 2007-08 data to provide an insight into the PTW usage pattern in Victoria.

4.2.1. Insight from VISTA 2007-2008 data

VISTA 2007-2008 survey collected all trip details made on a given day for all household members whereas that day could have been either weekday or weekend. Information collected on each trip includes its purpose, the time the trip had been started and ended and details of waiting times, travel distance and locations.

A total of 128,744 linked trips (comprising trips each might be undertaken by different mode of transport) were made from total 17,115 households. Half of the trips were made by car (driver: 55.1%) as the mode used for the longest trip distance within a linked trip whereas PTWs were used for just 0.3 percent of linked trips. Public transport (PT) was used for only one percent of linked trips as the mode used for the longest trip distance.

Analyses of trip purpose distribution by the mode of travel on the linked trips is presented in Figure 4.13. The mode of travel selected was the mode, which had the longest trip distance across different modes of travel used on a linked trip.

Almost half of trips by PTWs (45.2%) and by PT (51.4%) were commuting related compared with commuter trips by cars, which comprised less than one third (29.3%). Trip purpose and mode of travel had a statistically significant relationship as the chi-square p calculated equalled to zero and was less than 0.05. Given the significantly higher proportion use of PTWs for commuting trips compared with cars as the alternative option of private motor vehicle, commuter trips were chosen as a particular focus for this study.

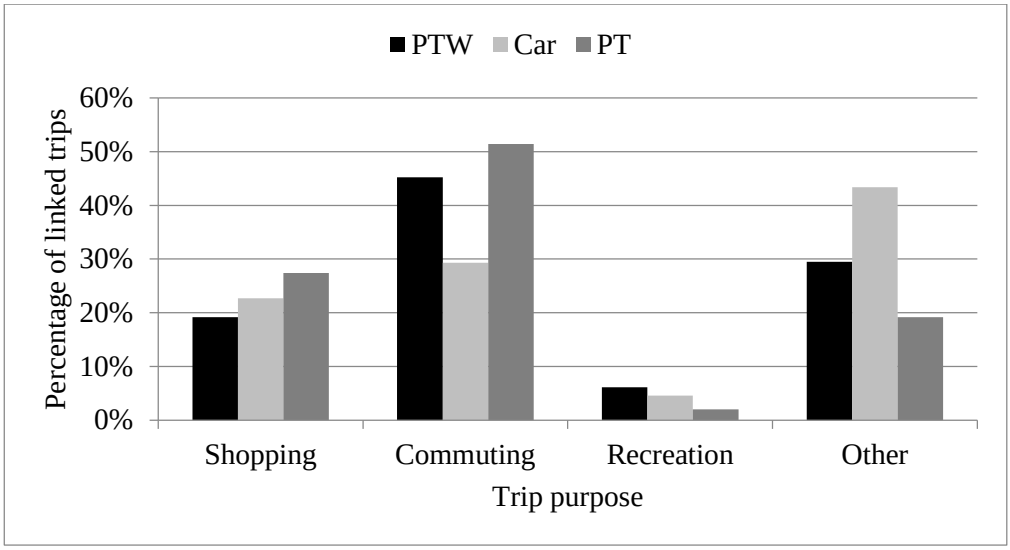


Figure 4.13. Trip purpose distribution undertaken by PTWs and cars

A greater proportion of PTW trips were for commuting than were for cars. Comparing their trip characteristics revealed that travel time by PTW was less than car (18.51 minutes versus 24.33 minutes) (Table 4.4). Therefore, less travel time by PTW than car, which can be an indicator of greater travel

time reliability for PTWs, might be a motivating parameter to use a PTW. ANOVA test identified statistically significant difference in trip travel time by PTW compared with car when both were used for similar travel distances ($p_{\text{travel time}} = 0.00$, $p_{\text{travel distance}} = 0.06$).

In the context of PT, while almost similar proportion of PT trips were for commuting as was for PTW, the travel time by PTW was in average 37.47 minutes less than PT (Table 4.4). The ANOVA test identified statistically significant difference in the travel time by PTW compared with public transport when both were used for similar travel distances ($p_{\text{travel time}} = 0.00$, $p_{\text{travel distance}} = 0.54$).

These results suggest that other parameters may have motivated people to use a PTW as opposed to other modes of transport, parameters that were not explored in the VISTA 2007-2008. The parameters could range from PTW costs including PTW purchase, maintenance and travel costs by PTW to the individuals' attitudes towards PTW use compared with other modes. Subsequent components of doctoral research identifies and explores those parameters and motivators.

Table 4.4. Trips details undertaken by PTWs versus cars for commuting purpose

Predominant Mode of Trip	Mean travel time (min)	Mean trip distance (km)
PTW	18.51	11.03
Car	24.33	15.99
PT	55.98	15.28

However, in VISTA 2007-2008 data it was not clear who owned each vehicle in the household, but the trips and mode of travel used by each household member were reported in the trip data file. In addition there was another file included details of each persons' age, gender, residential location and the type of car driving permit owned, but did not contain details of the vehicles owned by each person. These two files were linked together. Therefore, it was possible to examine the influence of demographic characteristics of the individuals on the mode of travel used to undertake the commuting trips. The VISTA 2007-2008 trip data analysed was filtered to only include the trips undertaken by individuals, who owned both riding and driving permits and had access to both car and PTW, which limited the input data to 1982 trips. This filtering provided the chance to obtain a clear view of the advantages of each mode of travel in comparison with other travel options when both car and PTW were available. The data filtering included:

- Details of commuting PTW trips in, which the car was available at the trip origin,
- Details of commuting car trips in, which the PTW was available at the trip origin,
- Details of commuting PT trips in, which both PTW and car were available at the trip origin.

4.2.1.1. Gender – PTW trip details

For commuting trips, females were slightly more likely to use PT than PTW and car (33.3% versus 18.6% and 10.4%) than males; when males were more likely to use car than PTW and PT (89.6% versus 81.4% and 66.7%) (Figure 4.14). (Figure 4.14). The mode of travel and gender were significantly dependent as the chi-square p (= 0.04) calculated, was less than 0.05.

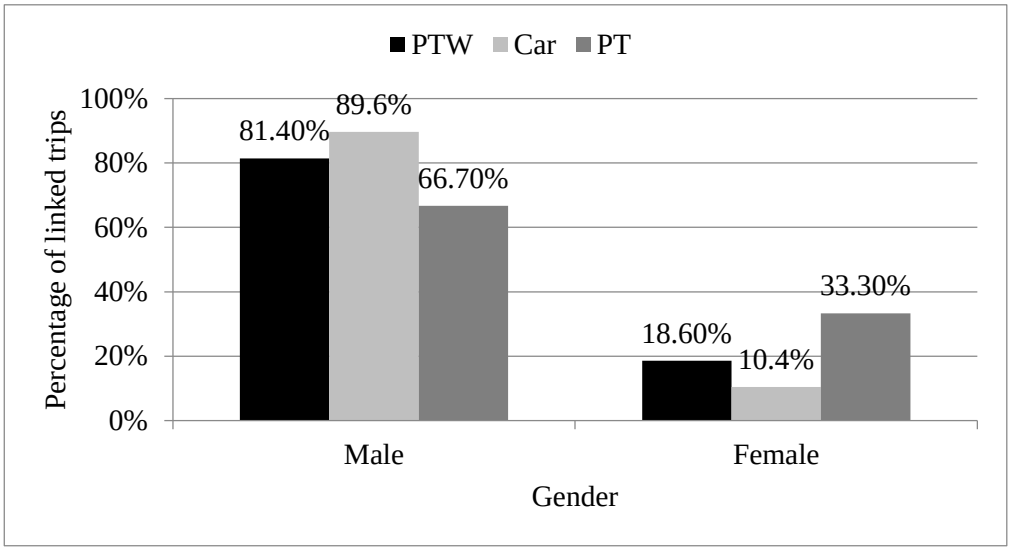


Figure 4.14. Distribution of mode used for commuting trips by gender

4.2.1.2. Age – PTW trip details

People aged between 25 to 54 years old and aged greater than 64 years old were slightly less likely to commute by PTW than car in comparison with other age groups (11.93%, 13.03% and 11.11% versus 20.69% and 18.48%) (Figure 4.15). In addition, the likelihood of using PT, gradually decreased by the increase in age of riders. Mode of travel and age had a statistically significant relationship as the chi-square p (= 0.00) calculated, was less than 0.05.

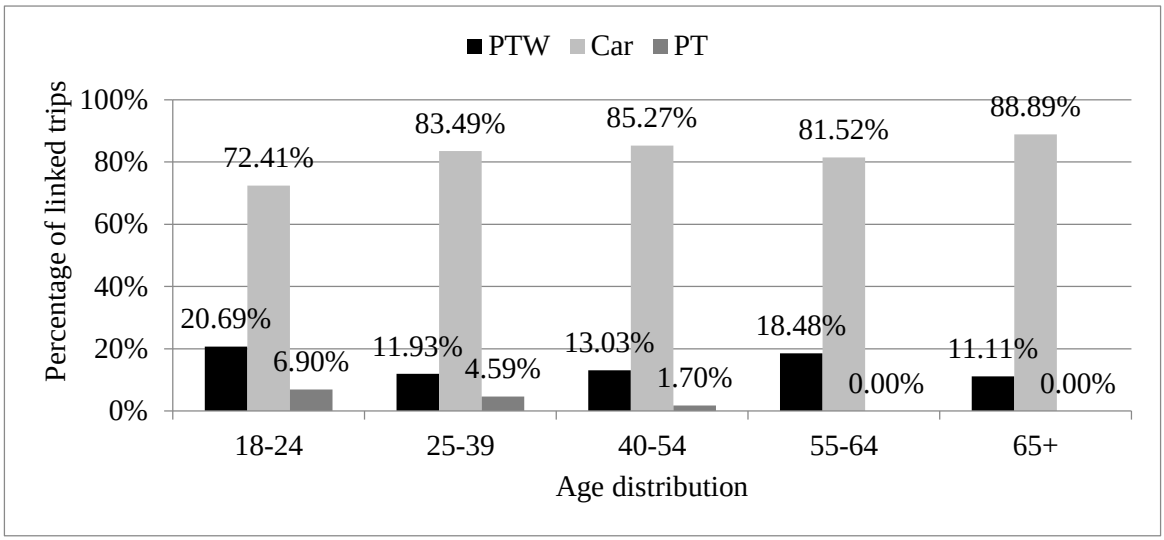


Figure 4.15. Distribution of mode use for commuting trips by age

4.2.1.3. Residential location – PTW trip details

Melbourne resident riders were more likely to use a PTW and PT than their non-metropolitan residents' counterpart (17.29% versus 9% for PTW) (4.01% versus 0.64% for PT) (Figure 4.16). Mode of travel and residential location had a statistically significant relationship as the chi-square p (= 0.00) calculated, was less than 0.05.

However, as stated in the previous section, non-metropolitan residents were more likely to own a PTW (Figure 4.7). This might reflect that those individuals who live in the Melbourne metropolitan areas are more likely to ride for commuting purpose than recreation in comparison with non-metropolitan residents.

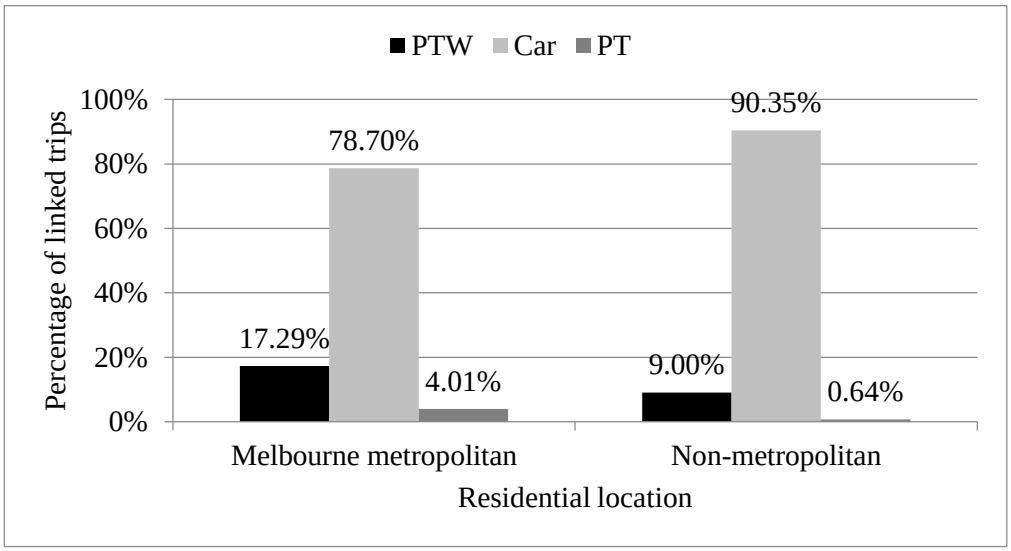


Figure 4.16. Distribution of the mode use for commuting trips by residential location

4.2.1.4. Insight from modelling the PTW use in comparison with car and public transport

In this section, the multinomial logistic regression model has been employed to determine the extent to, which trip details and demographic characteristics help to identify the mode of travel. Mode of travel was the dependent variable with three outcomes: “Car”, “PT” or “PTW”. SPSS was used to calibrate and examine different models. The models examined the gender, age and residential location of individuals, as well as travel details including travel time and travel distance. While travel time is presumably correlated and dependent on the mode of travel, but it was included in the model development to examine the significant of different parameters on the individuals’ modal choice. The model with the best overall performance identified three different set of variables as statistically significant in each model as presented in Table 4.5. The global test of the null hypotheses ($B = 0$), testing the model with a constant only against the model with two predictors was significant ($p < 0.001$). The model including the predictors performed significantly better than the constant only model and the null hypothesis must be rejected. Table 4.5 presents the odds ratio for each parameter.

The model outcome identified that

- Commuting trips with greater travel time were slightly more likely to be undertaken using cars or PT than PTW.
- Age was found to have different effects. Age increase was associated with the increased use of car than PTW whereas older riders were less likely to use PT than PTW. Therefore, there might be shift from PT use to car use by increasing the age of people.
- Melbourne metropolitan residents were almost 50 percent less likely to drive a car than ride a PTW.
- Males were almost 80 percent less likely to use PT than females.

The model had a good overall performance, but that goodness of fit measure was inflated because the majority of trips in the data file were undertaken by car and the model had classified that the majority of trips were undertaken by car and only classified 13 percent of the trips undertaken by PTW correctly.

Model developed here is constrained to socio-demographic characteristics of individuals and trip details and similar to the logistic regression model developed earlier to explain PTW ownership pattern in VISTA 2007-2008, is limited by the lack of attitudinal parameters and PTW riders’ perception. Therefore, this study focused to explore and identify the range of parameters that have motivated individuals to own a PTW and influence their pattern of PTW use.

Table 4.5. Parameter estimates*

Mode with the longest straight line distance	Parameters	Parameter definition	Exp(B)	Sig.	95% Confidence Interval for Exp(B)	
					Lower Bound	Upper Bound
Vehicle Driver	Intercept	--		.36		
	Age	Continues	1.02	.03	1.00	1.03
	Trip time	Continues	1.02	.04	1.00	1.04
	Residential location	Melbourne metropolitan area**	.51	.000	.28	.90
Public Transport	Intercept			.98		
	Age	Continues	.87	.00	.80	.93
	Trip time	Continues	1.1	.00	1.06	1.14
	Gender***	Male	.21	.02	.05	.78

* The reference category is "PTW"

** The reference category is non-metropolitan residents

***The reference category is female

4.3. Discussion

Due to the lack of knowledge in the literature about parameters influencing novice riders pattern of PTW ownership and use particularly in the local context, this research started with an analysis of existing PTW related data. However, in the existing data, novice riders were not distinguished from the other PTW riders and the findings of those studies may have varied over time, investigating the broader population of PTW riders from data accessible collected in 2007-2008; provided an initial insight into novice riders' PTW ownership and usage pattern. Two different data sources, which were accessible and relevant to the context of the study, were explored including VISTA 2007-08 and licencing data.

The data sources were limited. VISTA 2007-2008 and licencing data included some socio-demographic characteristics of individuals and no details about individuals' attitudinal characteristics, perceptions and motivations were collected. But even with those limitation, the analysis provided important initial insights into the patterns of PTW ownership and use in Victoria. Through analyses of household level VISTA 2007-2008 data, it was found that households with higher income level, who owned two or more passenger cars, owned four wheel drive vehicles or adult bicycles, comprising household structure of "couple with kids", with average age of adults between 25 and 54 years or living in non-metropolitan area were more likely to own a PTW.

Similarly, at the individual level, through analysing licencing data, individuals who owned two or more passenger cars, were males, aged between 18 and 54 years or lived in non-metropolitan area were more likely to own a PTW.

Therefore, parameters including income, vehicle ownership pattern including cars, 4WD vehicles and bicycles, household structure, individuals' gender, age and residential location influenced PTW ownership patterns either at the household level or at individual. But efforts to develop models using this data found they had limited capacity to explain the variability in the PTW ownership pattern.

To explore the PTW usage patterns for commuting trips, the VISTA 2007-2008 data was filtered included those trips made by who owned both riding permit and driving permit. Analysing the gender of riders revealed that males were more likely to drive a car than use a PTW or PT, whereas females preferred PT than both car and PTW.

Individuals aged between 25 and 54 years old were less likely to use a PTW than a car for commuting trips. In addition, the use of PT gradually decreased by increase in the age of individuals. In the context of residential location, greater proportion of trips by Melbourne metropolitan residents were undertaken by PTW and PT than non-metropolitan residents. However, using all the variables accumulated in the data to develop the logistic regression model resulted to the poor ability to explore the variability in the PTW usage pattern in the data.

Findings suggested that models developed using existing data collected details of the broader population of PTW riders had poor ability to explain the variations of PTW ownership and use. This reflects that there must be a range of parameters, which are not studied in the existing data. Therefore, the main focus of this study was to identify the parameters motivated people to ride a PTW and influence their pattern of PTW ownership and use particularly in the context of novice riders. In this regard, the interviews and focus group studies were undertaken to provide a qualitative insight into the area of research where very limited knowledge existed in the literature and existing data, particularly in the local context. Next chapter has analysed the data collected from the focus groups and interviews to identify the novice riders' intentions and their attitudinal characteristic motivated them to ride a PTW.

Chapter 5. Stage 2: Qualitative research exploring novice riders' riding motivations and attitudes

It is clear from the review of the literature (Chapter 2) and the analysis of existing PTW data in Victoria (Chapter 4) that there is limited insight into the motivations and attitudes of people to ride a PTW. The focus of this chapter was to explore the parameters motivated novice riders to ride a PTW and influenced their PTW use.

The analysis in this chapter mainly continuous towards addressing the first research question that underpins this research while results would provide an initial insight into addressing the third research question.

RQ1: What are novice riders' characteristics, motivations and attitudes towards ownership and use of PTWs in Victoria?

RQ3: To what extent do differences in characteristics, attitudes and motivations of novice riders explain variations in their riding travel behaviour?

In this stage of the research, focus groups and interviews were conducted. This chapter includes an overview of the development of the discussion guide, a description of the role of a market research company, recruitment strategies used, the conduct of the focus groups and interviews followed by a discussion of the findings.

5.1. Discussion guide

The review of the literature (Chapter 2) identified that a range of parameters influence the riding behaviour of individuals, which could be grouped into social norms (SN), attitudes (AT), socio-demographic characteristics and perceived behavioural control (PBC). The analysis of the socio-demographic characteristics of individuals and households in Chapter 4 identified that these parameters alone are not adequate predictors of the PTW use as well as their patterns of ownership. In addition, limited research explored the SN, AT and PBC of PTW riders and in particular, novice riders. Therefore, focus group topics were designed to address this gap. The focus groups were conducted to explore parameters motivated novice riders to ride a PTW, which were not studied in the PTW literature and existing local PTW data. The topics explored social norms, attitudes, perceptions, motivations and past riding experiences of novice riders in relation to obtaining a motorcycle riding permit and riding a PTW. A discussion guide was developed and used to guide each of the focus groups and covered the following topics with novice riders:

1. Exploring motivations to obtain a motorcycle riding learner permit/licence
2. Their prior experience with PTW

3. Factors influenced their PTW purchase decisions
4. Their current usage pattern of the PTW
5. Attitudes towards the use of other modes of transport
6. Perceptions of safety and environmental issues

5.2. Recruitment strategies: focus groups

Any research from humans in Australia must meet the ethical requirements as described in the "National Statement on the Ethical Conducts of Human Research" (Australian Government 2014). Therefore, to undertake focus groups and interviews, the ethics applications form were submitted to the ethics committee at Monash University. The ethics approval was achieved on 22/08/2014 under project number "CF12/1879-2012001031".

Next, a market research firm, IPSOS, was engaged to recruit focus group participants and undertake the focus groups using the discussion guide as it had prior success recruiting PTW riders in Victoria for focus group research. The reasons to undertake focus groups by a market research company than the student were:

1. It was planned to run focus groups by a professional team in a convenient office designed for undertaking focus groups, which we did not have access to; with the scope to obtain the most possible insight from the focus group participants.
2. The list of potential participants was not available. The market research company selected had good experience on working and collecting data from PTW riders. In addition, they had access to the potential list of novice riders satisfying the criteria to be invited to participate in the focus groups.

The inclusion criteria for participants to be recruited by IPSOS, introduced by me and my supervisor, were:

1. Novice riders who obtained their motorcycle learner permit within the last 15 months or who have held their motorcycle riding licence for less than one year
2. Who owned a PTW
3. Who had an interest in utilitarian use rather than purely recreational use of the vehicle.

In addition, it was desirable to recruit an equal number of males and females across the focus groups to obtain enough number of participants for each gender type as there might be participants who do not attend the focus group discussion. Participants were recruited by IPSOS through

- Direct contact to people who had parked their PTW in Melbourne CBD and met the recruitment criteria or,

- Participants of previous IPSOS studies who met the inclusion criteria were telephoned and invited to participate.

Seven to eight participants were recruited for each focus group. There was strategy to have mostly single-sex focus groups as the market research company believed that individuals may not feel confident to speak about their experiences, attitudes and perception freely in front of individuals from the other gender. While six participants is the desired size, participants were over-recruited to allow for non-attendance as recommended by Stewart and Shamdasani (1990). In addition, each participant received a $75 cash incentive at the completion of his or her focus group participation.

5.3 Focus groups

All focus groups were conducted in a room with a one-way mirror, which allowed the discussion to be viewed without distraction or interruption however, the participants were told that they might be observed. In total, seven focus groups were conducted by the market research firm. The expected total number of participants was 52, but focus groups involved a total of 27 novice riders comprising of 13 men and 14 women. This might reflect the unlikelihood of novice riders to participate in the PTW research studies, even when they had agreed to participate. Six focus groups were held in the inner city suburb of Richmond, approximately 4 KM from the Melbourne central business distance (CBD). One focus group was conducted in the outer suburbs in Narre Warren, 44 KM from the Melbourne CBD. Details of the gender split in the focus groups is summarised in Table 5.1.

Table 5.1. Gender split of participants across different focus groups and focus group location

Focus group No.	Focus group location	Female	Male	Total
1	Richmond	4		4
2	Richmond		2	2
3	Richmond		4	4
4	Richmond	3		3
5	Narre Warren	3	4	7
6	Richmond		3	3
7	Richmond	4		4
Total		14	13	27

The focus groups were led by an experienced facilitator. At the beginning of each focus group, the facilitator explained the details of the study and participants read the study Explanatory Statement and signed the Informed Consent. Each discussion lasted between 60 and 90 minutes.

The focus group discussion followed the discussion guide to ensure that each focus group covered similar topics. Each focus group's discussion was recorded on an audio recorder. Anonymous transcripts were then produced for each focus group discussion by IPSOS.

5.4 Interviews

Scheduling was a major barrier for some potential focus group participants. People who met the inclusion criteria and expressed an interest in participating were not available at the scheduled times and this resulted in smaller numbers of participants than expected. However, to capture the insights from these people, phone interviews were conducted using the same discussion guide as was used in the focus groups.

In total six interviews were undertaken by IPSOS with three males and three females. Each interview took approximately 30 minutes. Anonymous transcripts were then produced by IPSOS for each interview.

The transcripts generated from the focus groups and the interviews were analysed collectively using thematic analysis. This constructionist approach used to identify the realistic relationships and patterns within the data (Braun and Clarke 2006) is able to provide insights from the rich discussion (Flamm and Agrawal 2012).

A manual thematic analysis was conducted by the student on the transcripts of focus groups and interviews to explore novice riders' attitudes and motivations in relation to their PTW riding behaviour. Transcripts of focus groups and interviews were read and noted in a back and forth process to gradually build up the patterns (themes) within the data as outlined by Braun and Clarke (2006). The approach guided by Braun and Clark's (2006) included six steps of thematic analysis and is outlined in Table 5.2 (Braun and Clarke 2006).

Table 5.2. Steps of Thematic analysis used to analyse transcribed data (Braun and Clarke 2006)

Thematic analysis steps	Description
1. Data familiarisation	The transcripts were read and re-read again and initial notes were developed.
2. Producing initial codes	Key emerging issues within the data were coded, then data was sorted in order to the relevant to each code. Code is a small word or name reflecting the content of a group of sentences.
3. Identifying themes	Codes were grouped into potential themes focusing on the research purpose to identify novice riders' attitudes and motivations.
4. Re-inspecting themes	The themes developed were re-examined in relation to the coded extracted and the entire data set.
5. Explaining and naming themes	Each theme was named in the way, which could clearly define its story. Then there was a step back to assess the extent to, which those themes were aligned with the theory of planned behaviour.
6. Generating the report	Select the themes relevant to research purpose and compel extracted examples relating to each theme and produce a research report.

5.5. Understanding novice riders' attitudes and motivations

When analysing the transcripts, as they were anonymous, it was not clear that who had told each quote, therefore, the age and residential location of the person who had told each quote was not identifiable. Only the gender of the person was identifiable based on the group, which they had participated in. For participants of the fifth group comprised females and males, identifying the gender of the person was possible through listening to the audio file provided to confirm the gender of each person.

The themes identified through the thematic analysis of focus group and interview data are discussed in this section. Studying the themes identified emphasised that there was a combination of different attitudes and motivations across participants that influenced their decision to ride a PTW and prefer it to other modes of transport. The data analysed in this chapter provided qualitative insight into novice riders' motivation and attitudes to ride a PTW. But as this data was qualitative, it could not explain the differences in the novice riders' PTW usage pattern. Therefore, in the next step of this research, to obtain a quantitative insight into the parameters identified in this chapter, which motivated novice riders to ride a PTW, designing survey questionnaires were scheduled. Then it would be possible

to statistically examine the relationship between novice riders' motivations and attitudinal characteristics, and novice riders' PTW usage pattern. Here the themes identified are presented in the order that was found important to novice riders considering the range of quotes and parameters stated about each theme.

5.5.1. Advantages associated with the use of PTWs than cars

The scope to save on commuting costs was perceived to be an important motivating parameter to ride a PTW. Its level of concern can be an indicator of the individual's perceived behavioural control towards the use of a PTW while riding PTWs provide the riders the opportunity to minimize their travel costs and have a greater control over their travel costs.

Participants commented that PTWs are cheaper than other private vehicles to purchase, have lower running and maintenance costs and were either exempt from paying tolls or the toll is less than a car.

In addition, availability of free parking and being able to park close to their destination was a significant motivator. In Melbourne, and in particular in the CBD, riders are allowed to park on the footpath (sidewalk) as long as they do not interrupt pedestrian movement. This means they can park very close to their destination for free. PTWs were also regarded as a faster and more reliable mode of transport than a car.

The range of parameters associated with the PTW advantages motivated novice riders to ride a PTW in comparison with a car included:

5.5.1.1. Lower purchase and running costs of PTWs than cars

- *"I love the $7 a week for petrol"*
  (Gender: Female)
  (Note 1: Participant liked the low fuel cost associated with the use of PTW)
- *"I do change the engine oil at home, it costs me nothing, and I only have to buy the oil"*
  (Gender: Female)
  (Note 1: The PTW engine oil can be changed at home, no need to go to service shop)
- *"I didn't have a vast quantity of money and it's a cheaper way of getting around than in a car and I said it's cheaper, so much cheaper than driving a car. It's unbelievable".*
  (Gender: Male)
  (Note 1: The cheaper way of getting around by PTW than a car was a motivator)
- *"There are lower costs in terms of registration, insurance. They're cheaper to buy. You think of how much you have to pay for a car. If you buy a new bike, it's still a lot cheaper".*
  (Gender: Male)

(Note 1: The costs associated to buy and use a PTW were emphasised to be less than a car)

- *"Once we got bikes, we just didn't use the car. One day it would be sitting out in the front of the house and we'd say, is it still there? And we would not go out with it and there would be cobwebs on it. And my son borrowed it a bit but he didn't really need it because he lived inner city and we just decided that we could do without it. And why pay registration, insurance, servicing on a vehicle that we just weren't using? It just didn't make sense. It was just an economic decision in the end and plus it was just one less thing to worry about, and we figured that if we did need a car for whatever purpose, to pick up something from a hardware store or furniture or whatever, we would hire one. It would be so much cheaper just for the two or three times a year we need it, we just hire a car for the day or use a taxi".*

  (Gender: Male)

  (Note 1: The costs associated with keeping and using a car was a concern)

5.5.1.2. Free or reduced toll cost for PTWs

- *"Yeah, I think it costs me $3 to ride from here to Brunswick. It's nothing. No tolls. Only on the Monash".*

  (Gender: Female)

  (Note 1: Participant do not need to pay toll cost using Monash freeway while cars have to pay)
- *"I do not pay toll using Monash freeway to get to my work while on car I have to pay $8"*

  (Gender: Male)

  (Note 1: Participant used the freeway without being concern about toll cost)

5.5.1.3. Free parking for PTWs with the chance to park them close to the destination

- *"Especially like unis and stuff like that, it would be a lot easier. When I went to TAFE in the car, I ended up just catching the bus because you had to park like five blocks away, which was ridiculous. On a bike you can just park right in front. It does safe a lot of time and effort".*

  (Gender: Female)

  (Note 1: Participant could park the PTW close to the destination)
- *"I wasn't able to take a car into the city because I didn't have parking where I worked, but I could take my motorbike. You can get on and off and you don't have to wait around for public transport or for anyone else and here is very humid, so bicycling to work in summer, I need to have a shower when I get to work. But less on a motorbike. Depends how much gear you've got on."*

  (Gender: Female)

  (Note 1: Participant liked the advantage of being able to park her PTW in the city)

- *"A friend of mine said the convenience of just getting on there and parking it in front of work – he doesn't have to park it a kilometre away. Just ease in the city and he can park on the footpath there. He said, it's so handy and cheap to run".*
  (Gender: Male)
  (Note 1: Being able to park the PTW close to the destination was declared to be important)
- *"You're going to the city, where do you park? I've parked with a car in a parking spot and fortunately I'd put money in the meter, and I had three different parking attendants come through within the half hour period, all just itching to find a car that's expired. They're just ruthless in the city. Whereas with a scooter, I just go up on the footpath and park it there and it's all legal".*
  (Gender: Male)
  (Note 1: Free parking on the footpath in the city was a big advantage for the participant)
- *"I'm not using the car, because car park is about $20 a day. Your scooter costs you nothing, so big difference."*
  (Gender: Male)
  (Note 1: Free parking associated with the use of PTW was a big advantage)

5.5.1.4. Less travel time by PTW than a car

- *"I live in Cranbourne and I ride around down to my brother's over in Southland. If the traffic's really packed then you can go up the middle, which saves a lot of time".*
  (Gender: Female)
  (Note 1: Participant could save a lot of travel time through filtering the traffic)
- *"Once you're comfortable and you can do the speed limit, you can go anywhere a car can. You can save travel time"*
  (Gender: Female)
  (Note 1: Saving travel time was declared to be an advantage of PTW use"
- *"It is much faster than car when you can split the stopped traffic on red light".*
  (Gender: Male)
  (Note 1: Participant believed that riding on a PTW is faster than a car when you can split traffic)
- *"You know what irritates me? When I get in the car with someone and we're stuck in traffic and I can't filter. If I was in my bike, I'd be at the front now, not sitting here waiting".*
  (Gender: Male)
  (Note 1: Being able to filter traffic on the PTW and do not stuck in traffic was a motivator)

To explore the relationships between the parameters identified above and the novice riders' PTW usage pattern, it was necessary to obtain a quantitative insight into them. The importance of these parameters in motivating novice riders to ride a PTW in comparison with a car were asked in the survey questionnaire, deigned later in this study, on a six point Likert-scale ranging from "extremely unimportant" to "extremely important".

5.5.2. Benefits of using PTWs in comparison with PT

Most participants were reluctant to use public transport (PT). Most felt that PT was poor in Melbourne and many used derogatory terms in describing the quality of PT. Some participants mentioned that if they cannot ride for some reason on a work day, they would not use PT and preferred to drive instead while some said they would not travel to work on that day. For some participants, even their job acceptance was constrained to whether it was possible to ride to work or not and the job offers will be rejected if they were not able to do so. Here the concerns associated with the use of PT is listed.

5.5.2.1. Unreliability of PT

- *"Bus, train. It's annoying, because it's never on time and you can't call to complain. They say, "Okay. It'll be there soon."*
  (Gender: Female)
  (Note 1: Unreliability of PT was a concern)
- *"When I first started riding, one of the motivations for riding a motorbike as opposed to taking public transport was because the public transport is so horrendous and the buses are so unreliable. So you wait and wait for a bus, even though there's meant to be one every three minutes, it just never comes. So I got sick of spending my morning waiting at the bus stop"*
  (Gender: Male)
  (Note 1: Unreliability of PT was annoying)

5.5.2.2. Longer travel time by PT

- *"I would rather get on the bike and get the wet weather gear on and endure a horrible rainy day than take 50 minutes to get to Hawthorn on PT".*
  (Gender: Female)
  (Note 1: Long travel time by PT was a concern)
- *"It takes too long for me to get to uni by PT, if I do it, riding the bike is much faster and cheaper in the long run".*
  (Gender: Male)
  (Note 1: Long travel time by PT was a concern)

- *"This is my second year at uni and I'm living at Dandenong so Dandenong to Clayton traffic, I just thought bike would be a good way to get around for uni because public transport takes a long time and it's a waste of time sometimes, like one hour up and down – two hours".*
  (Gender: Male)
  (Note 1: Long travel time by PT was a concern)

5.5.2.3. Cannot change route by PT or travel directly to destination

- *"By using public transport, you have to commute around to lots of different places to get to one, it is annoying".*
  (Gender: Female)
  (Note 1: It was annoying that on PT is was not possible to travel directly to the destination)
- *"Public transport is much regimented, you can go one route and you have to wait for it to come and while other people get off. Whereas on a motorbike, that's your own form of transport so you decide where and when you go. If you want to go home via scenic route, you can, or change your route for a meeting".*
  (Gender: Male)
  (Note 1: Not being able to change and use other routes by PT was a concern)

5.5.2.4. Crowded PT

- *"I find that I've become a little bit antisocial because for years I caught the train in and you were sardine and people touched you all the time and you were used to it. Now, we go and line up in a line and my personal space has grown, but in PT you feel them breathing on your hair. It is a problem but now you're so in your own space. I find it crowded and I can't do PT".*
  (Gender: Female)
  (Note 1: The participant did not like the PT as found it crowded)
- *"I wouldn't be squished between 47 people in PT, riding my motorbike"*
  (Gender: Female)
  (Note 1: The participant did not like to be squished in the PT crowd)
- *"I used to work in the city and I'd get the train from Springvale to Melbourne Central every day and I'd be lucky to get a seat so I'd be standing the whole time, pressed against someone. With their phone in your face and music but now I ride my bike".*
  (Gender: Male)
  (Note 1: The participant did not like the PT as not enough space was available)

To obtain a quantitative insight into the parameters identified above, their importance in motivating novice riders to ride a PTW in comparison with PT were asked in the survey questionnaire, deigned later in this study, on a six point Likert-scale ranging from “extremely unimportant” to “extremely important”. In addition to the parameters identified above a couple of other parameters were also included in the survey question designed to provide a deeper insight into the individuals’ perception of the advantages associated with the use of PTW in comparison with a PT.

5.5.3. Enjoyment of riding

The pleasure of riding was mentioned by many participants as an important motivator to ride. Many said they like riding and feel “alive” and “energised” when they ride. Also it was mentioned by different riders that they enjoy the thrill of the riding, it is a fun for them and they like the close contact with the environment. The parameters identified each could be a motivator to ride a PTW and a reflection of the rider’s attitude, which included:

5.5.3.1. Like riding

- *“I have been here in Australia from Egypt because they restrict women from riding over there and I quite like bikes and my husband likes bikes. So I moved to Australia to ride a motorbike. I’m living the dream”.*
  (Gender: Female)
  (Note 1: Participant dreamed of riding a PTW, which came to reality in Australia)
- *“I ride for pleasure every morning to work. Cannot wait. Love it. I get to work and I’m grinning”.*
  (Gender: Male)
  (Note 1: Participant loved PTW riding)
- *“I start at 9 everyday, wake up at 8 and get out of bed at about 8:20. Get to work and think I’m going to get up early the next morning to have a ride. I get home and I’m so disappointed. I just want to ride more”.*
  (Gender: Male)
  (Note 1: Participant liked to commute on his PTW every morning)

5.5.3.2. Feel alive

- *"I feel alive. I feel energised and I feel I can't wait to ride every single day. If there's an excuse to go out on it, I go on it. Whereas two years ago, I don't think I was that enthused about life. I go out for coffee every day, I meet groups of people…, so it's transformed my life totally"*.
  (Gender: Male)
  (Note 1: Participant felt alive and energetic riding PTW)

5.5.3.3. Thrill of the riding

- *"I think of going around corners with knees touching the ground"*.
  (Gender: Male)
  (Note 1: Participant liked to ride with knees touching the ground on the corners)
- *"So I do it because I get a fair adrenalin kick and get a lot of enjoyment out of peak hour traffic navigation, which always sounds a bit weird but I also like running full tilt through peak hour CBD"*.
  (Gender: Male)
  (Note 1: Participant enjoyed riding in full tilt to get a fair bit of adrenalin)

5.5.3.4. Fun

- *"Every time I ride, I take it as an opportunity to try to improve a little bit, which is kind of what I was saying about it before being a skill that's fun to get better. It's like learning an instrument. It's fun to get better at it and also there's the safety aspect. But most of the time, I'm just focussed on the road. It's a bit Zen and keeps my mind away thinking about some issues"*.
  (Gender: Female)
  (Note 1: Riding was a fun for the participant and kept her mind away from other issues)
- *"Now I'm all on road bikes and it's practical as well as my hobby. I consider it a hobby so I'm quite lucky that something I do with a great deal of purpose in terms of using it as a commuter bike, in terms of just getting from A to B and doing whatever I want to do, the practical terms, it's also a great enjoyment for me as well"*.
  (Gender: Male)
  (Note 1: Riding has been a hobby for the participant)
- *"I'm not thinking about the destination. I'm enjoying the ride. I'm feeling – it's so clichéd. I'm feeling part of the bike, one with the bike. You know, you hear people say it and then you get to a point where you go, "Yeah, actually. I get that now and I'm going to have to say that phrase." But yeah, it's a very interesting sensation, travelling through space like that"*.

(Gender: Male)

(Note 1: Participant enjoyed riding and it was an interesting sensation for him)

5.5.3.5. Feel the environment:

- *"Especially on a beautiful day, you just love the air and the smells of dead animals on the side of the road. You don't get that in the car at all. It's totally different. The cold spots, the hot spots. You just feel everything. You smell everything and the bugs on your screen. It's crazy; it's a whole different feel".*

  (Gender: Male)

  (Note 1: Participant enjoyed feeling everything on the road including air, smell and weather)

To obtain a quantitative insight into the parameters identified above, the importance of them in the riding enjoyment contribution of novice riders were asked in the survey questionnaire, designed later in this study, on a six point Likert-scale ranging from "extremely unimportant" to "extremely important". However, in the survey questionnaire those parameters were rephrased in a more tangible form exploring the importance of "freedom of riding", "thrill of riding", "get away from everyday life" and "being exposed to sounds and smells" on their riding enjoyment.

5.5.4. Image and style

Image and style, often tied to the type of PTW or its colour, were identified as important by some participants, which could be a reflection of their riding preferences and consequently their attitude.

- *"Its colour attracted me. It looked cool. It was red so it means it goes fast, so I bought it".*

  (Gender: Female)

  (Note 1: Participant liked the colour of the PTW)
- *"I see many cruiser riders wearing jeans and t-shirts with tattoos on their hands, which they may like that style, but I am fan of riding sport bikes".*

  (Gender: Female)

  (Note 1: Participant did not like the style of cruiser riders and preferred riding sport bikes)
- *"Those bikes look cool. I like those kinds of vintage styles more than the super bikes and it's ridiculous".*

  (Gender: Male)

  (Note 1: Participant liked vintage style PTW)
- *"I wanted to ride a road bike instead of a Cruiser because I liked the look of them. I also like the look of naked bikes as well, which I'll probably get next time."*

(Gender: Male)

(Note 1: The look of the bike was a preference to the participant)

- *"I went for a classic bike. I like the style, I like the tank, I like the big headlight and I like that it's three times the size of the engine of the 250s"*.

  (Gender: Male)

  (Note 1: Participant liked the style of classic bike)

In the survey questionnaire designed later in this study, the importance of "like the image/style of riding" on the novice riders' riding enjoyment was similarly questioned on a six point Likert-scale, to obtain a quantitative insight into this parameter.

5.5.5. A family member, relative or a friend was a PTW rider

Most novice riders had a connection to a PTW rider before starting to ride a PTW themselves. This can be a reflection of the influence of the social norms on the individuals' decision to ride a PTW. That person who encouraged novice riders to ride a PTW could have been a family member, relative or a close friend. In addition, some novice riders participated in the study had been taken riding as a pillion passenger or had prior riding experience, before obtaining their riding permit. This previous riding experience discussed later in this chapter could have influenced their sense of confidence of being able to ride a PTW and resulted to positive perceived behavioural control to ride a PTW.

- *"My brother took me riding as a pillion and later then my partner was in an actual club for a while so used to be just on the back of the bike and thought, this sucks. So I promised myself one day I'd get my own licence. I've finally done it, it took me to my 40s and finally, yes, I have my licence"*.

  (Gender: Female)

  (Note 1: Participant's brother and partner were PTW riders)

  (Note 2: She had experienced riding as a pillion passenger before obtaining her riding permit)

- *"My father and brother rode sport bikes and there was a chance for me in the family to test riding a bike"*.

  (Gender: Female)

  (Note 1: Participant's brother and father were PTW riders)

  (Note 2: She had rode a PTW before obtaining her riding permit)

- *"We've got a weird family. Our family's historically flown, as in for several generations and mum was the odd one out. Mum rode motorbikes instead so we just do riding"*.

  (Gender: Female)

(Note 1: Participant's mother rode PTW)

- *"My dad does, my uncle does, and my brother does. But it's all boys so they never let me out. So what I did was my grandpa, he had like a little scooter, like the postman scooter. I just did it around and my dad's home going, "Why did you touch that?" And then the next day I took my brother's little one. It was the first time I rode the 80cc one and it was a bit scary. I fell off a couple of times but it wasn't that bad. It wasn't full on, full speed, so didn't hurt much. Just a small fracture. I had this arm tied to my neck for about a week and my dad's going, "You're not doing that again." I actually started to learn from my brother, like without actually going out on my own and then my brother taught me without my dad knowing and he saw me driving so he's like, "Okay, you're not that bad actually. You can go only in the local" and that's where I started off".*
  (Gender: Female)
  (Note 1: Participant's father, brother and uncle were PTW riders)
  (Note 2: Her brother taught her how to ride a PTW)

- *"I always wanted to ride but parents – it was never really an opportunity. A bunch of us, like my cousin, sister, brother-in-law – we all decided and got the bikes together and started cruising and stuff around together, which we only managed to do a couple of times as a full group. The opportunity came up so I took it".*
  (Gender: Male)
  (Note 1: Participant was initially motivated by the relatives to ride a PTW)
- *"My friend rode a PTW to work, so I was asking myself why I do not ride to work"*
  (Gender: Male)
  (Note 1: Participant's friend was a PTW rider)

To obtain a quantitative insight into the parameters identified above, the extent that novice riders regarded the role family members, friends or colleagues or being a pillion passenger as important in motivating them to ride a PTW were questioned on a six point Likert-scale ranging from "extremely unimportant" to "extremely important". In addition to the parameters identified above one other parameter (Need to ride for the job) were also included in the survey question, which might provide an additional insight from another perspective into the individuals' social norms.

5.5.6. Past riding experience

Most participants had previous experience with, or exposure to, PTW riding, which included riding before obtaining their PTW riding permit influencing their perceived behavioural control towards the use of a PTW.

- *"I've ridden since I was a kid, just in paddocks and stuff"*
  (Gender: Female)
  (Note: Participant had rode a PTW since her childhood)
- *"I remember sitting on the scooter. I'd had a couple of friends growing up that had dirt bikes on farms and things. I remember sitting on the scooter and how weird it was to just put my legs in front of me".*
  (Gender: Male)
  (Note: Participant had experienced riding on a scooter before obtaining his riding permit)

To obtain a quantitative insight into novice riders' past riding experience, the extent of that parameter was asked in a survey question in a four point Likert-scale including "none", "minimal (less than 5times)", "moderate (between 5 to 20 times)" and "experienced (rode regularly)". Therefore, there would be the chance to explore the relationship between novice riders past riding experience and their PTW usage pattern later in chapter 8.

5.5.7. Environmental consideration

While almost all participants believed that environment impacts were an issue, they did not consider that as an important motivating parameter in their decision to ride a PTW as opposed to cars. Therefore, environmental consideration has not been a big positive consideration (attitude) to ride a PTW.

- *"Environmental parameters, no. I consider that I'm riding a bike anyway, so I'm using less fuel, I'm producing less emission than all the cars that are sitting in front of me. So I consider that all bikes are fairly environmentally friendly anyway".*
  (Gender: Female)
  (Note 1: Environmental issues was not a main concern to the participant)
- *"I ride every morning I suppose what I'd describe as flat stick for the situation and environment".*
  (Gender: Male)
  (Note 1: Environmental issues was supposed to be a marginal benefit of riding on PTWs)

As this parameter was a marginal concern to novice riders and did not play an important role to encourage them to ride a PTW, this parameter was not included in the survey questionnaire.

5.6. Discussion

The analysis of the focus groups and interviews data, using thematic analyses method, identified a range of attitudes, beliefs and motivators influenced individuals' decision to ride a PTW.

Factors associated with the advantages of PTW use in comparison with a car or PT as well as the previous riding experience of novice riders found to motivate riders to ride a PTW. As these parameters explored the relative advantages of riding a PTW in comparison with other modes of transport and the extent that an individual perceived riding as an easy task to perform through the novice riders prior riding experience, through the lens of the Theory of Planned Behaviour (TPB), they could be regarded as the impact of Perceived Behavioural Control (PBC). In this chapter the range of parameters identified relevant to the PBC of individuals included:

- Advantage associated with the use of PTWs than cars, which were expressed through a range of parameters including
    - lower purchase and running costs of PTWs,
    - free or reduced toll costs for PTWs,
    - and free parking for PTWs
    - Less travel time by PTWs than cars
- Advantages associated with the use of PTW in comparison with PT, which were expressed through a range of parameters including
    - unreliability of PT,
    - longer travel time by PT,
    - cannot change route by PT,
    - and crowded PT.

However, the "crowded PT" was not found to be quoted by males as much as what was declared by females, which might reflect females greater concern over the "crowded PT" than males. However, to obtain an adequate comparison of the male and female towards "crowded PT", there is a need to provide a quantitative insight into the importance of these parameters ranked both by males and females. These comparisons are performed in chapter 7.

Apart from the perceived behavioural control, analysing the focus groups and interviews data revealed that there are a range of attitudinal characteristics, which were discussed by some of novice riders motivated them to ride a PTW. The parameters identified relevant to the novice riders attitudes (AT) included:

- Riding enjoyment, which was expressed through a range of parameters including
    - like riding,
    - feel alive and energised when riding,
    - enjoy the thrill of riding,

    - consider riding as a fun,
    - and enjoy feeling the environment.
- The importance of the image and style of riding
- To what extent environmental issues were a concern

The three parameters of “feel alive and energised when riding”, “enjoy the thrill of riding” and “enjoy feeling the environment” were not declared by any females, which indicates the difference in the male and female attitudes and their preferences to ride a PTW. However, to obtain an adequate comparison of the male and female attitudes, there is a need to provide a quantitative insight into the importance of these parameters ranked both by males and females. These comparisons are performed in chapter 7.

In addition to the novice riders’ perceived behavioural control and attitudes, it was found that for some novice riders there was a connection with a PTW rider who had motivated them to ride a PTW. It seems that the relatively positive attitude towards riding a PTW, which existed in some of novice riders’ family members, relatives or friends, might have encouraged them to ride a PTW. This sort of encouragement sourced from positive attitude of individuals towards riding a PTW, through the lens of Theory of Planned Behaviour, could be regarded as the impact of Social Norms (SN).

Based on the quotes analysed, it seems that the impact of social norms to ride a PTW might be greater on females than the males when it seems that greater proportion of females had a story of having a connection with a PTW rider than males. However, there is a need for a further analysing on quantitative data rather than qualitative data to compare more adequately the impact of social norms on motivating females to ride a PTW in comparison with males. These comparisons are performed in chapter 7.

Undertaking focus groups and interviews provided qualitative insight into the parameters motivated novice riders to use ride a PTW. Those parameters identified in this chapter are included in the survey questionnaire design to obtain a quantitative insight into those parameters. Obtaining a quantitative measure of the importance of those parameters motivated novice riders to ride a PTW enabled this research to explore their relationship with the novice riders PTW usage pattern in chapter 8.

Chapter 6. Stage 3: Recruitment of novice riders

Exploring the PTW literature (chapter 2), analysing existing PTW data (chapter 4) and undertaking focus groups and interviews in this research provided initial insight into the range of socio-demographic characteristics, attitudinal parameters and motivators that influenced people to ride a PTW. But as the significance of those variables and their relationship to the individuals' PTW usage pattern has not been clear, there was a need to collect quantitative data to explore their relationships with PTW use. Therefore, the survey questionnaires were designed to capture quantitative insight into those parameters. The surveys included questions that had never been asked before from novice riders and on the basis of the underlying reasons discussed in the section 3.4.2.1 they were designed in two surveys (the questions were split into two survey questionnaires).

The survey 1 (Appendix A – Survey 1) was designed as simple and short as possible to look as an easy survey to fill with the aim of recruiting more novice riders. This survey comprised invitation letter (first page), survey questions (second and third page) and explanatory statement (last page). Therefore, the first survey collected overall novice riders' demographic characteristics and intentions including their gender, age, residential location, previous modes of travel and their future intentions to use a PTW. The survey questionnaire was designed in a two page A4 paper taking less than 5 minutes to complete.

The second survey (Appendix B – Survey 2) was more detailed and was sent to those individuals who had replied to survey 1. It explored different riding attitudes, perceptions and PTW usage pattern of novice riders as well as their riding experiences. The second survey went through a substantial number of iterations to refine the questions and wording. A very small pilot test was also performed asking participants to fill the survey and discuss the issues they encountered particularly in the context of wording of questions. The survey was distributed across four novice riders and one person who was experienced in designing PTW surveys however, her focus was mainly in the context of PTW riders' safety. Two of those novice riders were student at Monash University, riding PTW to University, and the next two were my friends who had obtained recently their riding learner permit. The issues they found particularly about the complexity of a few questions, hard to understand, led to perform a couple of more iterations to refine the survey questionnaires.

This chapter discusses the strategies employed to recruit novice riders and maximise the number of respondents addressing the second research question:

RQ2: How can novice riders be engaged (e.g. examining different recruitment strategies) in surveys given the low response rates in previous studies?

Next section discusses the motivation and retention approaches employed in this research. Then novice riders' recruitment, difficulties encountered and the number of participants replied to the surveys

are discussed. It is followed by exploring the representativeness of the respondents to provide insight into the recruitment challenges associated with gender, age and residential location of novice riders. It helped to calculate the response weights used in the modelling on chapter 8. Finally, the outcomes of this chapter and recommendations for future research are discussed.

6.1. Motivation and retention strategies

Across from making the survey 1 in the form to look very simple, easy and fast to fill and return to maximise the number of respondents, different recruitment strategies were either employed including persuasive communication techniques, incentives and reminders.

6.1.1. Persuasive communication techniques

In designing the invitation letter of the survey 1, printed on its first page, principles of persuasion approaches developed by Cialdini (1993) discussed in chapter 2, were employed. However, four of the six principles of the persuasion approaches including commitment, liking, authority, scarcity and commitment were employed in recruiting the novice riders. These principles underpinned the persuasive communication method used in this study. The principles of "social proof" and "reciprocation" principles were not used in this study. Because the principle of "social proof", which lies on the social beliefs and attitudes towards performing a task, which influences individuals decision to do the behaviour (participate in PTW research), was not applicable in the context of novice riders as in overall PTW riders are found to be reluctant to participate in surveys. In the context of the principle of "reciprocation", it lies on the human tendency to respond positively to a positive behaviour, for instance giving an incentive in advance would increase the likelihood of reply to the survey. As no incentive or approach was employed to establish a strong communication with novice riders prior to asking them to fill the survey, this principle was not either applicable in the context of this study. But the way that the four other principles were employed in the wording of the survey invitation are listed here:

a. Commitment and consistency,

   In this research to encourage novice riders to participate in the survey and reply back the survey questionnaire, the principle of commitment was employed. As in the invitation letter it was emphasised that their contribution can help us to understand about their riding intentions and experiences worded as "you can help us to broaden the understanding about your riding intentions and experiences"

b. Liking,

   I wrote my story of how I got interested in riding a motorcycle to develop the sense that I am a similar person to them. My story was worded as "I am a PhD student at Monash

University and just like you, I recently passed my motorcycle riding learner permit. In my case, I did a learner rider course as part of my research, found I really loved it and then went on to get my licence and buy a motorcycle. My experience as a novice rider has influenced the direction of my research and I am now focussed on the motivations and experiences of people who are starting to ride on the road."

c. Authority,

   To increase the likelihood of participating novice riders in the survey, we used logos of TAC, Monash University and ITS (Institute of Transport Studies) on the top of invitation letter. As well survey partnerships were written in the content of survey invitation including VicRoads, the Victorian Department of Transport, the Transport Accident Commission (TAC), the RACV and the Federal Chamber of Automotive Industries. It was believed (by the research team) that including the logos and names of these authorities on the invitation letter (or postcards) could potentially increase the number of participants and there was not any data about the negative attitude of riders towards TAC or VicRoads. But the extent of their positive effectiveness and possibly their negative effect on recruitment of novice riders has not been examined.

d. Scarcity,

   To encourage novice riders to participate in the survey its scarcity was emphasised in the invitation letter worded as "in this study, what rarely happens is to explore riders' perceptions and priorities…"

6.1.2. Incentives

The other strategy employed to motivate novice riders to reply to the surveys, was using incentives. As discussed in Chapter 2, the PTW literature is largely silent on the use and effectiveness of incentives with little explicit consideration of how to choose the best value or number of incentives to maximise recruitment of motorcyclists for a study. Gneezy et al. (2011) reported that as a general recommendation the value of the incentive is more important than the number of incentives however, there was not a clear rule for the selection of the best amount and number of incentives.

Therefore, in this study different prize values were introduced to compare their effectiveness in the rate of responses obtained. However, according to the two main constraints of the research, it was not possible to examine any intended prize value. First, the research budget was limited. Second running any prize draw associated with surveys from humans in Australia must meet the ethical requirement as described in the "National Statement on the Ethical Conducts of Human Research" (Australian Government 2014). In the second chapter of this ruling report under the context of "Coercion and pressure" it is declared that "No person should be subject to coercion or pressure in deciding to participate". Also in the section of "Reimbursing participants" any disproportionate payment or any

inducement of any kind is reported to be unacceptable (Australian Government). Based on these regulations, it is necessary to convince the ethics committee at Monash University, about the value of incentives decided in the study, which will obey the ethics regulations. Therefore, the prize values were chosen not to be a high value in order to avoid the manner of being coercive or bribe to fill the survey and make bias responses, the issues, which were either emphasised by Stopher (2012) and Brennan (1992) in case the prize values are high.

In this research, two different structure of incentives were introduced to recruit novice riders for target group 1 (TG1) and target group 2 (TG2). Target group details are provided later in last paragraphs of section 6.2. The incentive format for TG1 to reply back to survey 1 was 10 gift cards each valued at $50 while for TG2 it was one $500 gift card. The ethics approval to recruit TG1 in the study with the prize of 10 gift cards each valued at $50, was obtained from ethics committee at Monash University on 23/04/2013 under project number "CF13/1032-2013000515". However, later an amendment form was submitted to get the permission to change the incentives to one $500 gift card, which was approved on 17/03/2014.

6.1.3. Reminders

Initially the priority was to approach as many potential respondents as possible with the simple initial survey (Survey 1) as it was expected to produce a high number of respondents. But when that did not work, later an alternative approach was adopted, to use reminders for the simple initial survey, which increased the total cost by $4300 (total cost associated with reminders in this research). Considering that Scott (1961) described follow ups (e.g. reminder) as "the most potent technique yet discovered for increasing the response rate" (p. 164). In addition sending reminders to the potential respondents is a much cheaper approach than replacing them in the sample sending new invitation letters particularly when it could result in biased responses (Richardson, Elizabeth et al. 1995).

Therefore, sending reminders was an additional approach employed in this study with the intention to increase the response rates following the small response rates obtained in the first contact to the target group of the study. The target group details, which the reminders were mailed, are detailed in section 6.2.1 and section 6.2.2. The total cost to recruit novice riders in this research including printings surveys and reminders, designing and printing postcards, mailing and the incentives cost reached to $15470.

6.2. Recruiting novice riders

In chapter two, it was found that researches, which had collected their data through undertaking interviews or had asked people to complete the questionnaire on the spot (e.g. rider training centre)

achieved much higher rates of response than other studies. But those methods were not applicable in the context of this study as in this study there were scopes to

- Identify challenges associated with recruiting novice riders given their gender, age and residential location.
- Provide insight into the representativeness of respondents and calculate the response weights. Then it would be possible to generalise the model outcome to the total population of the study.
- To compare the effectiveness of different recruitment techniques by examining each on a different target group sourced from the total population of study, having similar gender split, age distribution and residential location split.

Therefore, it was desirable to choose the recruitment approach providing access to the details of the gender, age and residential location of all novice riders in the target population of study as well as their contact details (even indirectly through another party) to be able to send survey questionnaires to them. As this PhD research was part of a funded project supported by VicRoads, Transport Accident Commission (TAC), Department of Transport (DOT) and other organizations, it was believed that we can access to the list of novice riders in the target population easily through that organizations, but it did not happen as expected.

In Victoria, Australia, VicRoads is the main authority who administers the licencing system so they keep records of all permit holders in Victoria and great effort was undertaken to access the list of learner riders through VicRoads. But there was not any success to access the list or either to obtain raw data from VicRoads. Any request for information was only available in the aggregate format as performing any detailed analysis was outsourced by VicRoads. Even in that case requesting any aggregate information from VicRoads would need to be followed through an outsourced company, which would be costly. Considering that we would be charged at full cost to get any simple aggregate analyses from that company while there was not either the capacity to analyse and perform different modelling techniques.

Therefore, an alternative way of accessing to data was proposed; access the list through TAC. TAC regularly got that list from VicRoads every three months and used that list to send some information to the people who had obtained their riding learner permit recently. In contact to TAC they agreed to provide us the list of people who had obtained their riding learner permit every three months sent to them from VicRoads. However, the list, which was supposed to be accessible did not include individuals' contact details due to privacy reasons and only included details of their age, gender and residential location postcode. Therefore, to contact and invite novice riders to participate in this study, as the mailing tasks of TAC were undertaken by a third party company (mailing house), it was supposed that TAC sends the contact details of the novice riders directly to the mailing house. Then the mailing

house as a third party would mail out surveys to the target groups on our behalf, so at the end we would not have access to the contact details of individuals in the target group.

Therefore, we ended up this way to access the list of novice riders from TAC, which first seemed to work like a clockwise and we planned to send our survey questionnaires every three months. So everything was settled down particularly in the context of research time line. We thought that it would be easy and everything will occur based on the expected timeline but in reality the list of novice riders who had obtained their riding learner permit in every three months were not provided as the scheduled timeline. Therefore, high delays were experienced sending out the survey to Target Groups (TGs) due to high unexpected delays that had happened sending the list of novice riders from VicRoads to TAC in every three months. The main reason to those delays could be the changes happened in the structure of VicRoads in 2012 and the reduction made in the number of employees, which coincided with our research timeline. VicRoads got other priorities and sending data to TAC was not one of them. Unfortunately, there was no other way to get that list faster, considering that, either TAC needed that list to send some information to new PTW riders. So we were in queue and nothing could be done about the delay. Based on those constraints and time limitation of this research two TGs were invited to participate in our surveys.

TG1 included all those novice riders who had obtained their motorcycle riding learner permit within the first quarter of 2013. The list of novice riders in TG1 was accessed to TAC by almost two months delay (at June 2013, which originally was expected to be received by April 2013). Next the mailing house had to print the survey questionaries and produce mailing labels for the contact address of each novice rider supposed to get the survey questionnaire. This printing and mailing process needed an extra time to be accomplished and consequently the first mail out of the survey 1 to TG1 was not possible to be distributed earlier than July 2013 (Table 6.1).

TG2 included all those novice riders who had obtained their motorcycle riding learner permit within the second quarter of 2013. It was expected that the list of novice riders who had obtained their riding learner permit within the second quarter of 2013 get accessed by July 2013, but that list was not prepared and mailed to the TAC from VicRoads by late October 2013 (after three months) (Table 6.1).

6.2.1. Target Group 1 (TG1)

A total of 4971 surveys were sent in a hard copy format with the option to either return back the completed hardcopy questionnaire by post or fill it on-line through the survey web-link (Table 6.2). The incentive used comprised a prize draw with the chance to win one of 10 gift cards each valued $50, totally worth $500. The number of respondents out of 4971 novice riders invited were 382 with the response rate of 7.6 percent. This low response rate (n=382, 7.6%) emphasised the hardness to recruit and high reluctance of novice riders to participate in the survey. In addition, there was not a clear preference across the mechanisms of responding to survey questionnaire in TG1 when the number of

respondents retuned back the hard copy did not vary from the number of respondents used the survey web-link (191 versus 191).

While the response rate achieved from the first contact of survey 1 was found to be small (7.6%), amendment into the recruitment strategy was planned, which was to use reminders to increase the number of respondents. However, sending reminders were not planned earlier as discussed in section 6.1.3 due to the budget constraints. The decision to mail out reminders to TG1 was taken in early October 2013 considering that we did not have access to the list of novice riders in TG2 by that time and similar to TG1 we were experiencing delays and we had only obtained a small rate of response from TG1. The reminders was designed through a professional team of designers at Monash University and was printed on a high quality DL postcard (Figure 6.1). Designing and printing the reminders took couple of weeks and did not get ready by end of November 2013 before they can be distributed. It was expected that sending reminders to TG1 would increase the overall response rate from TG1, particularly with the new design of the QR code. The QR code provided a convenient direct link to the survey questionnaire web address (web-link) without the need to type it in the internet browser. Therefore, it was believed that as it might be easier to access survey web-link, more novice riders particularly younger novice riders would be encouraged to participate in the survey.

By December 2013, reminders were mailed out in the form of postcards to a stratified group of novice riders, which due to budget constraint only comprised half of the size of TG1 contacted earlier in July 2013. This stratified group had similar age distribution, gender split and residential location distribution as the TG1. The number of respondents to the reminder was 39 out of 2494 with the response rate of 1.6 percent, which was too small. Of those 39 responses, 30 were collected from those who used survey web-link while 9 individuals responded through the QR code link (Table 6.2). The complexity of the survey monkey URL may also have contributed to lower the response rate, but as there was the option of using QR code, there seems to be other reasons of having low response rates. It seems that a main reason to the small number of responses obtained using the reminders could have been due to the long-time interval experienced till sending the reminders to TG1 from the time they had obtained their riding learner permit (after almost ten months) and were first contacted (after almost five months). Secondly, it might have happened because of the time when the reminders were sent, which was December. This month is usually a busy time for most people before Christmas holidays while others might have gone for vacations before Christmas holidays due to lower trip costs before Christmas. In addition, another reason for poor response to mail reminder in December could be the amount of junk mail received during that period of time, which could hide the reminder.

The total number of respondents to survey 1, TG1 reached to 421 out of 4971 with the response rate of 8.5 percent. However, this response rate was lower that other studies in the context of PTW riders like as in Victoria, Australia (15%) (Wigan 2002) and the UK (20%) (Jamson and Chorlton 2009) but there were studies in other locations like Taiwan where just 5.6 percent response rate were achieved (Chiou, Wen et al. 2009; Wen, Chiou et al. 2012).

Across survey 1 respondents, the majority (86.3%) agreed to participate in the follow up survey (survey 2). Figure 6.2 presents the breakdown of the respondents to TG1 at each stage.

6.2.2. Target Group 2 (TG2)

For the TG2, due to budget constraint and maintain the cost of sending reminders to this group, the size of the TG2 (to be invited into our research) was minimised and included half of those PTW novice riders who had obtained their motorcycle riding learner permit within the second quarter of 2013. While the response rate of novice riders was small in TG1, the TG2 was split into two stratified sub-groups with the plan to send two different form of invitations to those groups. It would help to examine whether sending postcards as an alternative form of invitation would increase the response rate or not. Therefore, half of the TG2 was invited by postcards to participate in the survey when another half was invited by hard copy. Each of the two stratified groups had similar age distribution, gender split and residential location distribution as the whole population of the novice riders who had obtained their motorcycle riding learner permit within the second quarter of 2013.

It was supposed that postcards and hard-copies for TG2 will get printed in November 2013 after clarifying the number of novice riders in each stratified group. But there happened coincidences with other tasks. On that time postcard designer team were engaged with designing and printing the reminder postcards for TG1, which was supposed to be printed as soon as possible to avoid experiencing any extra gap between the time TG1 novice riders were first contacted and the time they will get the reminders. Considering that postcard designer team were busy with other jobs on that time apart from our requested tasks and to avoid confusion of designing and printing jobs associated with TG1 with TG2, they were interested to do one job at a time. Therefore, priority given to designing and printing reminders of TG1, resulted to delay in printing TG2 postcards. A similar issue was either experienced with the mailing house, as they were able just to do one task at a time as being very busy at that time of the year, which was close to the Christmas holidays. So if we planned to print postcards and hard copies of TG2 they would not be prepared and mailed out earlier than the end of December 2013. So in that case, inevitably the novice riders in TG2 would get the survey questionaries in the Christmas holiday time when they might not be home. Therefore, all designing, printing and mailing tasks relevant to TG2 were left to be organised later after a suitable time from Christmas holidays in February 2014. The time, which the contact persons in the postcard designer team and mailing office had recommended and were happy to do our jobs.

Therefore, first contact of survey 1 to TG2 happened in March 2014. As presented in Table 6.2, a total of 2351 surveys were sent in forms of hard-copies (n=1174, 25.4%) and postcards (n=1177, 25.5%). The hard copy format had the option to either return the completed hardcopy questionnaire by post or fill it on-line using the survey web-link or the QR code. The postcard had the options of filling the survey on-line using either the survey web-link or QR code (Figure 6.3). The incentive used was a

prize draw with the chance to win one $500 gift card to examine the impact of changes in prize value on the response rate in comparison with TG1.

The number of respondents out of 2351 were 164 with the response rate of 6.9 percent, which was a bit less than the value obtained in TG1 (7.6%) at this step (Table 6.2). This lower repose rate most probably have been obtained due to the longer time elapsed since novice riders in TG2 had obtained their riding learner permit and they were first contacted (got survey 1) in comparison with TG1 (in average 10 months versus 5 months)

Analysing the number of responses revealed that there was not a clear preference for the mechanism of survey invitation. Of those TG2 invitees who were invited by hard copy, 79 novice riders (response rate of 6.7%) responded, close to the number of respondents who were invited by postcards, which were 85 novice riders (response rate of 7.2%).

However, in the context of the preferred method of response to the survey 1 questionnaire, comparing the response rates revealed that across those who were invited through hard copy, replying back filling the survey on-line using the survey web-link or the QR code was more common than returning back the hard copy (response rate of 4.3% versus 2.4%). In addition, use of survey web-link was more common than using QR code either across those who had received hard copy (3.4% versus 0.9%) or postcard (5.61% versus 1.61%). However, those who were invited by postcard in TG2 were slightly more likely to reply back using the QR than those who were invited through hard copy (1.6% versus 0.9%).

The postcard reminders (Figure 6.4) for survey 1 of TG2 were mailed out in April 2014 (Table 6.1) approximately after two weeks from when TG2 were first contacted. This timeline followed the recommendations in the literature to send reminders preferably within two weeks from the first contact (Richardson, Elizabeth et al. 1995; Haworth and Mulvihill 2003). A total of 2351 reminder postcards were mailed to all those who were earlier sent hard-copies and postcards in TG2. 51 novice riders responded the reminder with the response rate of 2.2 percent (Table 6.2).

By the end, the total number of respondents to survey 1, TG2 reached to 215 with 9.2 percent response rate (close to the value obtained on TG1). Majority of respondents (91%) agreed to participate in the follow up survey (survey 2) as presented in Figure 6.5.

6.3. Survey 2 (follow up contact)

As presented in Figure 6.6 in total 559 novice riders (for TG1 = 364 and for TG2 = 195) agreed to do the survey 2 (follow up survey). While 43 of the email addresses were invalid (for TG1 = 22 and for TG2 = 21), a total of 516 novice riders were contacted in June 2014 to fill survey 2 through the survey web-link emailed or messaged. The time frame to fill the survey questionnaire was two weeks when two waves of reminders were emailed or messaged within that period of time. They were sent respectively by the 8^{th} day and 13^{th} day from the date the survey 2 was first sent out. The second

reminder was sent the date before closure of the survey web-link. As presented in Figure 6.7 sending reminders resulted to a jump in the number of respondents at each stage. Sending two wave of reminders within the relatively similar time frame as recommended by Wermuth (1985) and Richardson (1995), resulted to the respectively 12 percent and 7 percent increase in the rate of response. These values are relatively close to what was reported by Wermuth (1985) (15 percent and 10 percent). As the impact of more wave of reminders to increase the response rate decreases, it seems that two wave of reminders seems to be enough and the first reminder seems to have the greatest impact.

For TG1, as presented in Table 6.3 the response rate to survey 2 obtained was 43 percent (148 novice riders responded to survey 2 out of 342), which was a successful achievement. This rate of response is similar to what was obtained in studies conducted in the NSW, Australia (44%) (Harrison and Christie 2005) and Taiwan (44.7%) (Wen, Chiou et al. 2012). The response rate to survey 2 for TG2 was even higher than TG1 and achieved the rate of 53 percent (92 novice riders responded to survey 2 out of 174). The higher rate of response for the TG2 than the TG1 could be as the consequence of elapsed time passed since the first contact (Survey 1) to get in touch again by survey 2 for TG2 was comparably less than what was for TG1 (3 months versus 11 months).

Overall, we achieved good response rates for Survey 2 when for the survey 1 those values were small. From a point of view, it seems that engaging novice riders to participate in a survey is the most difficult part when their rate of participation in follow up surveys is observed to be higher if they are engaged into the research. On the other hand, it might be the case that respondents to survey 1 are the novice riders who like to fill in surveys (or maybe more interested in motorcycling) and therefore, higher response rates for survey 2 from them is obtained.

The incentive used to motivate novice riders to participate in survey 2 was a $500 gift card. The small number of invitees to survey 2 did not provide the chance to break them into a number of groups to examine different incentive strategies. However, there seems to be a positive correlation with the novice riders' perception towards the chance of winning the prize and their participation in the survey. We got a couple of contacts by invitees questioning about their chance to win the prize draw. Analysing the collected survey 2 data, through tracking the ID number of novice riders who had contacted about their chance to win the prize draw revealed that they had filled the survey 2 hearing that the prize will be drawn across less than 250 respondents.

Table 6.1. Time table of when the list of novice riders for each TG were accessed and the surveys and reminders were mailed out

Time of year	2013												2014					
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6
Time period each TG had obtained their riding learner permit	TG1	TG1	TG1	TG2	TG2	TG2												
Expected time the list of novice riders within each TG will get accessed				TG1			TG2											
The time got access to the list of each TG						TG1				TG2								
Time the survey 1 was mailed out to each TG							TG1								TG2			
Time the survey 1 reminders were mailed out to each TG												TG1				TG2		
Time the survey 2 was mailed out to each TG																		TG1,2
Time the survey 2 reminders were mailed out to each TG																		TG1,2

Table 6.2. Recruitment of novice riders in the first survey and number of responses obtained

<table>
<tr><td colspan="6">Response to the first contact (Survey 1)</td></tr>
<tr><td rowspan="2">TG/time learner permit was issued</td><td rowspan="2">Total population</td><td rowspan="2">TG size/percentage of total population</td><td rowspan="2">Type of contact/ time of contact</td><td colspan="2">Respondents/method replied</td></tr>
<tr><td>No./rate of response</td><td>Method of response</td></tr>
<tr><td rowspan="2">TG1 (Jan-March 2013)</td><td rowspan="2">4971</td><td rowspan="2">4971 (100%)</td><td rowspan="2">Hard copy (July 2013)</td><td>191 (3.8%)</td><td>Hard copy</td></tr>
<tr><td>191 (3.8%)</td><td>Web-link</td></tr>
<tr><td colspan="2">Total TG1 invitees/respondents</td><td>4971 (100%)</td><td>--</td><td>382 (7.6%)</td><td>--</td></tr>
<tr><td rowspan="5">TG2 (April-June 2013)</td><td rowspan="5">4613</td><td rowspan="3">1174 (25.4%)</td><td rowspan="3">Hard copy (March 2014)</td><td>28 (2.4%)</td><td>Hard copy</td></tr>
<tr><td>40 (3.4%)</td><td>Web-link</td></tr>
<tr><td>11 (0.9%)</td><td>QR-code link</td></tr>
<tr><td rowspan="2">1177 (25.5%)</td><td rowspan="2">Postcard (March 2014)</td><td>66 (5.61%)</td><td>Web-link</td></tr>
<tr><td>19 (1.61%)</td><td>QR-code link</td></tr>
<tr><td colspan="2">Total TG2 invitees/respondents</td><td>2351 (50.9%)</td><td>--</td><td>164 (6.9%)</td><td>--</td></tr>
<tr><td colspan="6">Additional responses obtained through mailing survey 1 reminder</td></tr>
<tr><td rowspan="2">TG/time learner permit was issued</td><td rowspan="2">Total population</td><td rowspan="2">TG size/percentage of total population</td><td rowspan="2">Type of contact/ time of contact</td><td colspan="2">Respondents/method replied</td></tr>
<tr><td>No./rate of response</td><td>Method</td></tr>
<tr><td rowspan="2">TG1 (Jan-March 2013)</td><td rowspan="2">4971</td><td rowspan="2">2494 (51%)</td><td rowspan="2">Postcard (Dec 2013)</td><td>30 (1.2%)</td><td>Web-link</td></tr>
<tr><td>9 (0.4%)</td><td>QR-code link</td></tr>
<tr><td colspan="2">Total TG1 invitees/respondents</td><td>2494 (51%)</td><td>--</td><td>39 (1.6%)</td><td>--</td></tr>
<tr><td rowspan="4">TG2 (April-June 2013)</td><td rowspan="4">4613</td><td rowspan="2">1174 (25.4%)</td><td rowspan="4">Postcard (April 2014)</td><td>19 (1.6%)</td><td>Web-link</td></tr>
<tr><td>5 (0.4%)</td><td>QR-code link</td></tr>
<tr><td rowspan="2">1177 (25.5%)</td><td>23 (2%)</td><td>Web-link</td></tr>
<tr><td>4 (0.3%)</td><td>QR-code link</td></tr>
<tr><td colspan="2">Total TG2 invitees/respondents</td><td>2351 (50.9%)</td><td>--</td><td>51 (2.2%)</td><td>--</td></tr>
<tr><td colspan="6">Total responses to Survey 1</td></tr>
<tr><td>TG/time learner permit was issued</td><td>Total population</td><td>TG size</td><td>Prize draw</td><td colspan="2">Respondents to survey 1/ agreed to do survey 2</td></tr>
<tr><td>TG1 (Jan-March 2013)</td><td>4971</td><td>4971 (100%)</td><td>10 * $50</td><td colspan="2">421 (8.5%)/ 364 (7.3%)</td></tr>
<tr><td>TG2 (April-June 2013)</td><td>4613</td><td>2351 (50.9%)</td><td>1 * $500</td><td colspan="2">215 (9.2%)/ 195 (8.3%)</td></tr>
</table>

Figure 6.1.a. Front page

Figure 6.1.b. Back page

Figure 6.1. Reminder postcard for Survey1, TG1

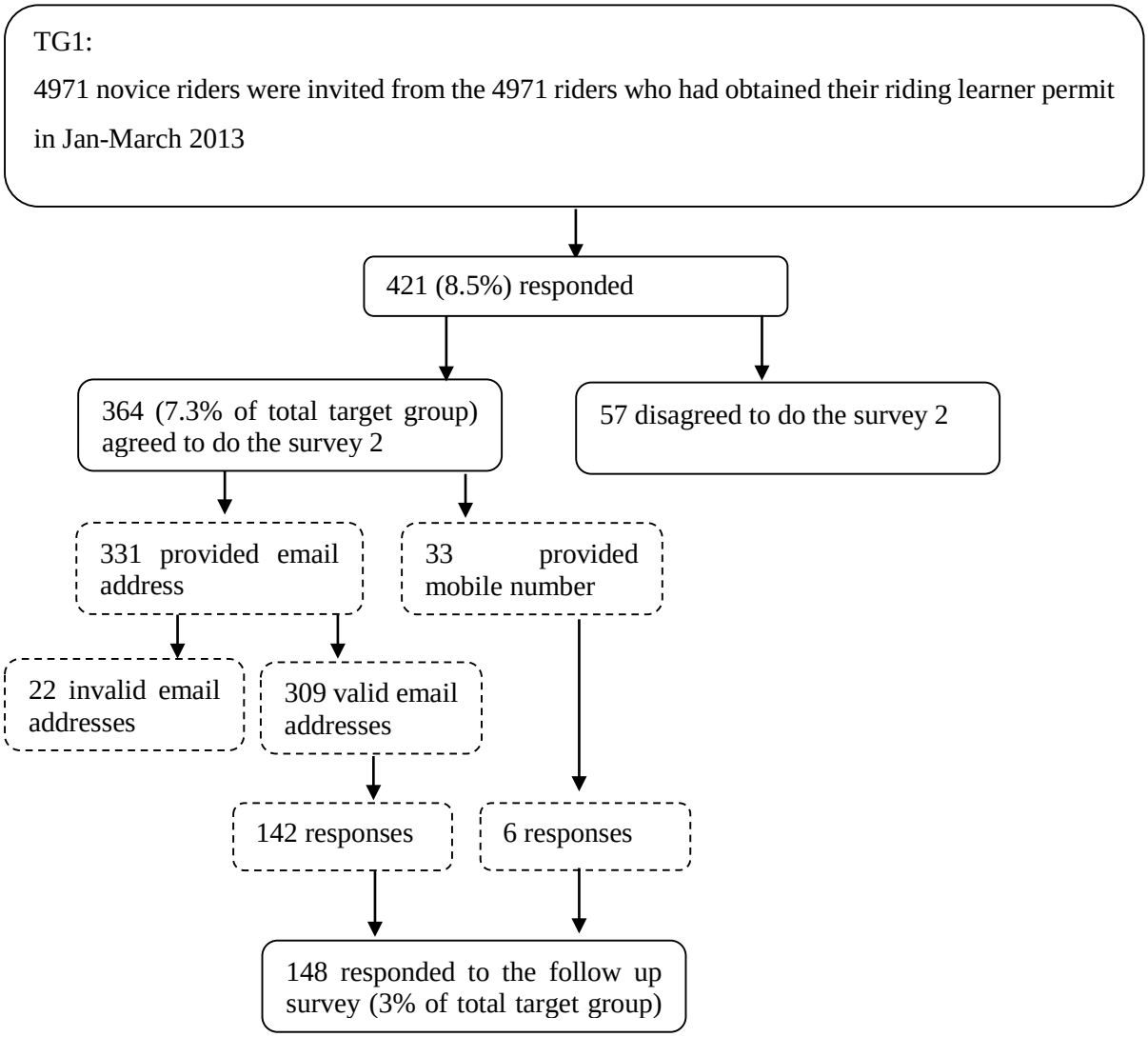


Figure 6.2. Breakdown of respondents for TG1

Figure 6.3.a. Front page

Figure 6.3.b. Back page

Figure 6.3. Survey invitation postcard for Survey1, TG2

Figure 6.4.a. Front page

Figure 6.4.b. Back page

Figure 6.4. Reminder postcard for Survey1, TG2

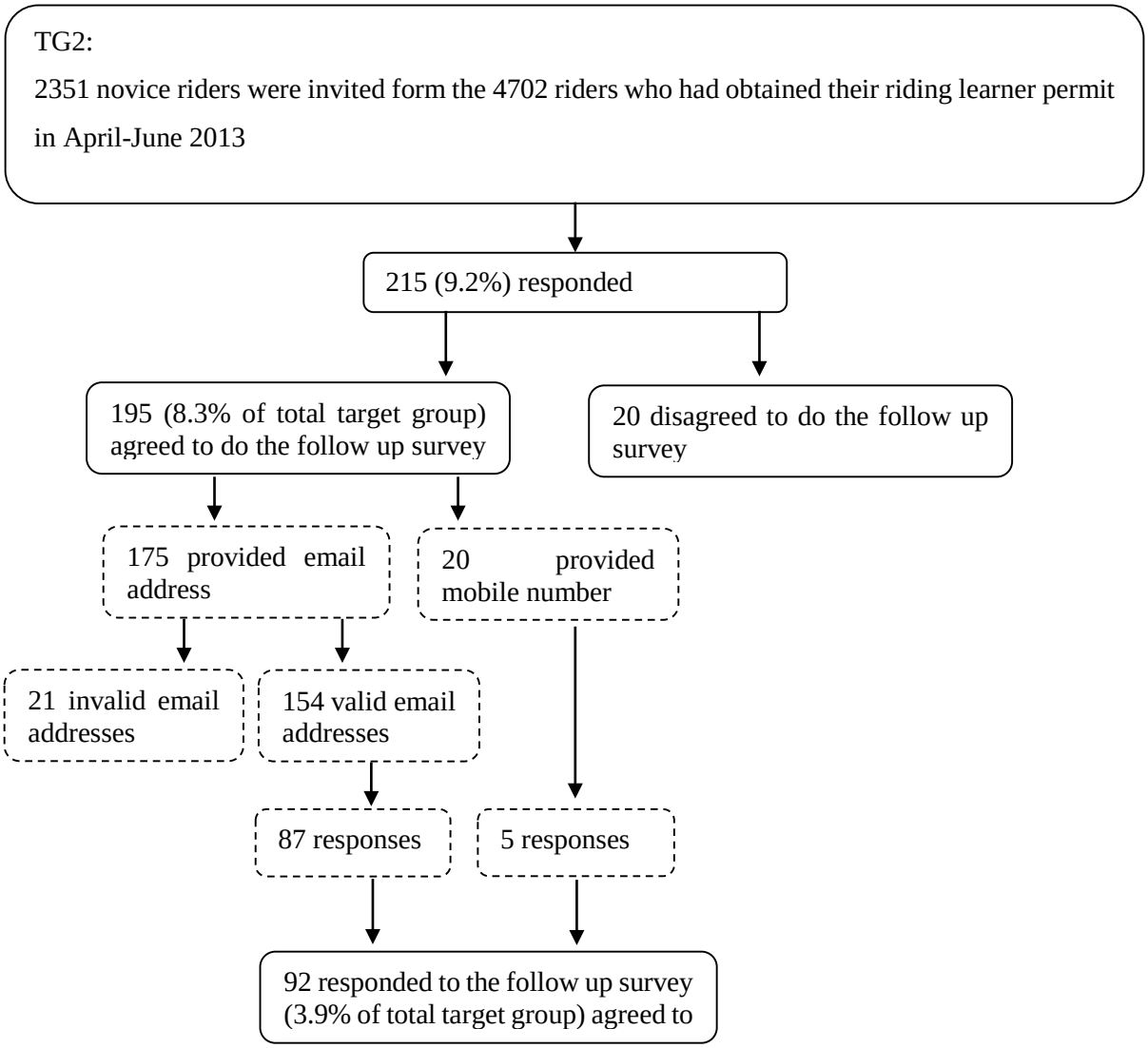


Figure 6.5. Breakdown of respondents for TG2

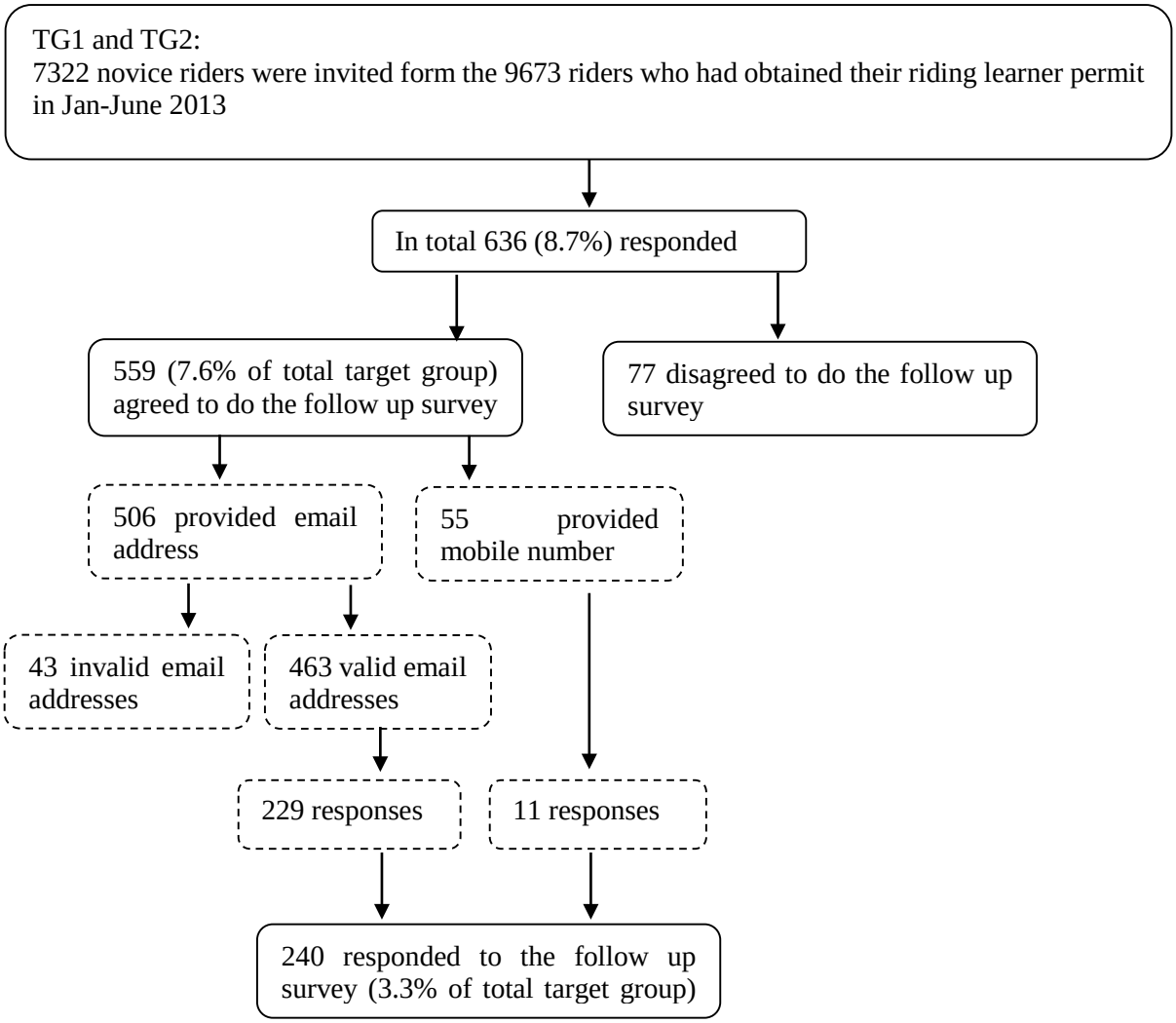


Figure 6.6. Breakdown of respondents

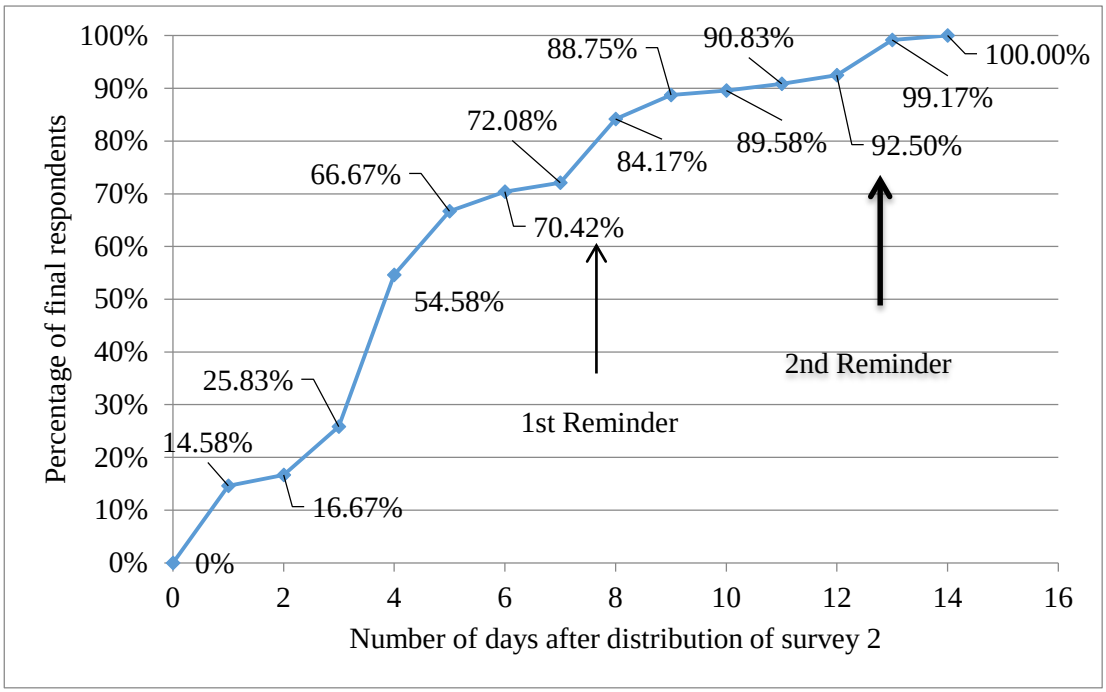


Figure 6.7. Cumulative percentage of the number of respondents to survey 2 over 14 days

Table 6.3. Total respondents to survey 2 in June 2014

Time learner permit was issued	TG size	Survey 1 respondents provided valid contact detail to participate in Survey 2	Prize draw	Total respondents to survey 2/ rate of response to survey 2/ rate of response obtained from the main TG size
TG1 (Jan-March 2013)	4971	342	1 * $500	148 (43.2%) (2.98%)
TG2 (April-June 2013)	2351	174		92 (52.9%) (3.91%)

6.4. Effectiveness of changes in the incentive strategies and distributing reminders

In this section the effectiveness of employing the reminders and different incentive strategies are discussed.

6.4.1. Incentives

As discussed earlier two different incentive formats were used in this study. To encourage TG1 novice riders to participate in survey 1, the incentive introduced was a prize draw including 10 gift cards each valued at $50 whereas for TG2 it was only a single gift card, which valued at $500. However, the total value of prizes for TG1 and TG2 were equal but Kahneham et al. (1979) argued that their impact could vary. Comparing the response rates obtained from the TG1 and that proportion of TG2 who were invited with the same format as TG1 (through hard copy) revealed that changes in the incentive strategies in addition to the use of QR codes (for TG2) were not effective (response rate of 7.6% versus 6.9%). However, the ineffectiveness of changes in the recruitment strategies could have mainly been happened as the consequence of having much greater delay to mail out survey 1 questionnaire (either in the form of hard copy or post card) to TG2 than TG1. That delay for TG2 was almost ten months from the time TG2 novice riders had obtained their riding learner permit while this figure for TG1 was almost five months. Therefore, the extent of the effectiveness of changes in the recruitment strategies can be a function of the time novice riders were contacted at each stage. To examine the influence of time on the recruitment strategies, one option could have been to recruit another TG experienced a different amount of delay to get survey questionaries. Then it would be possible to compare the impact of delays on the recruitment strategies. However, considering the time frame of the study and the budget constraints of this research there was not a chance to focus on recruiting another TG.

6.4.2. Reminders

As discussed earlier obtaining small rate of response for survey 1 from TG1 lead to undertake amendments in the recruitment approaches and to send reminder to the TG1. However, it was observed that sending reminders to the TG1 was not that much effective (reminders rate of response = 1.6%) probably due to delay in sending reminders, which was almost five months from the time TG1 novice riders were first contacted. For TG2, the rate of response obtained was only slightly higher (reminders rate of response 2.2%) than TG1 for the survey 1 reminders. Similarly this low response rate could have been obtained as the consequence of an overall big delay, which happened in contact to TG2 from when they had obtained their riding learner permit (more than ten months earlier). Therefore, the effectiveness of the reminders in this study was largely constrained, which seems to be a function of the time between when potential respondents were contacted earlier and the time reminders were distributed. In addition,

the complexity of the survey monkey URL may also have contributed to lower the response rate but it has not been examined in this research.

For survey 2, which was distributed across those who agreed to participate in survey 2, the reminders were sent only 8 and 13 days from the time survey 2 questionnaire was distributed. Using reminders increased the number of respondents by 37 percent from 175 number of respondents (before sending reminders) to 240 number of respondents (after sending reminders). Therefore, sending reminders can improve the rate of response if they are sent within a reasonable time frame following the literature recommendation as discussed earlier.

6.5. Representativeness of respondents

As discussed earlier in section 6.2, to provide an insight into the representativeness of respondents in this study, there was focus to access details of all novice riders who had obtained their riding learner permit in Victoria. The lists were accessed through TAC included gender, age and residential location details of all novice riders who had obtained their riding learner permit within the 1st and 2nd quarters of 2013. Therefore, it was possible to explore the representativeness of respondents comparing the gender, age and residential location distribution of respondents with the target population. This was a unique advantage of this research, which underpinned the recruitment approach from the starting point, when many studies cannot do that because they do not have access to the data about target population.

6.5.1. Gender

The gender split of the target population of the study showed that the majority were male (male: 83.4%; female: 16.6%). According to the 2006 consensus (ABS 2015) the Victorian population comprised almost an equal proportion of males and females (49.1% versus 50.9%). This difference in the gender split of Victorian population compared with the population of the people who had recently obtained their motorcycle riding learner permit represents males' greater intention to ride a PTW than females.

Comparing the rate of responses for males and females across the total target population showed that in the surveys undertaken, females were more likely to respond than males with a statistically significant difference. Females comprised respectively 24.2 percent and 25.6 percent of respondents for survey 1 and survey 2 while they only comprised 16.6 percent of the target population in combined TG1 and TG2 (Figure 6.8). On the basis of chi-square test, the proportion of female respondents in each of the surveys was statistically different to the proportion of the females in the target population (chi-square $p = 0.04$). On the basis of that test it can be concluded that women were more likely to respond

the surveys than males. This finding is similar to what is reported in the literature that females are more likely to participate in surveys (particularly on-line surveys) than males (Smith 2008).

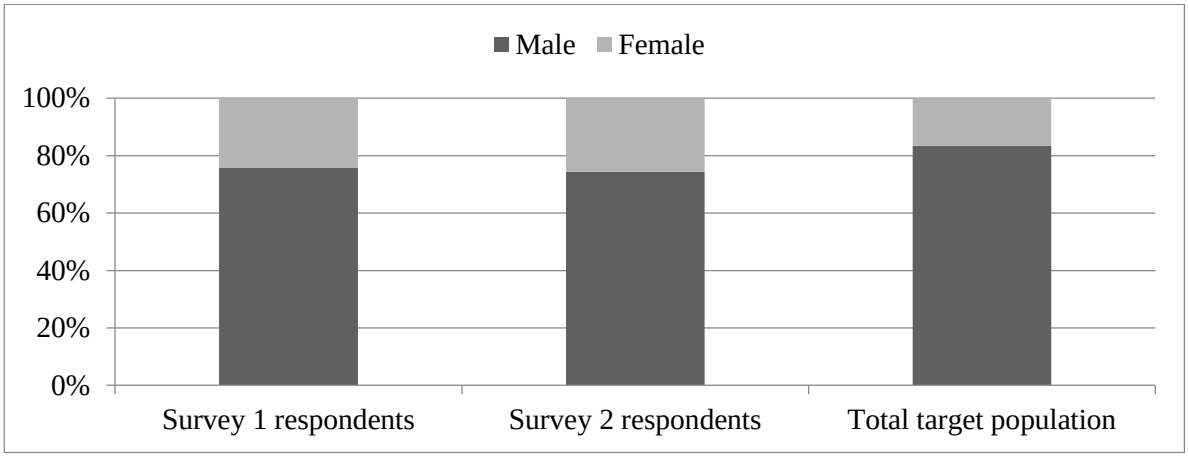


Figure 6.8. Gender split of respondents versus target population (TG1 and TG2 combined)

6.5.2. Age

The age distribution of Victorian residents (ABS 2015), the target population and respondents are presented in Figure 6.9. Almost half of the Victorian residents were above 45 years old (ABS 2015) while the novice riders who had recently obtained their motorcycle riding learner permit were more likely to be younger than 44 years old (89%). This might reflects that the riders' population in Victoria is predominantly comprised of the younger sector of the Victorian population aging less than 44 years old.

Testing the age distribution of respondents to survey 1 and survey 2 for TG1 and TG2 revealed that they are not normally distributed as the Shapiro-Wilk p value was greater than 0.05 for both TGs (Table 6.4). The average age of respondents to survey 1 (37.9 years old) and survey 2 (37.7 years old) were significantly higher than the average age of the target population (30.8 years old). On the basis of the two T-tests undertaken, the average age of survey 1 and survey 2 respondents significantly differed from the target population when p values obtained for both tests were zero. This might reflect that older novice riders were more likely to respond. This conclusion is confirmed when analysing the rate of response across the age of novice riders, as presented in Figure 6.10, increased by the age of novice riders for both survey 1 and survey 2. This finding is similar to what was reported in some researches where the increase of response rate was associated with the increase of respondents' age (Gigliotti and Dietsch 2014; Rindfuss, Choe et al. 2015).

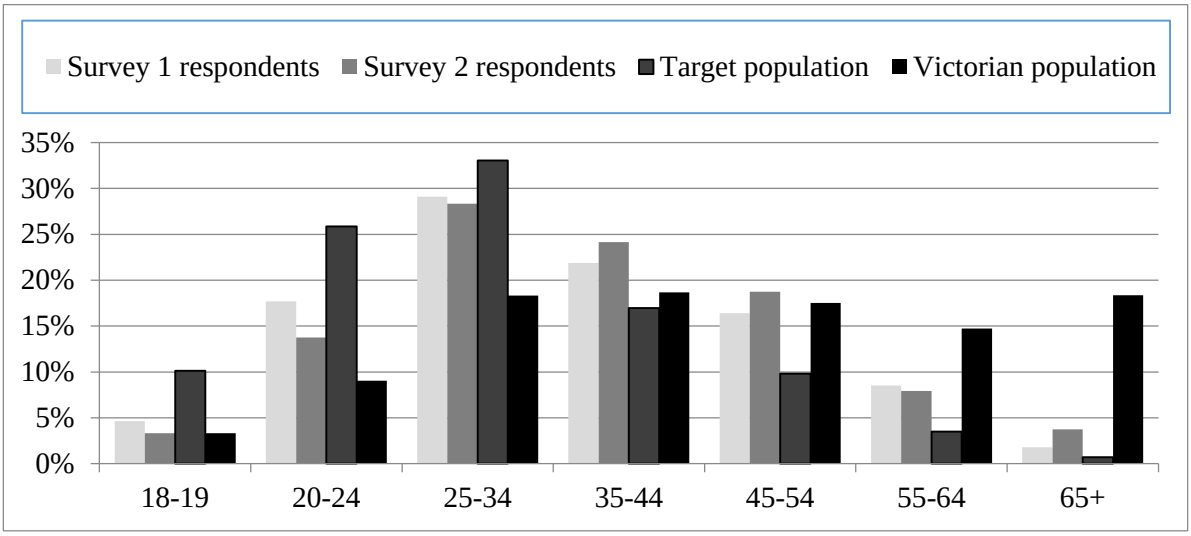


Figure 6.9. Age distribution of respondents and target population (TG1 and TG2 combined)

Table 6.4. Details of age distribution of respondents (TG1 and TG2)

		Survey 1		Survey 2	
		Statistic	Std. Error	Statistic	Std. Error
Mean		37.92	.74	37.70	.82
95% Confidence Interval for Mean	Lower Bound	36.46		36.07	
	Upper Bound	39.38		39.32	
5% Trimmed Mean		37.46		37.15	
Median		37.00		36.00	
Variance		166.23		163.91	
Std. Deviation		12.89		12.80	
Minimum		18.00		18.00	
Maximum		71.00		71.00	
Range		53.00		53.00	
Interquartile Range		20.00		20.00	
Skewness		.40	.14	.49	.15
Kurtosis		-.69	.27	-.55	.31

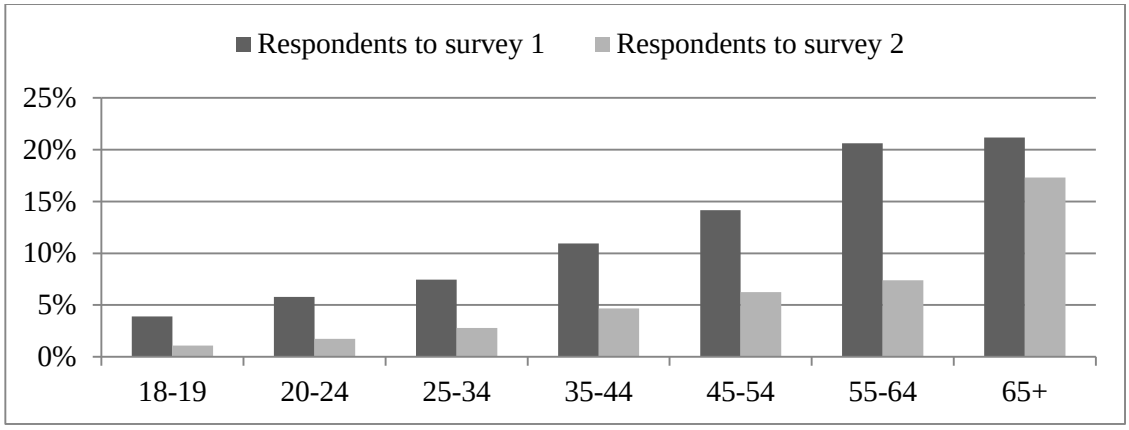


Figure 6.10. Rate of response across different age groups (TG1 and TG2 combined)

6.5.3. Residential location

In Victoria three quarters (75%) of the population live in the Melbourne metropolitan area (ABS 2015). The residential split of the target population of this study with 69.6 percent living in Melbourne metropolitan area was relatively close to the residential distribution of the Victorian population, when non-metropolitan area residents were only slightly over represented in the learner rider population. It might reflect that non-metropolitan residents were slightly more likely to obtain a riding learner permit than those who resided in Melbourne metropolitan area. Comparing the residential location of respondents versus the target group revealed that those who lived in Melbourne metropolitan area were slightly more likely to contribute up to the end of this research, as their proportion in survey 2 was 75 percent as opposed to 69.6 percent in the target population (Figure 6.11). The chi-square test revealed that there is significant different in residential split of respondents to survey 2 relative to the population of the study (chi-square $p = 0.03$).

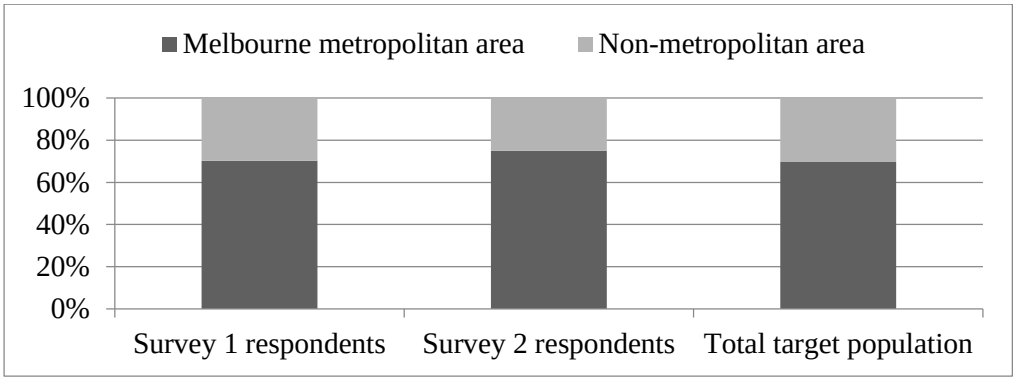


Figure 6.11. Rate of response versus residential location (TG1 and TG2 combined)

6.5.4. Generalising the responses, calculating weights

As the gender split, age distribution and residential location split of respondents differed from that in the target population of the study, weights were applied to correct the bias for respondents, as recommended by Fishman (2014). Calculating weights and employing them in the data analysis makes it possible to generalise the responses. Therefore, the outcomes obtained from the data analysis present insights into the target population rather than respondents (Richardson, Elizabeth et al. 1995; Stopher 2012).

In this study, first, for each class of gender, age and residential location, number of individuals in the target population for each level of classification for every parameter is divided to the number of respondents in that class (Table 6.5, Table 6.6 and Table 6.7). Then the weight associated to each class is calculated diving the ratio value calculated earlier to the lowest value of ratio calculated across different classes of a parameter. As a sample, here the calculations undertaken to determine weight for each gender type is presented:

- Ratio of the number of females in the target group to their number across respondents:
  1220/61 = 20
- Ration of the number of males in the target group to their number across respondents:
  6102/179 = 34.09
- The weight for the classification having the lowest value of ration is set to one:
  So females weight = 1
- The weight for the males is calculated by dividing the value of ratio associated to the males to the value of ratio associated with the weight equal to one:
  So males weight = 34.09/20 = 1.7

Then in the model, the weight devoted to each response in the data is the product of gender weight, age weight and residential location weight values chosen based on the novice rider's characteristics. For instance if a male novice rider's age living in the Melbourne metropolitan area, equals to 22 years old the weight associated to that individual in the model input data would be 1.7 * 9.94 * 1 = 16.89.

Table 6.5. Gender split weights

Gender	No. of respondents	No. of individuals in the target group	Ratio	Weight
Female	61	1220	20.00	1
Male	179	6102	34.09	1.7

Table 6.6. Age group weights

Age Group	No. of respondents	No. of individuals in the target group	Ratio	Weight
18-19	8	740	92.54	16.04
20-24	33	1894	57.38	9.94
25-34	68	2420	35.59	6.17
35-44	58	1241	21.40	3.71
45-54	45	718	15.96	2.77
55-64	19	256	13.49	2.34
65+	9	52	5.77	1

Table 6.7. Residential location weights

Residential split	No. of respondents	No. of individuals in the target group	Ratio	Weight
Melbourne metropolitan	180	5097	28.32	1
Non metropolitan	60	2225	37.08	1.31

6.6. Preferred method of response by novice riders' gender, age and residential location

In this section the preferences towards the method of response by gender, age and residential location of the invitees is explored.

6.6.1. Gender

As presented in Figure 6.12, in respond to the survey 1 for TG1 who were all invited through hard copy, it was found that males were more likely to fill the survey questionnaire through survey web-link than females (52.9% versus 38.5%). Females had more contribution to return back the hard copy than males (61% versus 47%). Across those who had got postcard (as the reminder for TG1) with the options of filling survey on-line or use the QR code, males were more likely to use the QR code than females (26.7% versus 11.1%). Undertaking the chi-square tests revealed that there is a statistically significant dependent between novice riders' gender and their preferred method of response for both methods of contacts when the p values obtained from the two tests were zero.

Similarly for TG2, in respond to survey 1, as presented in Figure 6.13, across those who were invited by hard copy with the options of returning back the hard copy or fill the survey on-line (using either survey web link or QR code), males were more likely to fill the survey on-line than females (66.1% versus 53.4%). For TG2, across those who had received postcards, males were pioneer to use

QR code (22.3% versus 10%). Undertaking the chi-square tests revealed that there is a statistically significant dependent between novice riders' gender and their preferred method of response for both methods of contacts when the p values obtained from the two tests were zero. On the basis of these figures it can be concluded that males are more technology friendly as having a greater preference to reply back the surveys using either survey web-link or QR code than females.

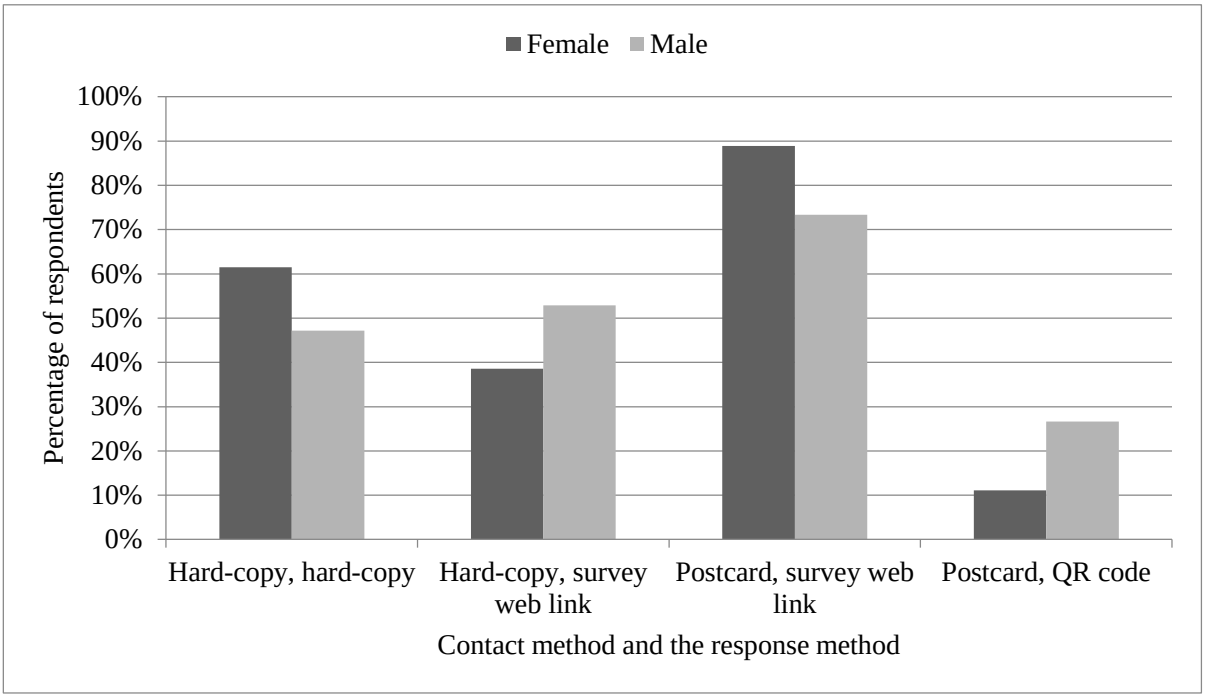


Figure 6.12. Gender split of respondents to survey 1 versus the method of response for TG1

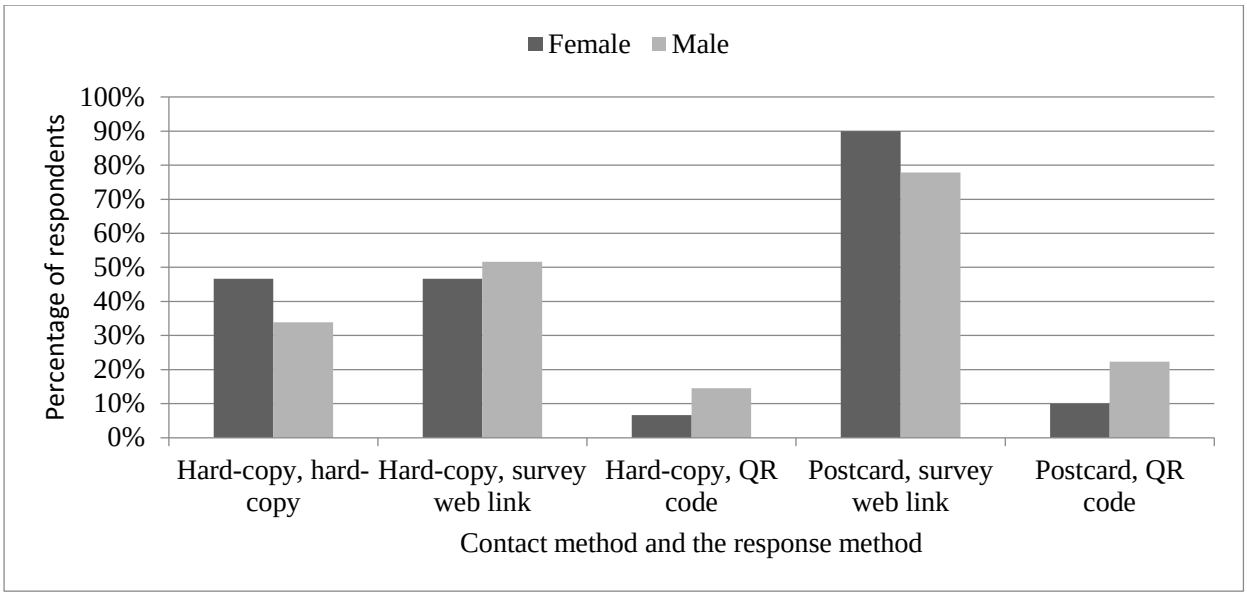


Figure 6.13. Gender split of respondents to survey 1 versus the method of response for TG2

6.6.2. Age

As presented in Figure 6.14, for TG1, those who were younger were more likely to respond the survey on line whereas those who were greater than 44 years old preferred pen and paper method and returned back the hard copy survey questionnaire. Similarly for TG2, as presented in Figure 6.15, those who were above 44 years old were less likely to fill the survey on-line (using survey web-link or QR code) than those who were younger and none of the respondents in that age bracket had employed QR code. It might reflect that younger respondents are more technology friendly and have a greater preference to reply the surveys through more advanced techniques.

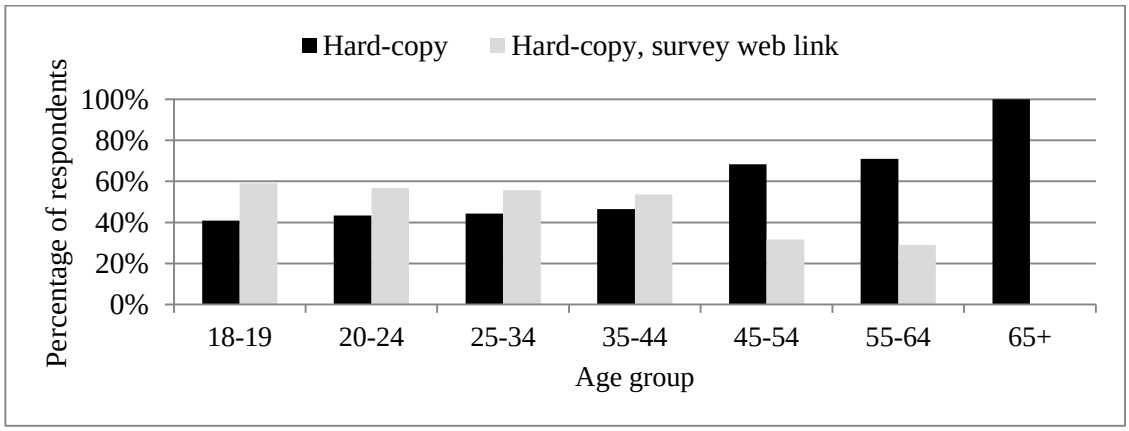


Figure 6.14. Preferred method of response within each age bracket to survey 1 hard copy for TG1

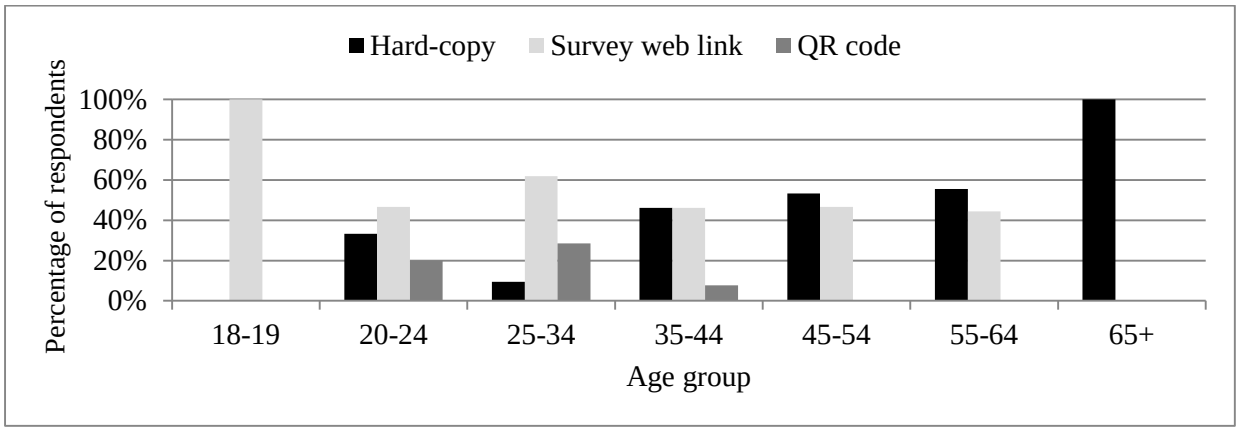


Figure 6.15. Preferred method of response within each age bracket to survey 1 for TG2

6.6.3. Residential location

Analysing the data, did not reveal a preference towards a method of response by the residential location of respondents for neither of target groups 1 and 2 across those who were invited by hard copy or postcards. The chi-square test did not found any significant dependent between the novice riders'

residential location and their preferred method of response in none of the target groups and also across those who were invited with a similar form of survey invitation (all chi-square p values were greater than 0.05).

6.7. Discussion

This chapter discussed the recruitment techniques and strategies employed to recruit novice riders with the scope to address the second research question.

The novice riders contacted to recruit in this study included two target groups (TGs). TG1 included the total novice riders who had obtained their riding learner riding permit within the first quarter of 2013. TG2 included half of the population of novice riders who had obtained their riding learner permit within the second quarters of 2013. Two survey questionnaires were designed when the survey 1 was short with the intention to look easy to fill by novice riders encouraging them to participate in the research. To encourage potential respondents to participate in the survey, in design of the invitation letter four of six principles of persuasion were employed. In addition, the incentives were introduced with the intention to encourage more number of novice riders to reply back the surveys.

However, employing all those tools did not lead to a high response rate (7.6%) to survey 1 for TG1. Even sending reminders to the TG1 only increased the response rate by 0.9 percent. The poor impact of reminder, most probably was obtained due to the long delay (five months) in contact to the potential respondents at the time of sending reminders.

Obtaining small value of response rates from TG1, emphasised the need to changes and examine other recruitment strategies for TG2. The incentive value was changed into a single $500 gift card while for TG1 the prize draw was 10 gift cards each valued at $50. In addition, the QR was designed as an additional method of accessing the on-line survey. Unlike what we expected, the response rates obtained from survey 1 TG2 was also small and was not improved (6.9%). However, this poor result might have been as the consequence of longer delay experienced in contact to TG2 than TG1 to mail out survey 1 invitation letter and questionnaire (ten months versus five months), which could have nullified the impact of changes in the incentive strategies and adding the QR code. Therefore, on the basis of the response rates obtained it is not possible to statistically conclude that changes in the incentives values and numbers and the use of QR has been effective due to the big time lag in recruitment of TG2.

In the context of reminders, the survey 1 reminders for TG2 were sent much earlier than what happened for TG1 (two weeks versus five months) and the response rates were increased slightly more for TG2 than TG1 (2.2% versus 1.6%). Therefore, the reminders impact could be a function of the time they get distributed and findings of this research confirms the literature recommendation that adequate time to distribute reminders is within two weeks from the first contact (Wermuth 1985; Richardson and

Ampt 1993; Richardson, Elizabeth et al. 1995; Haworth and Mulvihill 2003). Obeying that time frame for survey 2, for TG1 and TG2, resulted to an overall increase of 37 percent in the response rate.

Analysing the response rates obtained for both TG1 and TG2 revealed that females, older riders or those who lived in the Melbourne metropolitan area were more likely to participate in the surveys than other novice riders. Therefore, gender split, age distribution and residential location of individuals in the target population can be an indicator of the number of survey invitations needed to be distributed to achieve the intended number of respondents.

In this study, exploring the response rates obtained from survey 1 for TG2, across those who were invited by hard copy in comparison with those invited by postcard did not reveal any clear preference towards the method of contact in overall. However, across both TGs those who were female or older (particularly greater than 44 years old), were more likely to return the hard copy than complete the survey on-line.

In this chapter, apart from examining different recruitment approaches, the weight associated to each respondent in the data according to the respondent's gender, age group and residential location is calculated. Employing the weights in analysing the data, particularly in the modelling, would help to generalise the model outputs. The weights calculated in this chapter are employed in chapter 8 to develop the model using collected surveys data. The next chapter has focused to provide an initial insight into the collected survey data through undertaking descriptive statistical analyses and performing statistical test.

Chapter 7. Stage 4: Insight from surveys of novice riders

Chapter 5 provided qualitative insight into the range of parameters motivated novice riders to ride a PTW and probably influenced their PTW usage pattern. Each of those parameters identified, explored different aspect of novice riders including their SN, AT or PBC. But as data collected through undertaking focus groups and interviews was qualitative, it was not possible to examine different relationships and to explain the differences in the novice riders' PTW usage pattern. Therefore, it was necessary to provide a quantitative insight into those parameters, so the surveys were designed. As discussed earlier in chapter 5, to obtain a quantitative insight into most of those the parameters identified, the extent that they were regarded important by novice riders in motivating them to ride or to perform a riding behaviour is questioned in the surveys on six-point Likert-scale. However, the survey questions were not limited to explore the importance of the range of parameters identified in chapter 5. To obtain a deeper insight into novice riders SN, AT and PBC some additional parameters were included in the survey questions including:

- Factors, which neither were reported in the literature nor were discussed in the focus groups or interviews. They were new parameters that were designed by the research team (thesis author and supervisors) imagined to provide a deeper insight into novice riders' SN, AT or PBC.
- Factors, which were reported in the literature but have never been explored in the context of novice riders PTW use pattern.

This chapter provides initial quantitative insight into novice riders' motivations, attitudes and perceptions towards the use of a PTW in addition to explore their socio-demographic characteristics. The analyses of the collected data in this chapter is based on undertaking descriptive analysis, cross tabulating and undertaking different statistical test to address the first and third research questions of this study:

RQ1: What are novice riders' characteristics, motivations and attitudes towards ownership and use of PTWs in Victoria?

RQ3: To what extent do differences in characteristics, attitudes and motivations of novice riders explain variations in their riding travel behaviour?

In this chapter, first, patterns of PTW and car ownership across respondents are explored. Then the study focused to explore the usage pattern of PTWs by respondents, followed by exploring respondents' social norms (SN), attitudes (AT) and perceived behavioural control (PBC). The insight into the SN, AT and PBC of respondents is provided through analysing the parameters associated to each of those groups.

In this chapter, the data obtained from TG1 and TG2 were combined and analysed. As discussed in chapter 6, the recruitment approach including method of contact, incentive structure and recruitment timeline differed for TG1 and TG2. Therefore, comparing response rates obtained from TG1 and TG2 provided the chance to identify the effectiveness of different recruitment strategies employed at each stage. But in chapter 7, combining data from the TG1 and TG2 would provide a more reliable data source, including greater number of respondents than analysing data from TG1 and TG2 separately (240 versus 148 or 92). In addition, there was not any point to analyse TG1 and TG1 separately and no extra valuable insight could be obtained.

In this study, survey 2 was distributed after almost 13 and 16 months from the time that respectively TG1 and TG2 respondents had obtained their riding learner permit. Therefore, it was possible to explore respondents' common PTW usage pattern at the time they most probably had developed their riding skill up to the stage to confidently ride their PTW. Whereas in the first couple of months from the time they had obtained their riding learner permit, they might have been more cautious to ride their PTW for the trips they planned to and they most probably used less of their PTW.

7.1. Patterns of PTW ownership

PTW ownership pattern across respondents to survey 1 and survey 2 for combined TG1 and TG2 data is presented in Figure 7.1. It is observed that only a small proportion of respondents did not own any PTW by the end of survey 2 (9.2%). Comparing the rate of PTW ownership, between survey 1 and survey 2 (for the same people who had filled both surveys), highlighted that the likelihood of PTW ownership had increased from 84.1 percent to 90.8 percent. Indicating that there has been a positive attitude to obtain a PTW to ride. The chi-square test revealed that pattern of PTW ownership has significantly changed between survey 1 and 2 (chi-square $p = 0.00 < 0.05$). However, the pattern of PTW ownership in neither survey 1 nor survey 2 was dependent to the gender, age or residential location of respondents (the p values calculated from all the chi-square tests were greater than 0.05).

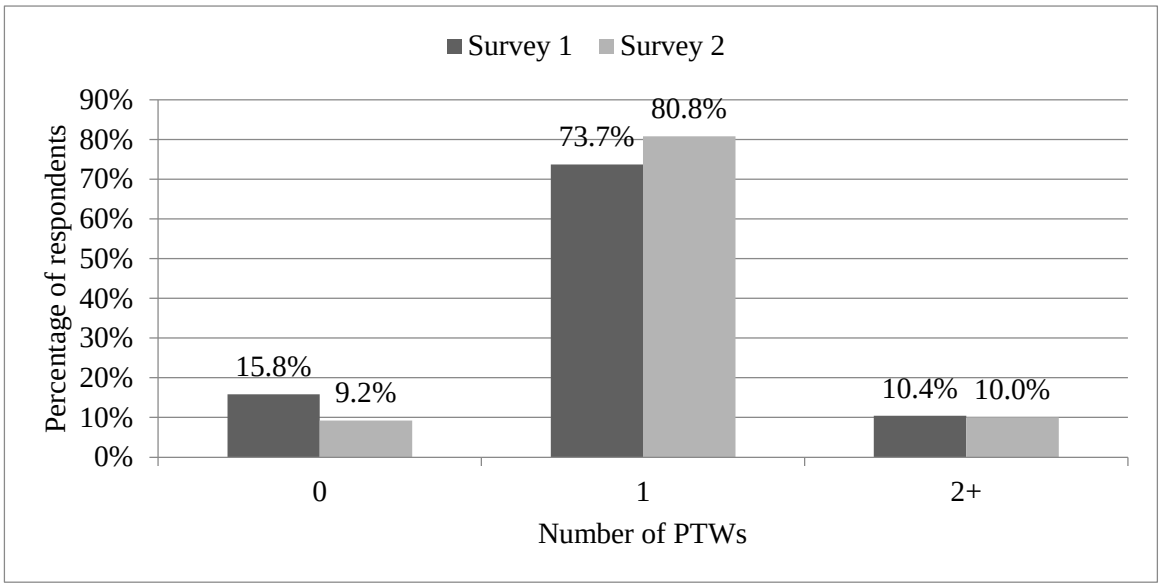


Figure 7.1 Pattern of PTW ownership in survey 1 and survey 2 (TG1 and TG2 combined)

7.1.1. Types of PTWs

In Victoria, learner riders and restricted licence holders must ride PTWs under the learner approved motorcycle scheme (LAMS) (VicRoads 2015). As our study participants in both survey 1 and 2, are either learner riders or restricted licence holders, they must ride PTWs under the LAMS. Therefore, their limitations to choose PTW types has not been changed between survey 1 and 2. Analysing the PTW types, revealed that sport motorcycles were the most popular type of bikes obtained by survey 2 followed by traditional motorcycles and motor scooters (Figure 7.2). Mopeds have been the least popular bikes.

Females were much more likely to own motor scooters than males (by survey 2) while a higher proportion of males preferred to own a sport motorcycle (Figure 7.3). Perhaps reflecting, the greater proportion of PTW trips undertaken by females had a commuting purpose than males. Chi-square test revealed that type of PTW has a significant relationship with the novice riders' gender as the chi-square p (= 0.00) calculated, was less than 0.05.

Also, respondents who lived in Melbourne metropolitan region were more likely to own motor scooters than those who lived in non-metropolitan area, perhaps reflecting their greater use of PTW for commuting trips than those who lived in non-metropolitan area (Figure 7.4). Chi-square test revealed that type of PTW has a significant relationship with the novice riders' residential location as the chi-square p (= 0.00) calculated, was less than 0.05.

The age of respondents was also found to have relationship with their preferred type pf PTW. Younger novice riders particularly those who aged less than 45, were more likely to own a sport or trail motorcycles whereas older riders were more likely to own a motor scooter or cruiser motorcycles (Figure 7.5). Perhaps reflecting that greater proportion of trips undertaken by those who aged 45 years

and more were for commuting purpose than younger riders. Chi-square test revealed that type of PTW (only across four of its types) has a significant relationship with the novice riders' age as the chi-square p (= 0.00) calculated, was less than 0.05. The relationships between other types of PTWs and respondents age category was not found to be significant.

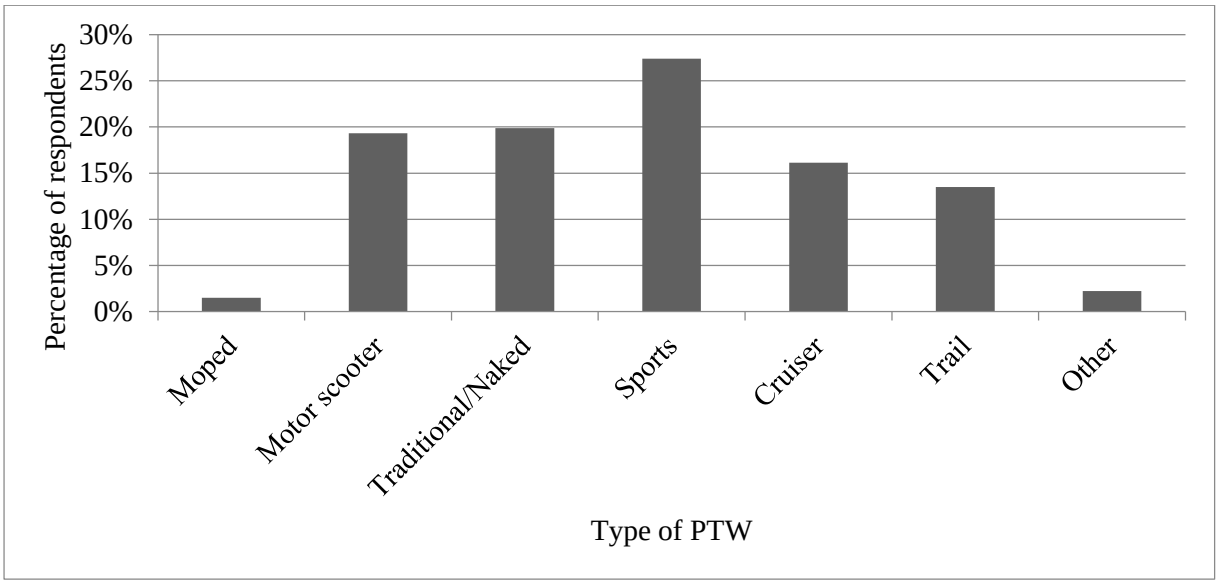


Figure 7.2. Distribution of PTW types by survey 2 (TG1 and TG2 combined)

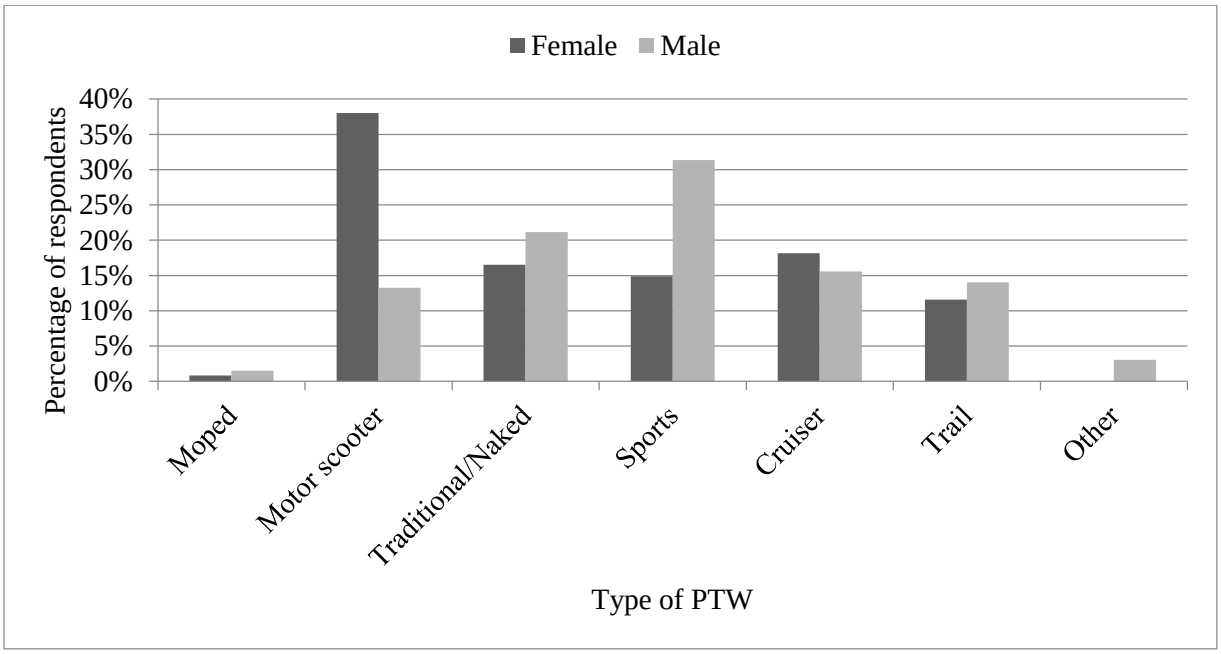


Figure 7.3. Distribution of PTW types versus gender by survey 2 (TG1 and TG2 combined)

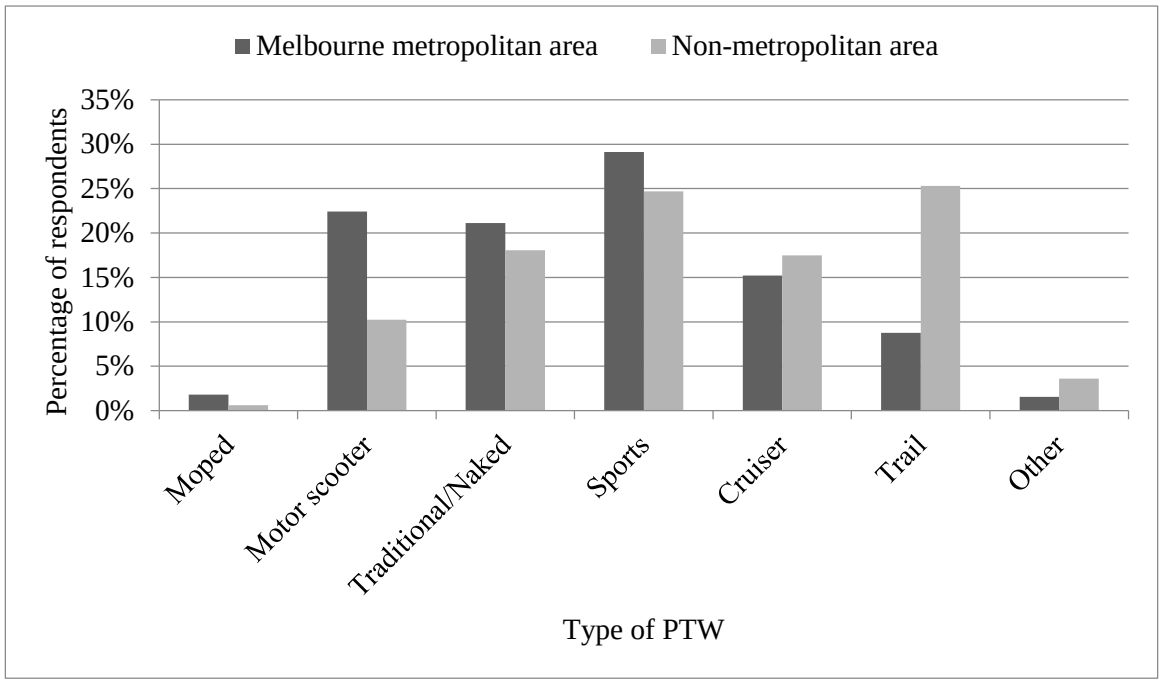


Figure 7.4. Distribution of PTW type versus residential location (TG1 and TG2 combined)

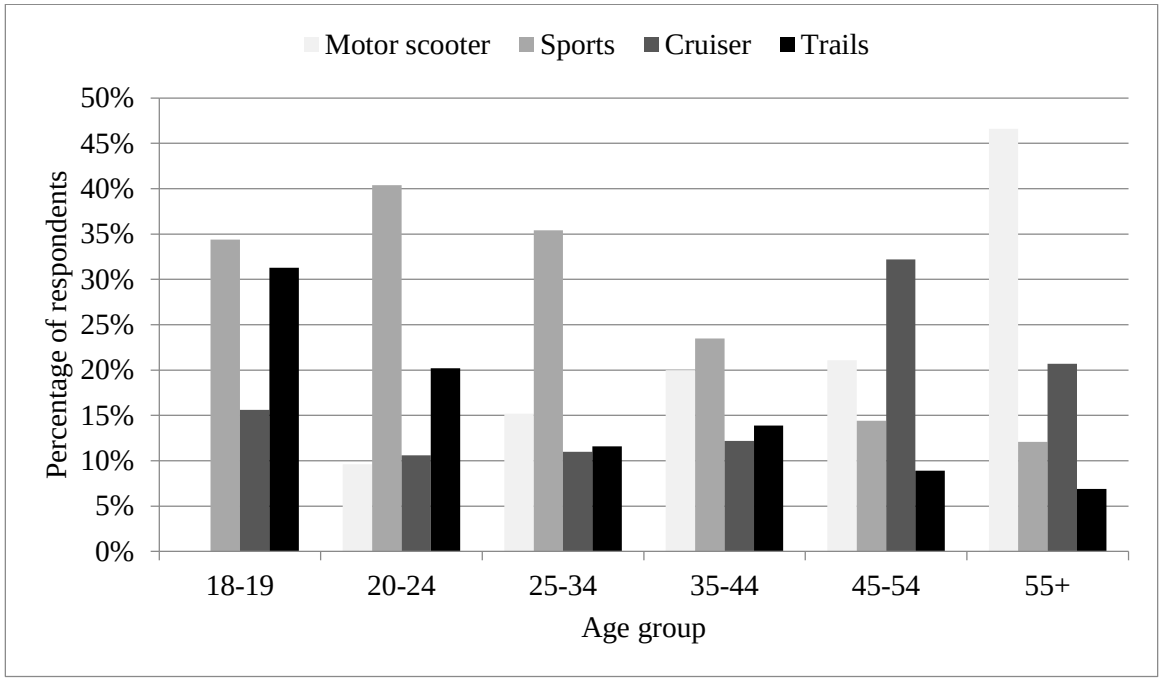


Figure 7.5. Distribution of four PTW types by the age of respondents (TG1 and TG2 combined)

7.2. Patterns of car ownership

Majority of respondents (82.4%) owned at least one car, which emphasises the reality of option for using car by most respondents. Comparing the car ownership split versus number of PTWs owned

by respondents by survey 2 (Figure 7.6) showed that the number of PTWs owned is independent from the number of cars owned by the respondents. Around 80 percent of respondents owned one PTW. Those who owned 2 or more cars were slightly more likely to own 2 or more PTWs. Chi-square test revealed that number of PTWs owned did not have a significant relationship with the novice riders' car ownership pattern as the chi-square p (= 0.27) calculated, was greater than 0.05.

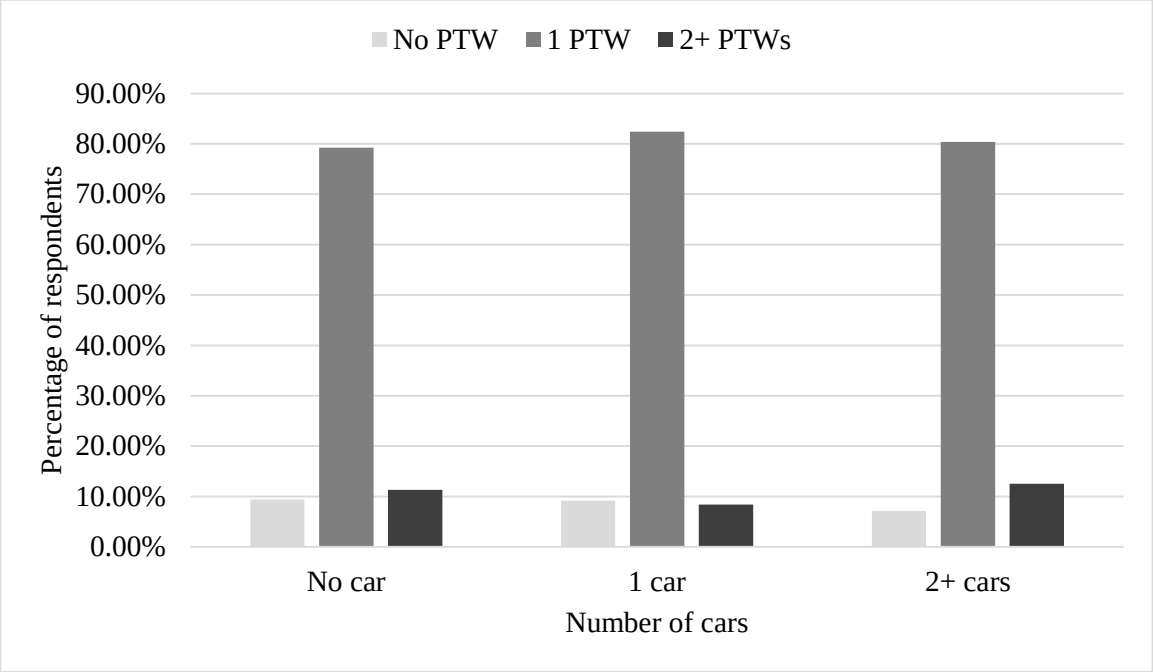


Figure 7.6. Patterns of car ownership versus PTW ownership (TG1 and TG2 combined)

7.3. Licencing (PTW and car)

By the time this research was undertaken in Victoria, Australia, every learner rider had to wait a minimum of three months after obtaining their learner permit before they could attempt the motorcycle riding licence test. Beyond that three-month of waiting period, they had a period of 12 months to obtain their riding licence or their riding learner permit would have been expired.

The time that survey 2 was distributed was almost after 13 and 16 months respectively for TG1 and TG2 respondents from when they had obtained their riding learner permit. Most respondents (90% for TG1 and 80% for TG2) had obtained their motorcycle riding licence by survey 2 reflecting that most learner riders will continue to obtain their riding licence. More than 50 percent of the motorcycle riding licences were issued between the fourth and sixth months from the time they had obtained their riding learner permit (Figure 7.7). This time frame was the earliest possible time that learner riders could legally take riding licence test. Therefore, those learner riders who had obtained their riding licence within that period of time might be more intended to use a PTW than those who had waited for a longer period of time to take their riding licence tests. There was no significant relationship between either

gender, age or residential location of respondents and the time they had obtained their riding licence from when they had obtained their riding learner permit as the chi-square p values obtained for all the test as presented in Table 7.1 were greater than 0.05.

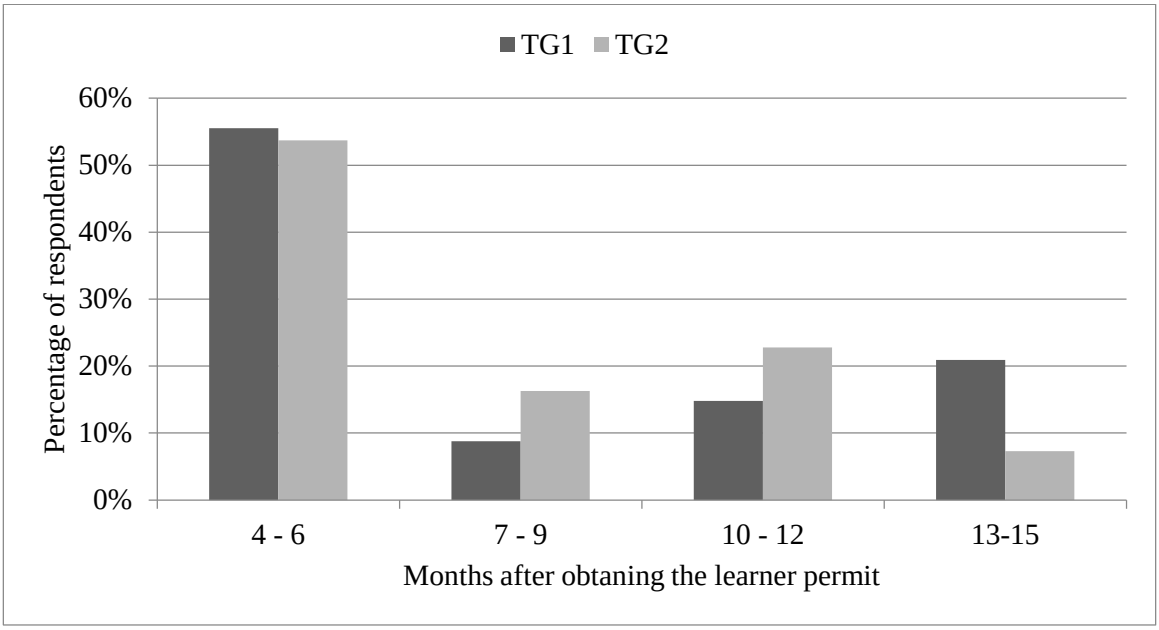


Figure 7.7. Time when motorcycle riding licence was obtained for each TG

Table 7.1. Chi-square p values

Factors	Novice riders' characteristics		
	Gender	Age	Residential location
Time when motorcycle riding licence was obtained for TG1	0.07	0.64	0.92
Time when motorcycle riding licence was obtained for TG2	0.07	0.49	0.21

Analysing the type of car driving permit held by respondents (Figure 7.8) revealed that almost all of them (99.6%) had some form of car driving permit. The majority of them (84.4%) owned a full driving licence and only a small proportion of them were on the level of learner permit or either probationary licence stage. Therefore, driving a car seems to be an available option for the majority of respondents. Studying the time frame that respondents had obtained their car driving permit (as presented in Figure 7.9) revealed that majority (89%) had obtained their car driving permit more than a year earlier than obtaining their riding learner permit. Three quarter of respondent (75%) had obtained their car driving permit more than seven years before they had obtained their riding learner permit. These findings perhaps reflect that for the great proportion of respondents there was a transition from car use to PTW use or the PTW was going to be an additional option of travel. Next section explores the proportion of the average use of each mode of travel for commuting purpose by respondents.

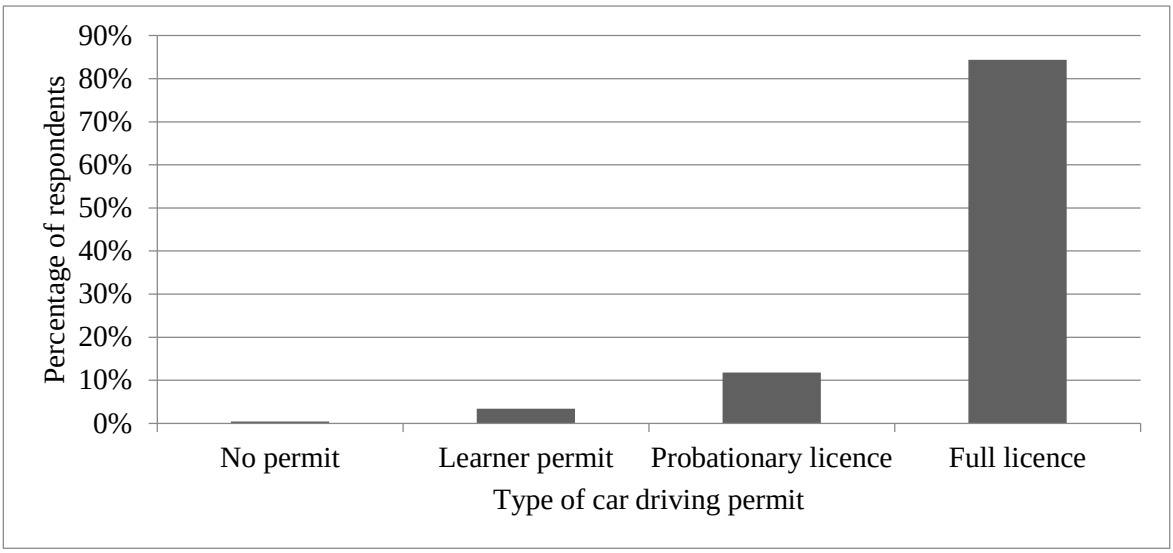


Figure 7.8. Types of car driving permits held by respondents (TG1 and TG2 combined)

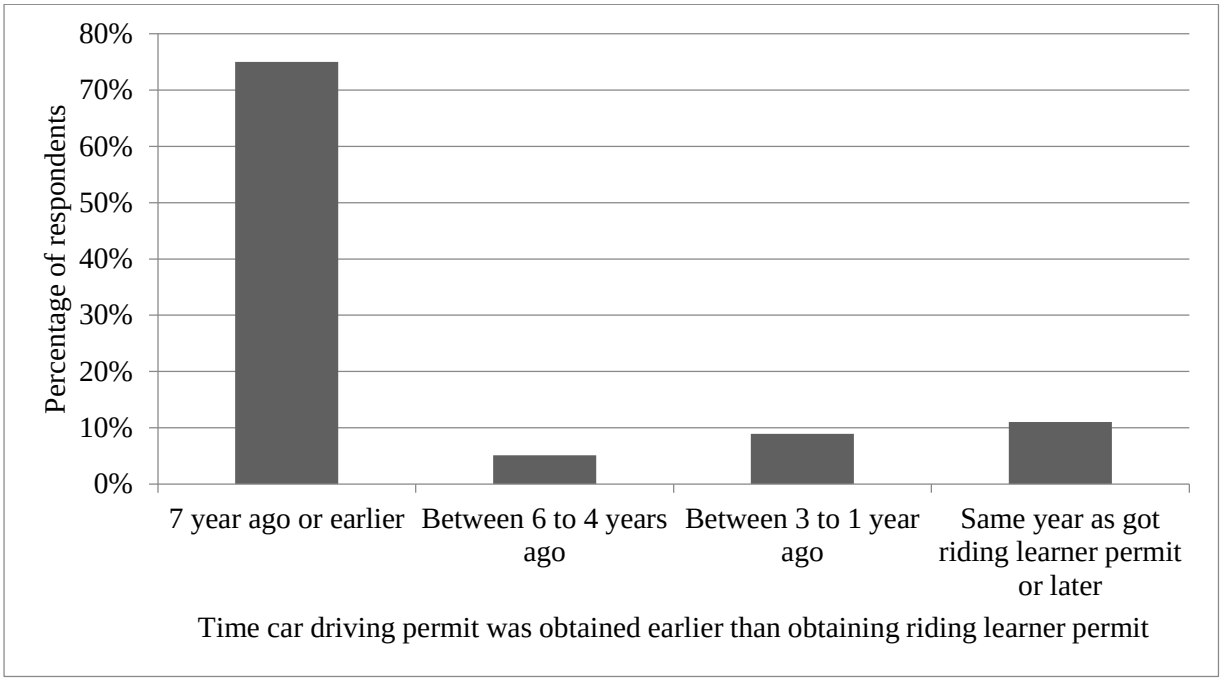


Figure 7.9. Time car driving permit was obtained (TG1 and TG2 combined)

7.4. Usage patterns of different modes of travel

Findings from the previous section that almost all the respondents had some form of driving permit (Figure 7.8) and small proportion of novice riders did not own a car (less than 20%) or a PTW (less than 10%); supports the novice riders' modal access that for the majority of novice riders the two options of either use PTW or a car was available.

Figure 7.10 presents the average proportion of the travel days that each mode of travel was used for commuting purpose (either work or study) by respondents. Analysing usage pattern of different modes of travel revealed that more than 50 percent of the commuting trips (52.8%) were undertaken by car when the share of trips undertaken by PTWs was 28 percent. Therefore, novice riders are more likely to drive their car than ride their PTW to the work or place of study. The other modes of transport were not popular when their share to undertake the commuting trips was small.

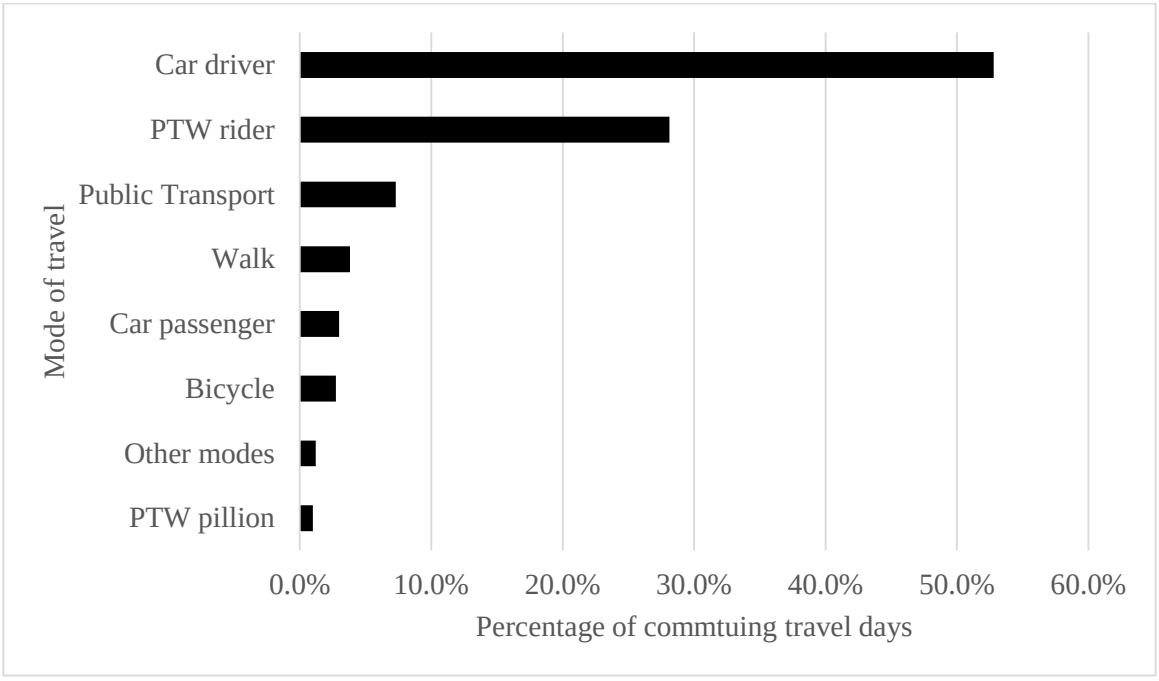


Figure 7.10. Average proportion of commuting travel days each of travel mode been used (TG1 and TG2 combined)

Analysing the proportion of commuting travel days that only PTW was used across different respondents revealed that a high proportion of respondents (56.2%) had never used PTW for their commuting trips (Figure 7.11). However, almost 21 percent of respondents had used PTW in more than 75 percent of their commuting travel days. It is found that females have not been using PTWs as much as males when 68.5 percent of females and 51.6 percent of males had reported that they did not use PTW on any day of the week to undertake their commuting trips. Age of respondents was also found to influence their PTW usage pattern. Those who were younger were more likely to undertake their commuting trips by PTW whereas the likelihood of undertaking commuting trips by PTW decreased gradually by the age of the respondents. Only 28.6 percent of respondents aged less than 20 years had not used PTW on any day of the week for commuting purpose whereas this ratio for those who aged greater than 54 years was 75 percent.

Chi-square test revealed that the gender and age of respondents have significant relationship with the usage pattern of PTWs as p values calculated from both tests equalled to zero. The residential location did not impact the pattern of PTW use as the chi-square p calculated testing the significant of relationship between residential location and PTW usage pattern was equal to 0.32, which is greater than 0.05.

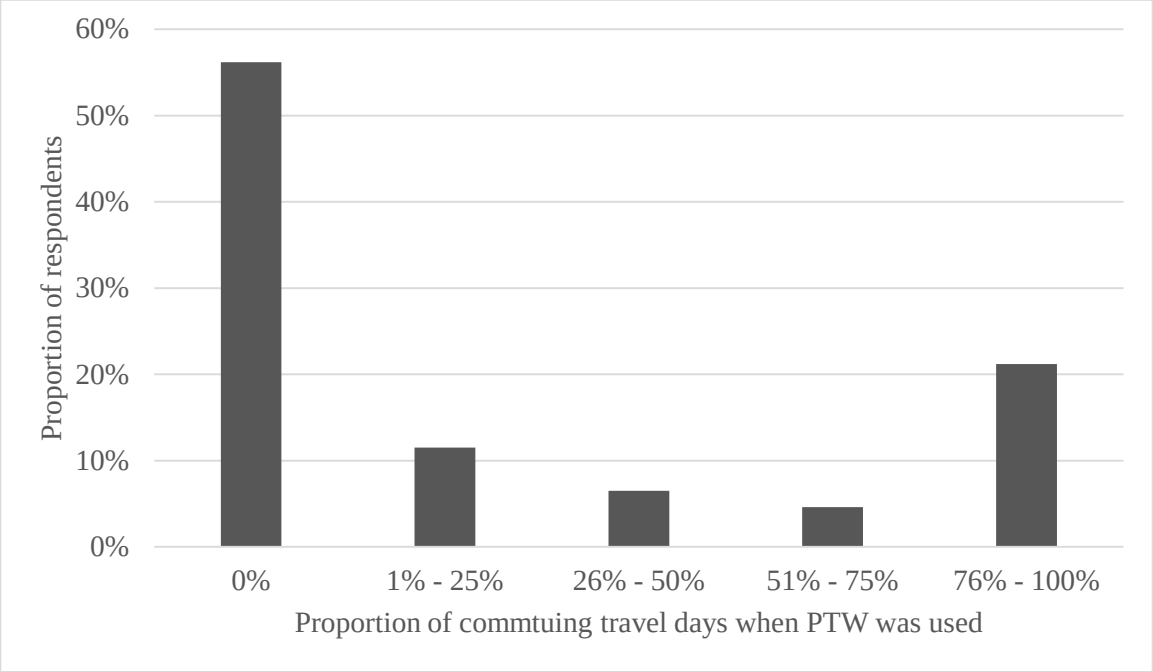


Figure 7.11. Usage pattern of PTWs across different respondents

Therefore, the patterns of PTW use varied considerably across novice riders whereas the underlying reasons of those changes across respondents are not clear. Reviewing the literature in chapter 2 and studying the Theory of Planned behaviour (TPB) in chapter 3 identified that individuals behaviour is influenced by their social norms (SN), attitudes (AT) and perceived behavioural control (PBC). Therefore, next sections have focused to provide an initial insight into the novice riders SN, AT and PBC that might influence their PTW usage pattern. In this context, as the SN, AT and PBC of the individuals were not directly measurable, a range of parameters included in the survey questionnaire provided insight into novice riders SN, AT and PBC. The parameters studied and questioned asked in the surveys were designed and grouped in the SN, AT and PBC from the point of how they could explain novice riders' behaviour in the context of their PTW usage pattern.

7.5. Social norms (SN)

Social norms (SN) can be classified into two groups. "Descriptive norms and injunctive norms. Descriptive norms are typical patterns of behaviour, generally accompanied by the expectation that

people will behave according to the pattern. Injunctive norms are prescriptive (or proscriptive) rules specifying behaviour that persons ought (or ought not) to engage in" (Kitts and Yen-Shenh 2008).

To explore the SN of respondents, the significance of different parameters (listed in the left side of Figure 7.12) in motivating novice riders to ride a PTW were explored in survey 2. The answer to each question comprised six Likert-scales from "extremely unimportant", "unimportant" and "slightly unimportant" to "slightly important", "important" and "extremely important". However, in presenting the graphs in this section and following sections the six Likert-scales are merged into two Likert-scales to make it more simple and clear when presenting and analysing the results. Therefore, the first three of them were grouped to "unimportant" when the next three of them were grouped into "important". The parameters studied can be classified as follow:

a. Injunctive norms
    i. Need to ride for the job
b. Descriptive norms
    i. There are people in the family who ride
    ii. A friend/colleague encouraged you
    iii. Being encouraged by a family member

Across the parameters explored novice riders' social norms, none of them were regarded important by more than 50 percent of respondents. Analysing the social norm of respondents identified "being encouraged by a friend/colleague to ride a PTW" as the most common motivator regarded important by 43.5 percent of respondents. The chi-square test did not reveal any significant relationship between this parameter and the gender ($p = 0.13$), age ($p = 0.13$) and residential location of respondents ($p = 0.43$) as presented in Table 7.2.

Next having PTW riders in the family or being encouraged by a family member were regarded as the most important motivators by respondents to ride a PTW. Analysing the gender of the respondents revealed that females were more likely to be motivated by a family member who rides a PTW than males (52.5% versus 30.6%). But "there are people in the family who ride" did not reveal significant relationship by the gender of the respondents. The chi-square test revealed significant relationship between the gender and the "being encouraged by a family member" as the p value (= 0.00) calculated, was less than 0.05 whereas this figure for the "there are people in the family who ride" was greater than 0.05 as equalled to 0.06. These two parameters did not have a significant relationship with the age of respondents (as presented in Table 7.2, the p values calculated from the chi-square tests were greater than 0.05).

Almost half (51.7%) of non-metropolitan respondents found "there are people in the family who ride" important while 34.3 percent of metropolitan respondents regarded it as important. Similarly 50 percent of non-metropolitan respondents found "being encouraged by a family member" important while 32.4 percent of metropolitan respondents regarded it as important. Therefore, riders in non-metropolitan area were more likely to be influenced by their family members to ride. Chi-square test

revealed that there is significant relationship between the parameters including “there are people in the family who ride” and “being encouraged by a family member”, and respondents’ residential location as the chi-square p calculated for both tests were less than 0.05 (Table 7.2).

Only 21.6 percent of respondents considered the experiencing of being pillion passenger as important, which had significantly different impression by the gender of respondents (chi-square p = 0.00). It is found that only 11.6 percent of males considered it as important while almost 50 percent of females regarded it as an important motivator to ride. The chi-square test did not find any significant relationship between this parameter and novice riders age (p = 0.28) and residential location (p = 0.22) as the p values calculated were greater than 0.05.

The parameter regarded least important was the “need to ride for the job” as an injunctive norm (only 14.1 percent of respondent regarded it as important). Across gender, age and residential location of novice riders, only their age had a significant relationship with that parameter. Those who aged between 20 to 24 years were much more likely to ride a PTW for their job than respondents from other age groups (34.5% versus 8.9%). Chi-square test revealed significant dependent between the age and the rate of important given to the “need to ride for the job” as the p value (= 0.03) calculated, was less than 0.05.

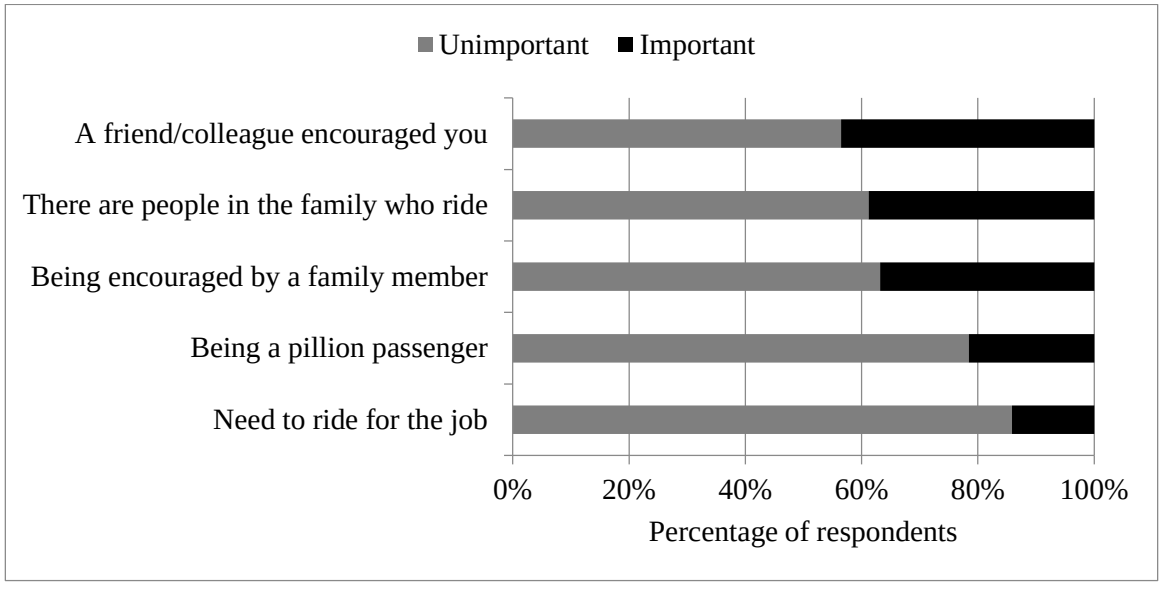


Figure 7.12. Importance of different parameters in motivation people to ride a PTW

Table 7.2. Chi-square p values

Factors	Novice riders' characteristics		
	Gender	Age	Residential location
A friend/colleague encourage you	0.13	0.13	0.43
There are people in the family who ride	0.06	0.15	0.01
Being encouraged by a family member	0.00	0.06	0.02
Being a pillion passenger	0.00	0.28	0.22
Need to ride for the job	0.67	0.03	1.00

7.6. Attitudes (AT)

In order to explore the attitudes of novice riders towards riding a PTW different type of questions were designed examining the importance of different parameters in a six point Likert-scale answer as discussed earlier. The survey questions explored different attitudinal characteristics of novice riders ranging from the importance of different parameters that makes riding enjoyable for novice riders to the importance of different parameters that might change their decision to NOT ride a PTW in a day.

7.6.1. Riding enjoyment

In contrast to the motivating parameters considered in the previous sections, a high percentage of respondents indicated that a numbers of the parameters explored in the survey were important determinants (indicators) of riding enjoyment. Figure 7.13 presents the importance of different parameters associated with the riding enjoyment. The parameters studied are ordered from most to least important. Majority of respondents (94%) enjoyed riding because of the freedom it provides and the thrill of riding they face with; followed by "getting away from every day of life" regarded important by 85 percent of respondents. These parameters did not hold a significant relationship with the gender, age and residential location of respondents (chi-square p values calculated for all the tests as presented in Table 7.3 were greater than 0.05) except for the "like the freedom of riding", which varied across different age groups (chi-square p = 0.01). The likelihood of considering "the freedom of riding" as an important parameter was almost 12 percent more across those who aged more than 44 years than younger riders aged 44 years or less (97.95% versus 87.3%).

Factors of "being exposed to sounds and smells when riding" and "like the image/style of riding" were regarded important by more than half of the respondents. However, liking the image and style varied significantly by age group (chi-square p = 0.00). The likelihood of considering this parameter as important were almost 2.5 times more across those who aged 44 years or less than those who were younger than 44 years old (75.8% versus 30.06%).

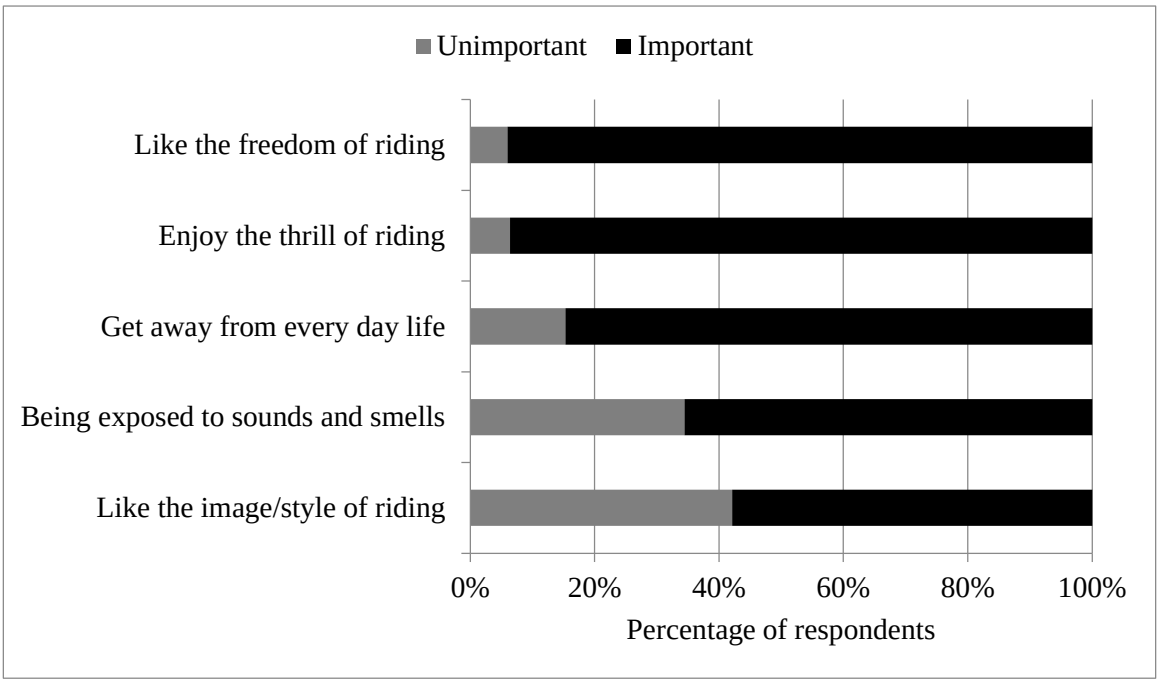


Figure 7.13. Importance of different parameters, which contribute to riding enjoyment

Table 7.3. Chi-square p values

Factors	Novice riders' characteristics		
	Gender	Age	Residential location
Like the freedom of riding	0.49	0.01	0.75
Enjoy the thrill of riding	0.57	0.62	0.54
Get away from everyday life	0.39	0.57	0.14
Being exposed to sounds and smells	0.06	0.07	0.06
Like the image and style of riding	0.76	0.00	0.64

7.6.2. Importance of different prohibitive parameters to ride a PTW

This section explored the importance of two range of different parameters that either might influence novice riders' decision to not ride a PTW in a day or may lead them to not ride in the future. Analysing these parameters would provide insight into novice riders' willingness to ride a PTW when experiencing different deterrents.

7.6.2.1. Daily trips

The importance of different parameters, which might contribute to not ride a PTW on a day for commuting trips are presented in Figure 7.14. Heavy rain, must dress formally in a day and strong windy day were the parameters regarded important by more than three quarter of respondents

discouraging them from riding on a commuting day. As presented in Table 7.4 the importance of heavy rain did not vary by the gender and residential location of respondents but varied with the age of novice riders. Those who were younger than 25 years did not consider the heavy rain parameter as important as those who were 25 years and older (64% voted important versus 90%). The chi-square test revealed that the importance of heavy rain varies by the age of the respondents as the p value (=0.04) calculated, was less than 0.05.

In addition, females were more reluctant to ride in a strong windy day in comparison with males when 90 percent of females regarded strong wind as an important parameter as opposed to 73.7 percent for males. As presented in Table 7.4 the extent that respondents regarded strong wind as important did not vary by their age and residential location. The chi-square test revealed that the importance of strong wind varied significantly by the gender of the respondents as the p value (= 0.01) calculated, was less than 0.05.

Other parameters including trip length or unfamiliar rout, hot or cold day, going to gym were not as important as the other parameters to discourage novice riders to ride in day.

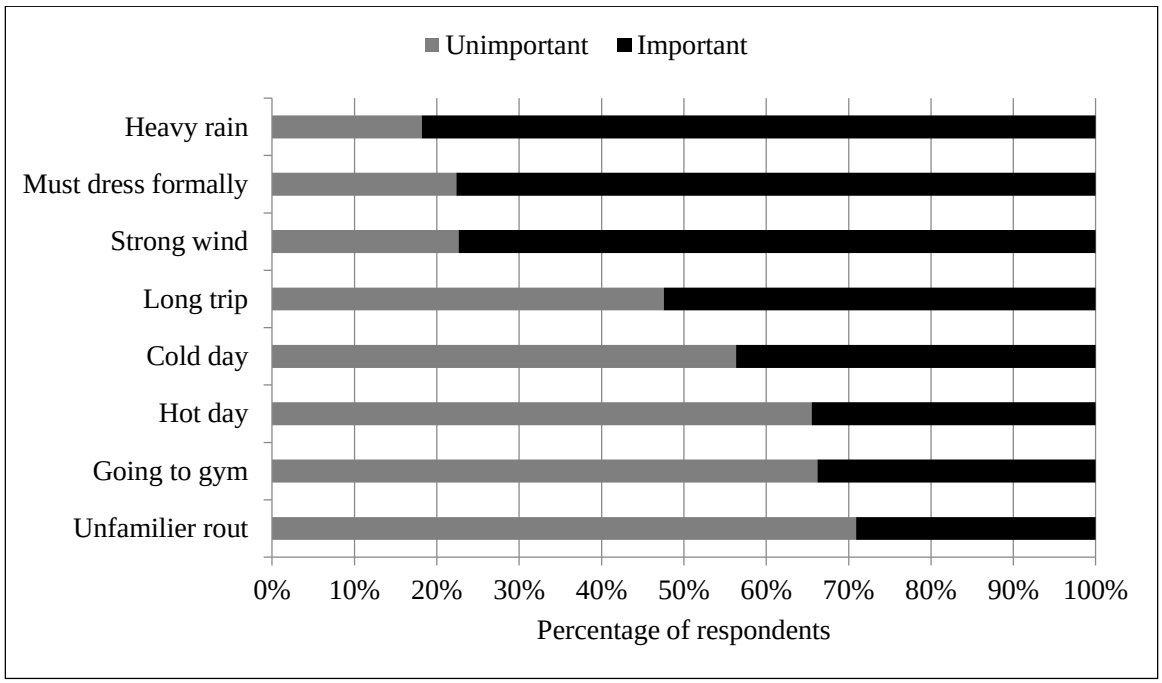


Figure 7.14. Importance of different parameters discouraging respondents from riding on a commuting day

Table 7.4. Chi-square p values

Factors	Novice riders' characteristics		
	Gender	Age	Residential location
Heavy rain	0.27	0.04	0.46
Must dress formally	0.35	0.07	0.22
Strong wind	0.01	0.09	0.37
Long trip	0.00	0.65	0.07
Cold day	0.04	0.27	0.59
Hot day	0.04	0.73	0.63
Going to Gym	0.52	0.28	0.08
Unfamiliar route	0.00	0.80	0.22

7.6.2.2. Future riding

The importance of different parameters, which might discourage novice riders to ride a PTW in the future is presented in Figure 7.15. It is found that experiencing a serious PTW crash had the biggest impact. More than three quarter of respondents (76.9%) reported having a serious crash as an important prohibitive parameter, which might stop them from riding in the future while other parameters were regarded potentially important by less than 40 percent of respondents. While the rate of concern associated to experience a PTW crash did not vary by the age and residential location of respondents, males regarded "serious PTW crash" less important than females (voted important by 72% versus 91.7%). The chi-square test revealed that the importance of "serious PTW crash" varied significantly by the gender of the respondents as the p value (= 0.00) calculated, was less than 0.05. However, this parameter did not have significant relationship with the age and residential location of respondents as the p values calculated were greater than 0.05 (Table 7.5).

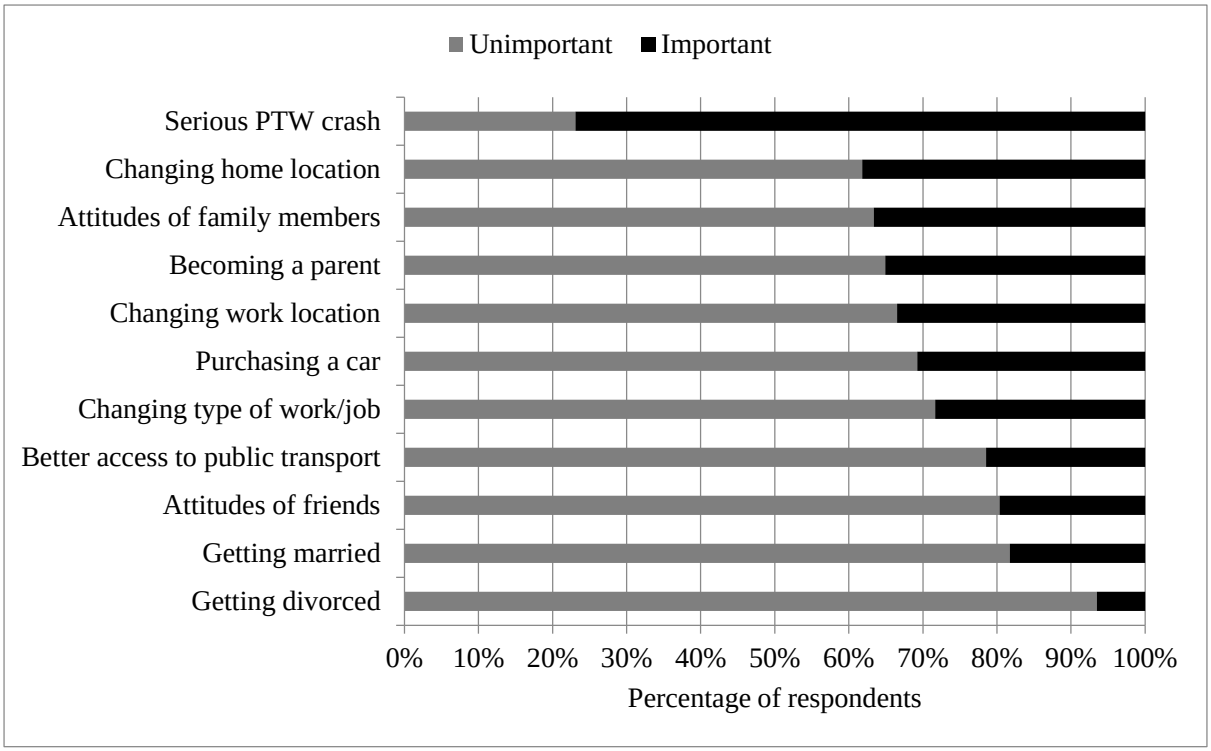


Figure 7.15. Importance of different parameters to not ride a PTW in the future

Table 7.5. Chi-square p values

Factors	Novice riders' characteristics		
	Gender	Age	Residential location
Serious PTW crash	0.00	0.27	0.37
Changing home location	0.54	0.11	0.12
Attitudes of family members	0.09	0.49	0.04
Becoming a parent	0.64	0.00	0.34
Changing work location	1.00	0.02	0.01
Purchasing a car	0.28	0.00	0.56
Changing type of work/job	0.50	0.00	0.09
Better access to public transport	0.46	0.69	0.46
Attitudes of friends	0.70	0.27	0.44
Getting married	0.69	0.00	0.23
Getting divorced	1.00	0.83	0.54

7.6.3. Safety perception

One question on the survey was designed to explore the risk perception of novice riders. Novice riders were presented with a series of statements each describing a riding situation and were asked to be rated by novice riders according to their perception of how risky each situation was on a six point Likert-scale (extremely risky, risky, slightly risky, slightly safe, safe, extremely safe). Situations identified as risky by more than 80 percent of respondents were:

a. "Not wearing any safety gear"
b. "Splitting between fast moving traffic",
c. "Wearing helmet and gloves as the only safety gear" and
d. "Riding in peak hour traffic".

As presented in the Figure 7.16, the last two parameters explored the novice riders' perception of the risk asking about the level of the risk associated with riding a PTW in general and for them as a personal behaviour. It is found respondents reported riding a PTW as a less risky behaviour for themselves than the general population. This reflects the individuals' over-confidence to be able to perform a behaviour better than the rest of the population. This finding is similar to what was reported in the literature when each PTW rider was found to be over-confident about his/her abilities to undertake a riding behaviour (Mannering and Grodsky 1995; Joshi, Bellet et al. 2010)

However, it seems that rates given to the risk associated with riding in different situations explored in the survey, did not vary by gender, age and residential location of respondent. The chi-square test did not reveal a significant relationship between any of the parameters explored and the gender, age and residential location of respondents as the p values calculated were greater than 0.05 (Table 7.6). It might present that the novice riders' risk perception is independent from their gender, age and residential location. However, these findings differed from what was reported by VicRoads. On a research commissioned by VicRoads (2009), it was reported that males were much more likely to experience a crash than females and those riders who aged between 25 to 34 years had a lower chance of having a crash than riders from other age groups. These findings perhaps reflect that riders risk perception varies by the gender and age of motorcyclist unlike what was found in this research. In another study undertaken in New Zealand, Therese (1997) found that the pattern of taking risks associated with riding a PTW changes with the riders' age but stood similar for male and female.

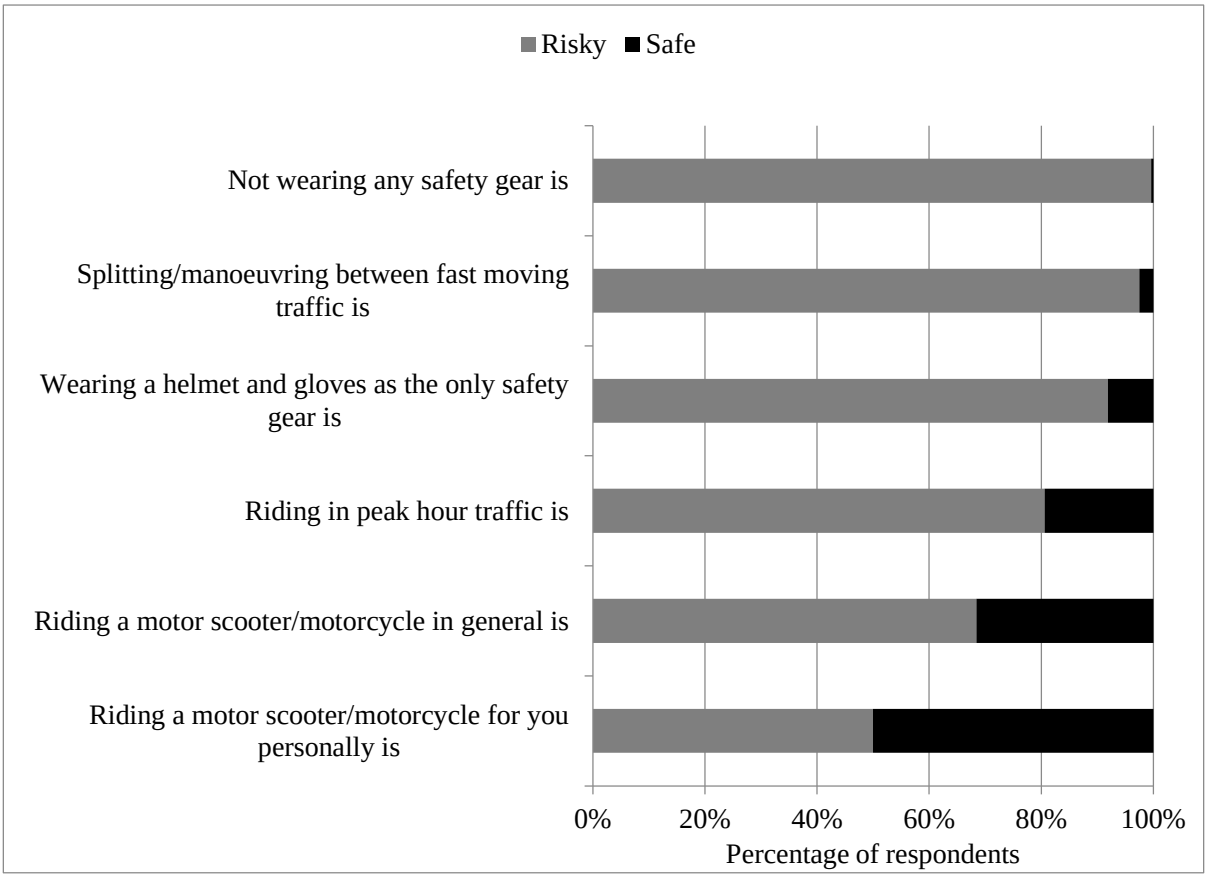


Figure 7.16. The level of risk associated with each parameter across respondents

Table 7.6. Chi-square p values

Factors	Novice riders' characteristics		
	Gender	Age	Residential location
Not wearing any safety gear is	1.00	0.80	0.25
Splitting/manoeuvring between fast moving traffic	0.65	0.81	0.64
Wearing a helmet and gloves as the only safety gear is	1.00	0.75	1.00
Riding in peak hour traffic is	1.00	0.06	0.06
Riding a motor scooter/motorcycle in general is	0.42	0.25	0.06
Riding a motor scooter/motorcycle for you personally is	0.23	0.22	0.07

7.6.4. Attractions to risky behaviours

One question on the survey was designed to explore the novice riders' likelihood to undertake different risky behaviours. Novice riders were presented with a series of statements each describing a behaviour and they were asked to rate their extent of likelihood to perform that behaviour on a six point Likert-scale (extremely unlikely, unlikely, slightly unlikely, slightly likely, likely, extremely likely).

These statements are sourced from the research work by Weber et al (Weber, Blais et al. 2002) presented in the Appendix A and Appendix C of that report.

Exploring the novice riders ranking to the parameters that each were associated with a behaviour can help to obtain a better insight into their risk attitudes. The likelihood of undertaking behaviours is presented in Figure 7.17. It is found that more than half of respondents were likely to do white water rafting (59%) and going on holiday without booking an accommodation (52%). There was not any significant relationship between the "go white-water rafting" or "go no holiday without booking an accommodation" and the gender, age and residential location of respondents (as presented in Table 7.7, chi-square p values calculated from the tests were greater than 0.05), except between the gender and "go on holiday without booking an accommodation". Females were more likely to go on holiday without booking an accommodation than males (64.4% versus 46.8%). Chi-square test revealed significant relationship between the gender and rate given to "go on holiday without accommodation" as the p value (= 0.02) calculated, was less than 0.05

Almost 42 percent of respondents were likely to "go bungy jumping" while only 11 percent of them were likely to "spend up the limit of their credit card without thinking about how to pay it back". However, the likelihood of go bungy jumping was found to depend on the age of novice riders. Those novice riders who were younger than 44 years were much more likely to go to bungy jumping than those who were older than 45 years old (51% versus 20.4%). Chi-square test revealed significant dependent between age and the rate given to "go bungy jumping" when the p value (= 0.00) calculated, was less than 0.05. Except between the age and "go bungy jumping", there was not any other significant relationship between this parameter or "spend up the limit of their credit card without thinking about how to pay it back" by gender, age and residential location of respondents as all the chi-square p values calculated from the tests were greater than 0.05 (Table 7.7).

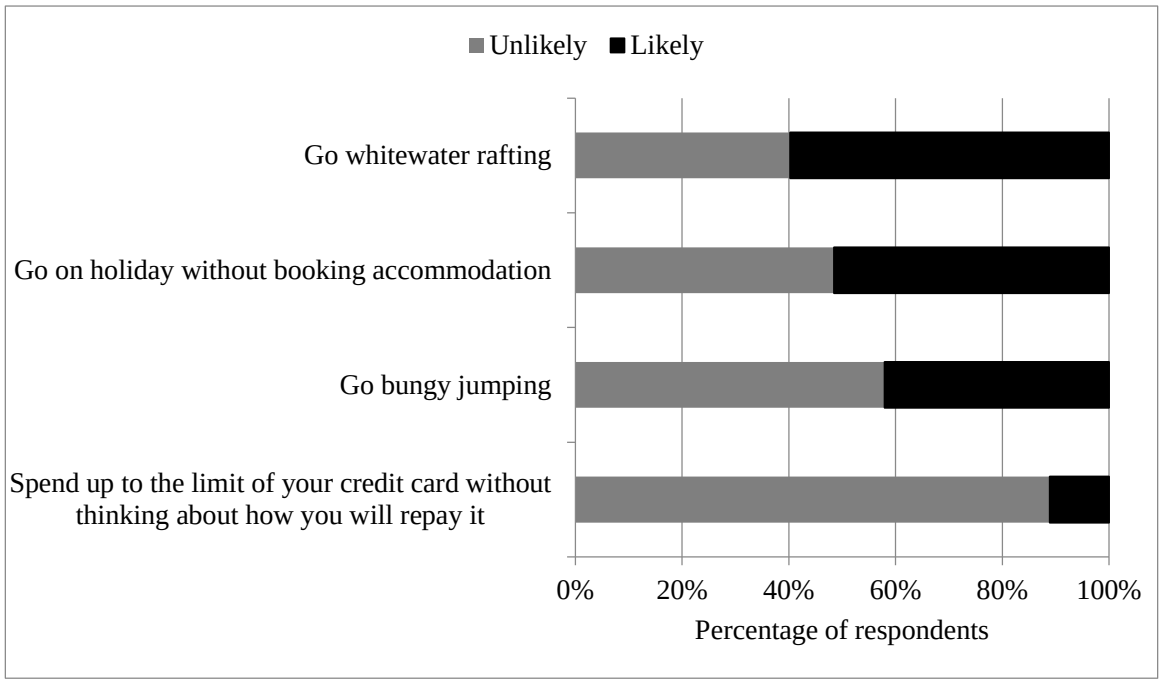


Figure 7.17. Likelihood of undertaking different behaviours by respondents

Table 7.7. Chi-square p values

Factors	Novice riders' characteristics		
	Gender	Age	Residential location
Go white-water rafting	0.28	0.09	0.54
Go on holiday without booking accommodation	0.02	0.59	0.23
Go bungy jumping	0.17	0.00	0.54
Spend up to the limit of your credit card without thinking about how you will pay back	0.49	0.06	0.81

7.7. Perceived behavioural control

Understanding the novice riders' perception associated with the advantages of using PTWs in comparison with other modes of transport and their level of confidence to ride a PTW potentially provided insight into the perceived behavioural control of respondents. Therefore, in the survey, a series of questions were designed to explore each novice rider's rate dedicated to the importance of different parameters associated with the advantages of using PTWs in comparison with driving a car or using public transport. Then some other parameters explored novice riders riding experiences and their previous pattern of using different modes of travel prior to obtaining their riding learner permit.

7.7.1. Advantages of PTW compared with car

Figure 7.18 presents the importance of different parameters motivated respondents to use a PTW than a car. Free parking in Melbourne CBD and region was found the most important motivator to ride a PTW than drive a car. This variable was regarded important by more than 70 percent of respondents (70.4%) as in Victoria, PTW riders are allowed to park on footpaths even in the Melbourne CBD for free as long as they do not disturb pedestrian flow. Therefore, it is not surprising to see that respondents, who lived in the Melbourne-metropolitan area, considered “free parking” more important than those who resided in non-metropolitan area (77.7% versus 49.2%). Perhaps those who lived in Melbourne metropolitan area undertook more commuting trips to the Melbourne CBD where parking costs are higher. Chi-square test revealed significant relationship between the residential location and the rates given to the importance of free parking by the respondents as the p value (= 0.00) calculated, was less than 0.05. There was not significant relationship between this parameter and either the gender or age of respondents as the p values calculated from the chi-square tests between them were greater than 0.05 (Table 7.8).

Lower fuel cost and less travel time associated with the use of PTWs in comparison with a car were next parameters regarded important by more than 60 percent of respondents motivating them to ride a PTW. For both of these parameters, greater proportion of riders under 34 years of age considered them as important than those who were over 34 years old (81.1% versus 49.2% for lower fuel cost and 74.8% versus 43.5% for less travel time). Chi-square test revealed significant relationship between lower fuel cost and less travel time by the age of novice rider as the p values calculated for both tests were equal to zero.

The toll costs and maintenance costs for PTWs in Melbourne are lower than the cars. The lower PTW toll costs and lower maintenance costs of PTWs were regarded important by almost 40 percent of respondents and did not vary by the respondents’ gender, residential location and age on the basis of the chi-square p values calculated (Table 7.8).

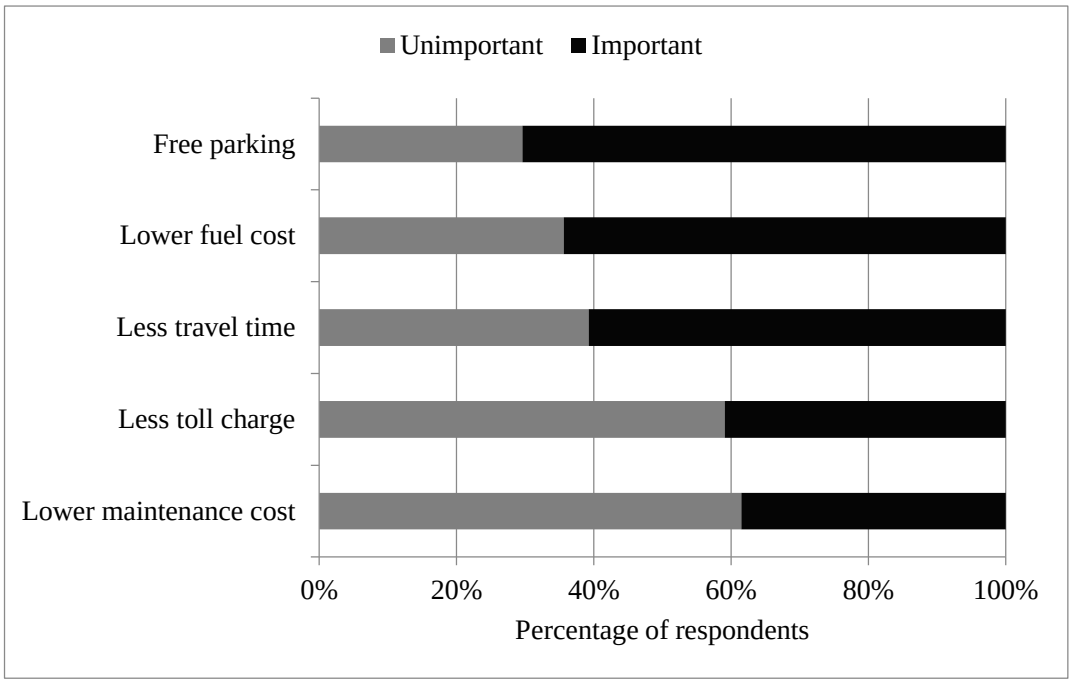


Figure 7.18. The importance of different parameters to use a PTW as opposed to a car

Table 7.8. Chi-square p values

Factors	Novice riders' characteristics		
	Gender	Age	Residential location
Free parking	0.74	0.24	0.00
Lower fuel cost	0.12	0.00	0.64
Less travel time	0.54	0.00	0.06
Less toll charge	0.88	0.06	0.76
Lower maintenance cost	0.08	0.12	0.07

7.7.2. Advantages of PTW compared with public transport

The longer travel time by public transport was reported by almost 70 percent of respondents as an important parameter encouraging them to use a PTW as opposed to public transport (Figure 7.19). Analysis of respondents' characteristics revealed that those who aged between 25 to 34 years old were more concerned about the longer travel time associated with the use of PT than other age groups (80.6% versus 59.7%). This could perhaps be as the consequence that respondents aged between 25 to 34 years were more likely to be new or in the early stages of their occupation compared with those who were from other age groups. Therefore, they might prefer to be more productive and try to make a good reputation of themselves in work place by working harder and being on time, which necessitate to be more cautious of their trip travel time. Chi-square test revealed only significant relationship between

the age and the rate of concern given to the longer travel time associated with the use of PTWs on the basis of the p value (= 0.01) calculated, which was less than 0.05 (Table 7.9).

Next, the parameters of not being able to change the route by PT, to avoid crowded PT, the unreliability of the PT and do not pay the cost of PT travel were regarded as important by more than half of the respondents discouraging them to use PT. None of this parameters had a significant relationship with gender, age and residential location of respondents as the chi-square p values calculated from all the tests were greater than 0.05 (as presented in Table 7.8) except between the age and the unreliability of PT as well as between the age and not to pay the cost of PT travel. Those who aged between 25 to 34 years old were more concerned about the unreliability of PT (73.1% versus 45.1%) and PT travel costs (65.2% versus 45.01%) than those from other age groups. The chi-square tests revealed significant relationship between the age and the unreliability of PT and between the age and not to pay the cost of PT travel, as the p values calculated from both tests equalled to zero and were less than 0.05. This finding is consistent with earlier finding; who aged between 25 to 35 years were more concerned than respondents from other age groups about the longer travel time associated with the use PT. Therefore, it seems that respondents aged between 25 to 34 years were more concerned than those from the other age groups about the reliability, travel time and the costs associated with the use a mode.

The other parameters were regarded important by less than half the respondents. The parameter regarded least important to not use PT was “dislike PT” regarded important by 42.5 percent of respondents. The chi-square test did not reveal any significant dependent between the novice riders’ characteristics and the rate given to dislike PT as the p values calculated for all the tests were greater than 0.05 (Table 7.9).

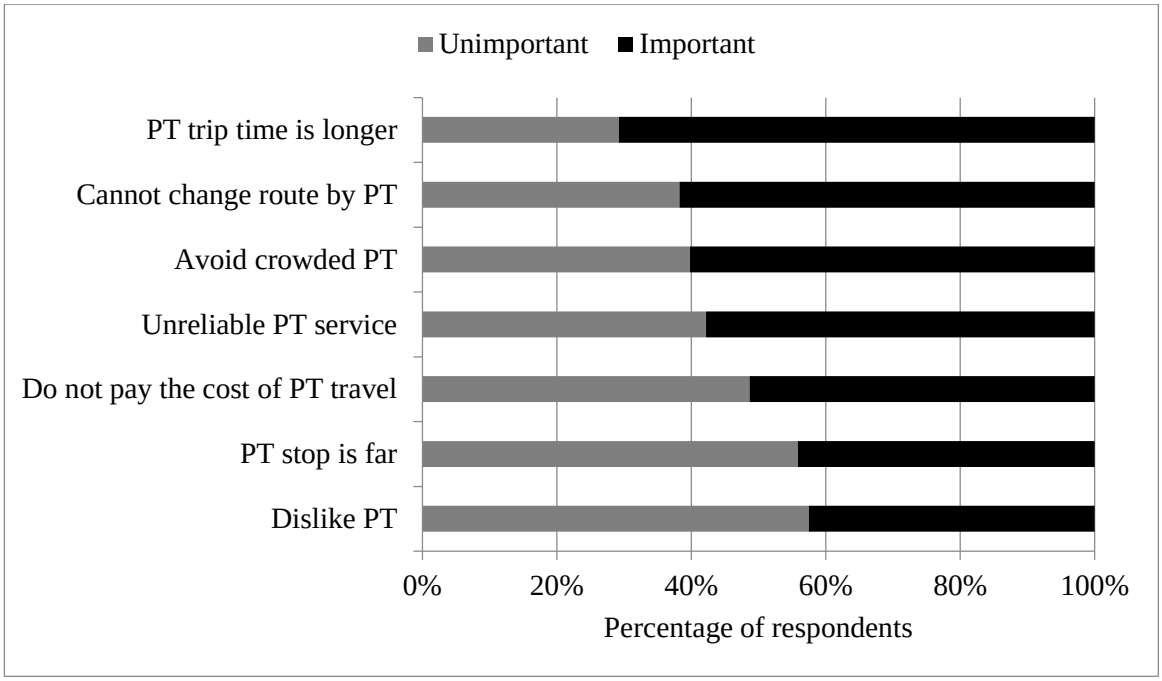


Figure 7.19. The importance of different parameters to use a PTW as opposed to public transport

Table 7.9. Chi-square p values

Factors	Novice riders' characteristics		
	Gender	Age	Residential location
PT trip time is longer	0.13	0.01	0.18
Cannot change route by PT	0.08	0.22	0.35
Avoid crowded PT	0.06	0.44	0.12
Unreliable PT service	0.06	0.00	0.28
Do not pay the cost of PT travel	0.06	0.00	0.54
PT stop is far	0.10	0.68	0.10
Dislike PT	0.12	0.06	1.00
Note: PT = Public Transport			

7.7.3. Previous riding experience

The greater extent of PTW riding could increase the level of confidence associated with the use a PTW. Therefore, one question was designed in the survey to explore novice riders' extent of PTW riding prior to obtaining their riding learner permit, which can represent their perceived behavioural control towards riding a PTW.

It is found that more than half of the respondents (58%) had a prior PTW riding experience before obtaining their riding learner permit. Males were more likely to have ridden a PTW prior to obtain their riding learner permit than females (65% versus 35%). The chi-square test revealed significant relationship between the gender and having a prior riding experience as the p value (= 0.00) calculated, was less than 0.05 (Table 7.10). This might present males' greater perceived behavioural control towards riding a PTW than females.

In addition, those who aged 20 years and more were more likely to have a PTW riding experience than those who aged less than 20 years (41% versus 25%). The chi-square test revealed significant relationship between the age and having a prior riding experience as the p value (= 0.04) calculated, was less than 0.05 (Table 7.10)

Furthermore, those who lived in non-metropolitan area were much more likely to have a prior riding experience than those who lived in Melbourne metropolitan area (71.2% versus 53.1%). The chi-square test revealed significant relationship between the residential location and having a prior riding experience as the p value (= 0.01) calculated, was less than 0.05. The greater likelihood of having a prior riding experience by non-metropolitan residents than Melbourne metropolitan residents could be as a consequence of their greater chance of doing illegal riding or off road riding in non-metropolitan areas.

Figure 7.20. Prior riding experience of respondents

Table 7.10. Chi-square p values

Factors	Novice riders' characteristics		
	Gender	Age	Residential location
Extent of PTW riding prior to obtaining learner permit	0.00	0.04	0.01

7.7.4. Usage pattern of PT and car prior to obtaining riding learner permit

This section explored novice riders' usage pattern of public transport and car prior to obtaining their riding learner permit. It is found that less than half of respondents (48.5%) used PT for their commuting trips. Those who lived in non-metropolitan area were less likely to use PT in comparison with Melbourne metropolitan residents (18.6% versus 57.2%). The chi-square test revealed significant relationship between the residential location and the pattern of using PT prior to obtaining their riding learner permit as the p value (= 0.00) calculated, was less than 0.05 (Table 7.11).

Overall, using a car to undertake commuting trips were more common across respondents than using PT. Almost 65 percent of respondents had undertaken their commuting trips by car on five days or more per week and only 11 percent had not used a car at all.

Females were slightly more likely to undertake their commuting trips by car than males, as only 5.4 percent of females had not reported the use a car for their commuting trips when this figure for males was 13.3 percent. The chi-square test revealed significant relationship between the gender and the pattern of using a car prior to obtaining riding learner permit as the p value (= 0.00) calculated, was less than 0.05 (Table 7.11).

Furthermore, those respondents who were older than 24 years were more likely to undertake their commuting trips by car than those who were 24 years old or younger. 23.2 percent of respondents aged 24 years old and less had not reported the use of a car at all whereas this figure for those who aged greater than 24 years was 12.4 percent. The chi-square test revealed significant relationship between the age and the pattern of using car prior to obtaining riding learner permit as the p value (= 0.00) calculated, was less than 0.05 (Table 7.11). This pattern is a reflection of that the respondents aged 24 years old and less were more likely to be a learner driver than those who aged greater than 24 years old. When learner drivers are not permitted to ride a car alone in Victoria, they are found to be interested in using PTW to undertake their commuting trips. This assumption is supported by analysing the age of respondents versus the type of car driving permit owned by them. It is found that majority of respondents (92.1%) aged greater than 24 years old owned a driving licence whereas only 42.4 percent of respondents aged between 20 to 24 years old owned a driving licence. In addition, none of the respondents aged between 18 to 19 years old owned a driving licence. The chi-square test revealed significant relationship between the respondents' age and their type of car driving permit as the p value (= 0.00) calculated, was less than 0.05.

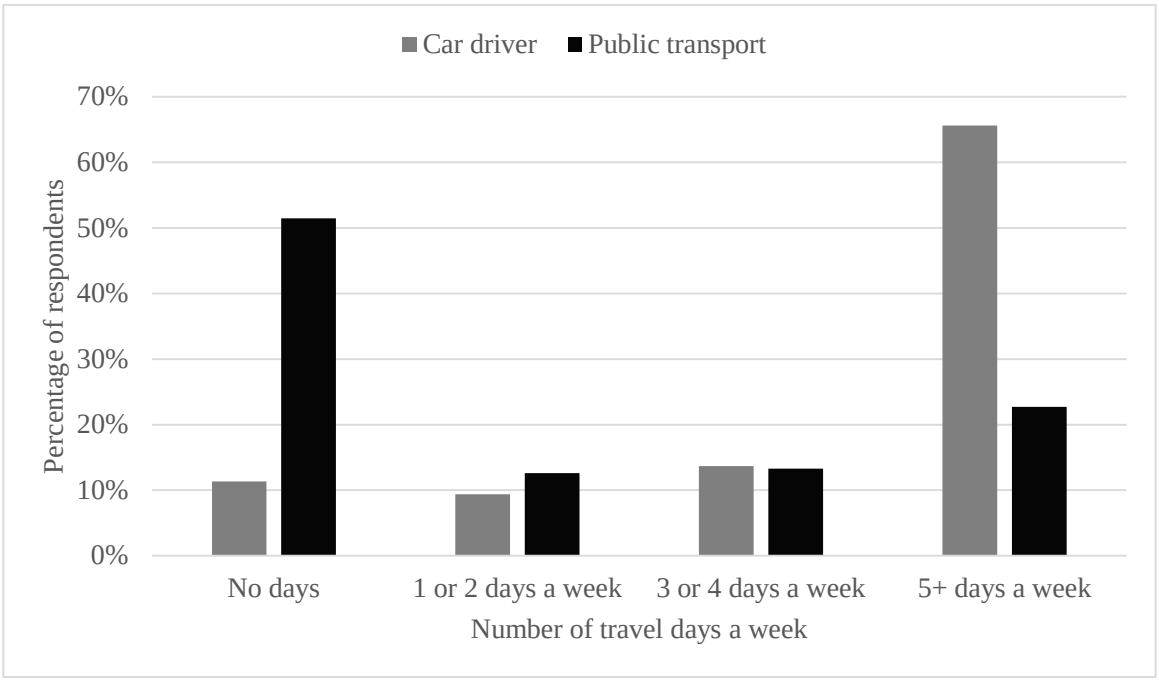


Figure 7.21. Distribution of the car and PT usage pattern prior to obtaining riding learner permit

Table 7.11. Chi-square p values

Factors	Novice riders' characteristics		
	Gender	Age	Residential location
Public transport	0.98	0.23	0.00
Car driver	0.00	0.00	0.18

7.8. Discussion

A range of parameters were explored in the surveys to provide insight into novice riders' socio-demographic characteristics and their motivations, attitudes and perceptions towards the use a PTW with the scope to address the first and third research questions of this study.

It was found that the greater number of novice riders owned a PTW by survey 2 than survey 1. Perhaps reflecting that there is an overall positive attitude towards the use of PTWs across novice riders. In addition, analysing the time frame, when novice riders had obtained their riding licence revealed that more than half of the respondents had obtained their riding licence at the earliest possible time they could take riding licence tests. It can probably reflect that more than half of the respondents have been very determinant to use a PTW.

Analysing the collected data revealed that the majority of respondents (99.6%) had a car driving permit and 82.4 percent of them owned a car. Similar pattern was reported in the US (Bates 2000) where majority of PTW riders owned a car, which differed from what was reported in South East Asian countries including Malaysia (Leong and Sadullah 2005), Taiwan (Lai and Lu 2007) and China (Yun, Liu et al. 2013).

Analysing the travel patterns of respondents presented that PTW was not used as much as cars. In average 52.8 percent of respondents' commuting trips were found to be undertaken by cars whereas PTWs share was 28.1 percent. PTW usage pattern varied considerably across them as it is found that 56 percent of respondents had never used PTW on commuting trips whereas for almost a quarter of them (21.2%), PTW was the predominate mode of travel. Therefore, obtaining PTWs by respondents who undertook commuting trips by PTWs could reflect either that there has been a shift into the PTW use or PTW has been the additional option for commuting travel.

Analysing the gender and age of respondents found that they have significant relationship with the usage pattern of PTWs. Males or younger riders were more likely to undertake their commuting trips by PTW whereas the likelihood of undertaking commuting trips by PTW decreased gradually with increasing age and if they were females. This perhaps could be as a consequence of changes happening in the novice riders' intentions, attitudes and perception towards the use of a PTW by their age and gender. When there is not any literature reporting the use of PTWs by novice riders, in Greece and the UK males were more likely to own a PTW compared with female (Burge, Fox et al. 2007; Kepaptsoglou, Milioti et al. 2011) and possibly use it for commuting trips.

As discussed in chapter 3, the theory of planned behaviour (TPB) has been found useful in explaining the differences observed in the individuals' behaviour through exploring their social norms (SN), attitudes (AT) and perceived behavioural control (PBC) relevant to that behaviour. In this study a series of questions were designed in the survey each comprised different parameters to explore the social norms, attitudes and perceived behavioural control of respondents towards their PTW riding intentions and behaviour. The collected data would then provide the data entry to model supposed to be developed in chapter 8 in the framework of the TPB to explore the riding behaviour of novice riders. This chapter provided an insight into the social norms, attitudes and perceived behavioural control of respondents before contributing them in a model at the next chapter to explore novice riders riding behaviour.

In the context of social norms, five different parameters were explored in the survey with the intention to explore the importance of social norms in motivating novice riders to ride a PTW. It was found that almost 40 percent of respondents were encouraged to ride PTW by their friends or colleagues or by someone in the family who rides a PTW; reflecting the impact of positive social norms in motivating individuals to ride a PTW. Analysing the gender of respondents revealed that greater proportion of females regarded being encouraged by someone in the family to ride a PTW as important motivator to ride a PTW than males. In addition, analysing the residential location of respondents revealed that those who lived in non-metropolitan area were more likely to be motivated to ride a PTW by someone in the family who rides than those who lived in the Melbourne metropolitan area.

Next the parameter of "being a pillion passenger" was regarded as important only by 21.2 percent of respondents. However, almost 50 percent of females considered it as important as opposed to 11 percent for males. This might reflect that females' fear of riding was broken more than males when they had experienced riding as a pillion.

In the context of attitudes, a series of questions comprised different parameters were designed in the survey to explore novice riders' riding enjoyment, importance of different parameters to NOT ride PTW in a day or in the future, their safety perception and their attraction to take risky behaviours.

It is found that all the parameters exploring the novice riders' enjoyment were regarded important by more than half of the respondents. Across them, the parameters of "freedom of riding", "thrill of riding" and "getting away from everyday life" were regarded important by more than 85 percent of respondents that makes riding enjoyable for them. The gender, age and residential location were not found to have a significant relationship with any of these three parameters except between age and "like the freedom of riding". Older riders aged greater than 44 years old regarded this parameter more important than younger riders aged 44 years old or less, perhaps reflecting elders' greater preference to have the freedom. Whereas those respondents who aged 44 years old or less had more concern about the image and style of riding than respondents aged greater than 44 years old.

Then the importance of different parameters, which might contribute to not ride a PTW on a day for commuting trips were explored. It was found that heavy rain, must dress formally in a day and

strong windy day were the parameters regarded important by more than three quarter of respondents discouraging them to ride in a day for commuting purpose. However, those who were younger than 25 years did not consider the heavy rain parameter as important as those who were 25 years and older perhaps reflecting their greater willingness to ride a PTW even in more challenging weather condition.

Exploring different parameters, which might discourage novice riders to ride a PTW in the future revealed that only experiencing a serious PTW crash was regarded important by a great proportion of respondents (76.9%). Other parameters were regarded important by only less than 40 percent of respondents. These figures can present that the majority of novice riders intend to ride for the time of their life unless they encounter a serious PTW crash and their physical ability would be a deterrent to ride a PTW. In addition, as males had less concern about experiencing a PTW crash to not ride in the future than females, they might be more likely to keep riding a PTW in the future than females.

One question in the survey comprised different parameters designed to explore novice riders' perception of risk when encountering different riding situations. It was found that more than 80 percent of respondents regarded the following situations risky and the gender, age and residential location of respondents did not change their perception of risk:

a. "Not wearing any safety gear"
b. "Splitting between fast moving traffic",
c. "Wearing helmet and gloves as the only safety gear" and
d. "Riding in peak hour traffic".

However, Weber et al (2002), in the study that measured risk perception and risk behaviour of individuals, found that males are in overall more likely to take risky behaviours than females. Whereas in this study, in the context of the risk associated with the riding a PTW was not different between males and females.

The other two parameters explored the novice riders' perception of the risk asking about the level of the risk associated with riding a PTW in general and for them as a personal behaviour. It is found that respondents reported riding a PTW as a less risky behaviour for themselves than the general population; similar to what was reported in the literature (Mannering and Grodsky 1995; Joshi, Bellet et al. 2010) reflecting the individuals over-confident about their abilities to undertake a riding behaviour.

Some other parameters were either included in survey questionnaire to explore novice riders' attraction to undertake risky behaviours. It was found that respondents were much more likely to go to white water rafting (60%), go on holiday without booking accommodation (52%) or go bungy jumping (42%) than spend up to the limit of their credit card without thinking about how to pay back (11%).

The perceived behavioural control of respondents is explored through four questions comprised different parameters exploring the advantages of using PTW compared with a car and either public

transport as well as identifying their previous riding experiences and pattern of travel prior to obtaining their riding learner permit.

Free parking, lower fuel cost and less travel time associated with the use of PTWs were regarded the most important parameters motivated novice riders to ride a PTW in comparison with a car. For those respondents who lived in the Melbourne-metropolitan area, the free parking was found to be more important than those who resided in non-metropolitan area. Perhaps those who lived in Melbourne metropolitan area undertook more commuting trips ending at Melbourne metropolitan area where availability of parking was a big concern. Those who aged 34 years old or less regarded the lower fuel cost and less travel time more important than those who aged more than 34 years.

Exploring the advantages of using PTWs as opposed to public transport revealed that the longer travel time by PT has been the biggest concern of novice riders motivated them to ride a PTW. Next the "cannot change route by PT", "avoid crowded PT", "unreliable PT service" and "do not pay the cost of PT travel" were regarded as the biggest concerns. It was found that those who aged between 25 to 34 years were more concerned about the longer travel time, unreliability of PT and the cost of PT travel in comparison with PTW than those from other age brackets. On the basis of earlier findings, this age group also fits into the age range of respondents who were found to be more concerned about the fuel cost and travel time associated with the use of car in comparison with PTWs. Therefore, collectively those novice riders aged between 25 to 34 years old seems to be more concerned than those from other age groups about the travel time and prefer to use a mode of travel, which is more reliable and cheaper.

Analysing the riding experience of novice riders prior to obtaining their riding learner permit revealed that more than half of them (58%) had ridden a PTW at least once. That prior experience perhaps gave novice riders a sense of what riding a PTW could look like, which might have been regarded as an enjoyable activity and had probably broken their extensive fear associated with riding a PTW. It is found that males, those who aged 20 years old and more or those who lived in non-metropolitan area were more likely to have a previous rising experience.

Finally, the respondents' usage patterns of car and public transport prior to obtain their riding learner permit is explored. It is found that in Melbourne metropolitan area the use of PT was not very popular, as only 57 percent of respondents had used PT to undertake their commuting trips. This figure for residents in non-metropolitan areas residents was even much less (18.6%) representing the great unpopularity of PT use by novice riders living in non-metropolitan areas. Overall, the use of car was more common than PT across respondents. When the residential location did not have a significant relationship with the novice riders usage pattern of car, females or those respondents who aged greater than 24 years old were more likely to undertake their commuting trips by car than males or those who were 24 years old or less. When those who aged 24 years old or less were more likely to be learner driver who were not permitted to drive a car alone, it is not surprising to see that lower proportion of them were undertaking their commuting trips by car prior to obtain their riding learner permit.

Therefore, this chapter provided an initial insight into the social norms, attitudes and perceived behavioural control of respondents through exploring the parameters designed in the survey questionnaire. Next chapter will examine those parameters in a model obeying the framework of TPB to explore the riding behaviour of respondents.

Chapter 8. Stage 5: Modelling novice riders' travel behaviour

The previous chapter looked at a univariate analysis of responses to individual questions to provide a quantitative insight into each of those parameters explored. In this chapter, responses from the two surveys were used to develop a model to understand the novice riders' travel behaviour (PTW use pattern). The benefits of developing models is that they are multivariate and so they can provide richer insight into the significance of each parameter while controlling for the influence of other parameters. The parameters explored in the survey questionnaires were analysed using the theoretical framework of the Theory of Planned Behaviour (TPB) and its three categories of latent explanatory variables: social norms, attitudes and perceived behavioural control. The analysis in this chapter focused on addressing two research questions that underpin this research:

RQ1: What are novice riders' characteristics, motivations and attitudes towards the use of PTWs in Victoria?

RQ3: To what extent do differences in characteristics, attitudes and motivations of novice riders explain variations in their riding travel behaviour?

This chapter continues with a brief overview of how the theoretical framework, Theory of Planned Behaviour, was interpreted in the context of modelling novice riders' travel behaviour. This is followed by an explanation of the model development process using Structural Equation Modelling (SEM). Estimation results from a series of models are then presented and the model outcomes are discussed to identify key learnings about novice riders' travel behaviour.

8.1. Model formulation, estimation and performance

This section addresses issues associated with the formulation and estimation of the model of novice riders' travel behaviour. First, the formulation of the underlying model, grounded in the Theory of Planned Behaviour, is described. The technique used to estimate the model is then outlined before consideration is dedicated to the indicators used to measure model performance.

Then in the next section, the model development approach is outlined. The approach involved construction of initial models that included individual categories of explanatory variables before more comprehensive models were developed and tested. The initial models, which separately examined the effects of social norms (SN), attitudes (AT) and perceived behavioural control (PBC), referred to here as measurement models, were then refined through a series of iterations. In those iterations, explanatory variables that were not statistically significant were deleted and different correlations between explanatory variables were examined. This led to the construction of the final behavioural model that

included all statistically significant SN, AT and PBC variables and satisfied the model goodness of fit criteria.

8.1.1. Model formulation: Theory of Planned Behaviour (TPB)

The Theory of Planned Behaviour (TPB) provides a rigorous conceptual framework that has been tested and found to be a reliable model for human behaviour (Fishbein and Ajzen 1975; Ajzen and Fishbein 1980; Ajzen 1991; Armitage and Conner 2001). This theory has been widely used in different PTW studies exploring PTW riders' safety behaviour, their risk perception (Chen and Chen 2011; Yao, Wu et al. 2011; Özkan, Lajunen et al. 2012) and their travel mode choice (Chen and Chao 2011; Guillen, Ishida et al. 2013). This theory can be used to identify variances in intentional behaviour of individuals (Ajzen 1991; Notani 1998; Armitage and Conner 2001) when it is assumed that the stated intention by individuals is a highly proximal predictor of their behaviour (Armitage and Conner 2001).

Under the TPB, behaviour (the dependent variable) can be explained on the basis of three categories of explanatory variables: social norms (SN), attitudes (AT) and perceived behavioural control (PBC). Those explanatory variables influence the intention to undertake the behaviour in question and that intention then influences behaviour. The structure of the model is illustrated in Figure 8.1 (Ajzen 1991).

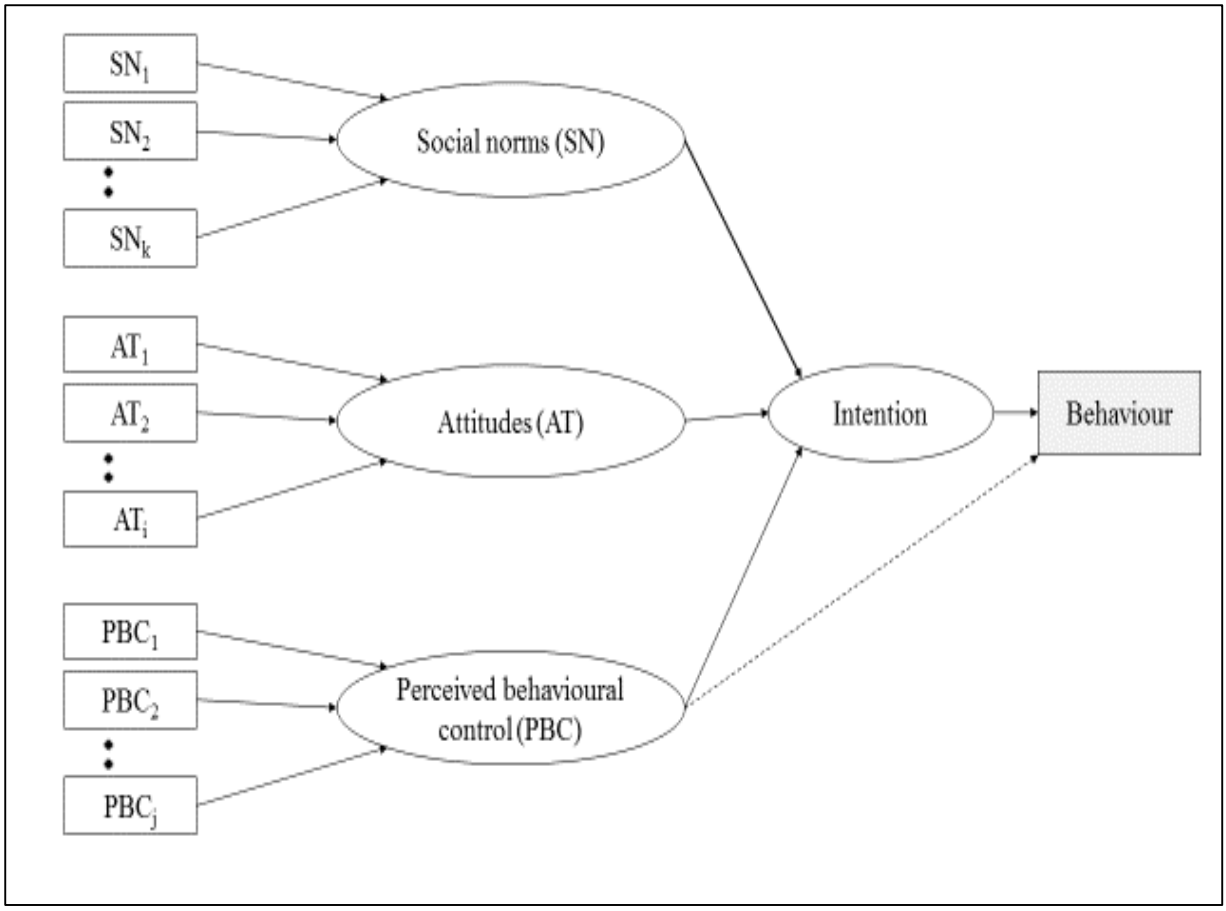


Figure 8.1. Theory of Planned Behaviour (Ajzen 1991)

The categories of explanatory variables included in the model are interpreted as below:

- Social Norms (SN):
  reflects the perceived social pressure and the influence of the common culture to undertake a specific behaviour by an individaul (Ajzen 1991). SN could reflect each person's feeling of the extent of social aggreement to undertake a behaviour (Schwartz and Tessler 1972; Pomazal and Jaccard 1976; Gorsuch and Ortberg 1983).
- Attitudes (AT):
  reflects the degree of favourability and attitudinal perception to peform a behaviour by an individual, AT explored the psychological parameters of individual that influence the behaviour (Atkinson 1964).
- Perceived Behaviour Control (PBC):
  reflects the expectancy of behaviour by an individual and the perceived ease or difficulty and confidence in performing the behaviour and the relative advantages of performing the task (Atkinson 1964; Ajzen 1991; Bamberg, Ajzen et al. 2003).

As SN, AT, PBC are not directly observable, they are referred to as latent variables in the model. The values of those variables are inferred from the responses to the questions about self-reported behaviours and attitudes and are analysed in the statistical modelling. Figure 8.1 illustrates the range of explanatory variables used to capture the effects of the three latent variables (SN, AT, PBC). Figure 8.1 shows that a total of 'k' variables being used to capture SN, 'i' variables used to capture AT and 'j' variables used to capture PBC. In this study the survey undertaken explored a range variables listed in Table 8.1 (each entry reflects a statement or variable that appeared on the questionnaire) to explore SN, AT and PBC of respondents. These variables replace SN_1 to SN_5, AT_1 to AT_{34} and PBC_1 to PBC_{18} in the model.

Table 8.1. Survey questions that explored latent variables for SN, AT and PBC

Social Norms (SN)	Attitudes (AT)	Perceived Behavioural Control (PBC)
Importance of … in motivating people to ride • A friend/colleague encouraged you • Family members ride • Being a pillion passenger • Being encouraged by a family member • Need to ride for your job	Importance of … to making riding enjoyable • Like the freedom of riding • Enjoy the thrill of riding • Get away from everyday life • Being exposed to sounds and smells when riding • Like the image/style Importance of … to **not** riding a PTW • Heavy rain • Cold day • Unfamiliar route • Strong wind • Hot day • Going to gym • Long trip • Must dress formally Importance of … to stopping PTW riding in the future • Getting divorced • Serious PTW crash • Getting married • Changing home location • Attitudes of family members • Purchasing a car • Changing type of job • Better access to PT • Attitudes of friends • Becoming a parent • Changing work location The level of risk associated with … • Riding in peak hour traffic • Not wearing any safety gear • Wearing a helmet and gloves as only safety gear • Splitting (riding between) between fast moving traffic • Riding in general • Riding for you personally The likelihood of … • Going bungy jumping • Going white-water rafting • Going on holiday without booking accommodation • Spending credit card limit without thinking about repayment	Importance of … to riding a PTW compared with driving a car • Lower fuel cost • Less travel time • Free parking • Less toll charge • Lower maintenance costs Importance of … to riding a PTW compared with using PT • Do not pay the cost of PT travel • Unreliable PT service • PT trip time is longer • PT stop is too far • Dislike PT • Avoid crowded PT • Can change route Usage pattern of … prior to obtaining riding learner permit • PT • Car Previous riding experience Number of … owned. • Cars • PTW Time car driving permit was issued prior to obtaining riding learner permit

8.1.2. Model estimation: Structural Equation Modelling (SEM)

Structural Equation Modelling (SEM) has been widely used to estimate models formulated on the basis of TPB (Van Den Putte and Hoogstraaten 1997; Golob 2003; Lee, Jin et al. 2009; Chen and Chen 2011; Bachani, Tran et al. 2012). The SEM approach explores latent variables by incorporating observed (measurable) variables (Ullman 2001; Schreiber, Stage et al. 2006) and it can be used to determine the statistical significance of relationships within in the model. Therefore, the SEM approach was employed in this study to estimate novice riders' travel behaviour.

However, the structural equation model, like all statistical models, requires sufficient data to generate reliable variable estimates. It is suggested that between 5 and 20 cases are required for each variable in the model to obtain reliable estimates (Kline 2005). Schreiber (2006) reviewed other researchers work (e.g. (Loadman, Freeman et al. 1999)) and reported that 10 cases per estimated variable is the consensus in the literature guiding the required sample size. In addition, it is recommended that the sample size not to be less than 100 even if the proportion of the number of cases per variable is satisfied. A sample size greater than 100 and up to 200 numbers is considered a medium sample size (Kline 2005).

In this study to achieve a viable sample size and ensure a robust model, all responses were analysed collectively, specifically with grouping of:

- Both recruitment populations:
  Target Group 1 (TG1) and Target Group 2 (TG2)
- All commuting trips:
  Trips to work and study

Grouped together, the sample size of 240 participants was obtained. According to the number of participants obtained, the criteria to have sufficient number of cases for each variable in the model is satisfied as discussed in more detail for each model developed.

8.1.3. Model performance: measuring goodness of fit criterion

Goodness of fit describes how well a model fits to the data. Measures of goodness of fit typically summarise the extent of discrepancy between the measured values and the values obtained from the model. These values differ from the R-squared discussed later in this chapter, which presents the model power to explain the variations in the dependent variable (Arbuckle 2011; Pallant and Tennant 2012). For instance, there might be a model that fits very well to the data but has a poor capacity to explain variations in the dependent variable. Goodness of fit has been an important criterion, which needs to be satisfied to ensure the reliability of the structural equation model (Ullman 2001; Schreiber, Stage et al. 2006). Different goodness of fit indices are reported in the literature and it is recommended that a number of indices be considered to gauge model goodness of fit (Crowley and Fan 1997; 1999).

Hooper et al. (2008) identified that it is important to report the chi-square value and its p value while including other indices in the study. Suitable indices identified in the literature include: the adjusted goodness of fit statistics (AGFI), root mean square error of approximation (RMSEA) and comparative fit index (CFI) indices (Bentler and Bonnet 1980; Joreskog and Sorbom 1993; MacCallum, Browne et al. 1996; Fan, Thompson et al. 1999; Diamantopoulos and Siguaw 2000; Byrne 2001; McDonald and Ho 2002; Bamberg, Ajzen et al. 2003; Kline 2005; Sharma, Mukherjee et al. 2005; Schreiber, Stage et al. 2006; Hooper, Coughlan et al. 2008; Pallant and Tennant 2012). These three were used in this study in conjunction with the model chi-square value to assess the model goodness of fit.

AGFI and RMSEA indices are classified as absolute fit indices representing the extent the variations in the sample covariance matrix is accounted for by the model (Joreskog and Sorbom 1993; McDonald and Ho 2002). Equations 8.1 and 8.3 respectively detail how the AGFI and RMSEA are calculated (Taylor 2008).

$$\mathrm{AGFI} = 1 - \frac{\mathrm{P}^*}{\mathrm{df}}\,(1 - \mathrm{GFI}) \qquad \text{(Equation 8.1)}$$

Where P* = P (P+1)/2, GFI is calculated as

$$\mathrm{GFI} = 1 - \frac{\mathrm{V_{residual}}}{\mathrm{V_{total}}} \qquad \text{(Equation 8.2)}$$

Here df stands for the degree of freedom of the model

P is the number of variables

$V_{residual}$ = residual variance in covariance matrix (the variance that can't be explained in the model)

V_{total} = total variance in the covariance matrix

$$\mathrm{RMSEA} = \sqrt{\frac{\max(X^2 - df, 0)}{\mathrm{df(N-1)}}} \qquad \text{(Equation 8.3)}$$

X^2 is the model chi-square value

N is the sample size

CFI is classified as an incremental indice where the level of the goodness of fit of the model is verified by comparing the covariance matrix of the baseline model with the proposed model (McDonald and Ho 2002; Lei and Wu 2007). The base model assumes no correlation between observed variables in the model and the CFI is calculated using equation 8.4 (Taylor 2008).

$$CFI = 1 - \frac{\max(X^2 - df, 0)_{\ proposed\ model}}{\max(X^2 - df, 0)_{\ base\ model}}$$ (Equation 8.4)

The chi-square value estimates the difference between observed values and expected values obtained by the model using Equation 8.5

$$X^2 = \sum \frac{(Observed\ values - Expected\ values)^2}{Expected\ values}$$ (Equation 8.5)

The minimum or maximum threshold for adequate goodness of fit indices is presented in Table 8.2.

Table 8.2. Thresholds for adequate goodness of fit (Schreiber, Stage et al. 2006; Hooper, Coughlan et al. 2008)

Index	Rule
Chi-square	P value greater than 0.05
CFI	Greater than or equal to 0.95
GFI, AGFI	Greater than or equal to 0.95
RMSEA	Smaller than 0.08

8.2. Model development approach

The data used in this study has been weighted considering the gender, residential location and age group of novice rider as described and detailed in chapter 6. The weightings enable the findings to be generalised beyond the study participants to represent the broader PTW novice rider populations' travel behaviour.

To explore novice riders' travel behaviour, survey respondents reported the mode of travel they used to travel to work and/or place of study (in response to separate questions) over a week period. In the structural equation modelling, it is recommended that the behaviour studied to be a continuous variable (Pallant and Tennant 2012). Therefore, behaviour was defined as the proportion of commuting travel days when a PTW was used as the predominant mode of travel each individual (its distribution across respondents was presented in the previous chapter in Figure 7.11). This allowed analysis of PTW use between all respondents and accounted for variations in the travel commuting days across different respondents in the sample. This definition of behaviour ensured all survey responses were included in the model.

After the data were prepared, the models were developed. The Analysis of Moment Structures (AMOS) software was used to develop the SEM models (Arbuckle 2011) of novice riders' travel behaviour. The model development process involved three steps:

- Initially separate models for each latent variable (SN, AT and PBC) were developed. These are referred to as measurement models (Schreiber, Stage et al. 2006). The statistical significance of explanatory variables to explore each latent variable were examined and the measurement model that met the following criteria was selected:
    - Satisfied the sample size requirement
    - Had an adequate level of goodness of fit for the model
    - Incorporates only statistically significant variables
    - In addition to the above criteria, the model needed to pass a series of refinements to obtain the highest value of coefficient of determinations possible, which is known as R-squared, in the existing data. This value presents the model power to explain the variations in the dependent variable (here latent variable: SN, AT and PBC) (Arbuckle 2011; Pallant and Tennant 2012). It is calculated using the equation, $R^2 = \sum b_i^2 + \sum r_j^2$, in, which the b_i is the regression weight of the variable predicting the dependent variable and r_j is the correlation coefficient between each couple of variables predicting the dependent variable.
- In the next step, the measurement models were combined in the pattern following the framework of TPB. Different combinations of the explanatory variables in the measurement models were examined to ensure the combined model met the required criteria in addition to obtaining the best explanatory power as possible to explain variations in the behaviour. In the literature it is highly recommended that any development, changes or expansion to the SEM must have theoretical support, which in this study was provided by the TPB. This theoretical support contextualises the data, which is not achieved by the data modelling alone (MacCallum 1986; MacCallum, Roznowski et al. 1992).
- A final round of model refinement was undertaken to produce a model that incorporated all statistically significant variables.

In the following sections of this chapter, the models are represented as follows:

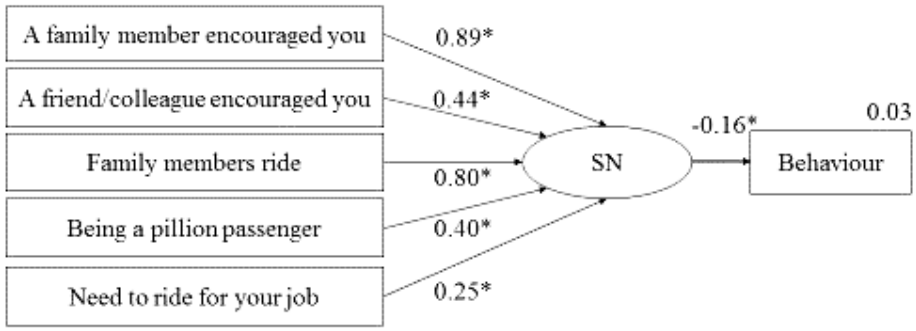
- Observed variables are represented by rectangles and latent variable are represented by ellipses.
- Values on top of the one way arrows are regression weights known as "b" in a linear regression equation (Y = a + b X). Larger values indicate greater contribution of that variable to predict the dependent variable (Arbuckle 2011; Pallant and Tennant 2012).

- Regression weight values with an asterisk on the top right corner are statistically significant at 95% level.
- Values on the top right corner of the rectangular represent the coefficient of determination known as R-squared.

8.2.1. Social norms (SN)

The first measurement model developed analysed the SN. The first SN model included all the five parameters in the survey questionnaire, which explored individuals' SN (Figure 8.2). In the initial model developed, the model R-squared was 0.03 and none of the goodness of fit criteria were satisfied. Therefore, model was refined, which involved estimating to more than 10 different model formulations to develop a model with adequate goodness of fit and best possible R-squared value achievable securing the adequate goodness of fit . The model refinement went through a systematic back and forth process between

- Examining different combinations of explanatory variables,
- Removing variables that were not statistically significant and
- Testing different combinations of the correlations between explanatory variables. Introducing all the correlations existed between the explanatory variables in the model, in most cases, would result to a non-estimable model (also known as unidentified) due to obtaining negative value of model degree of freedom. Therefore, it would be necessary to identify and introduce only the correlations between the explanatory variables, in the model, which are significant and improve model goodness of fit along with the model R-squared. To identify, which combination of correlations between explanatory variables in the model can best express variations in the data (goodness of fit) and variations in the dependent variable (R-Squared), different formulations of correlations between explanatory variables are tested. However, in the models presented in this chapter the best combination of correlations between the explanatory variables identified are not drawn to present the model developed in a simple format, being able to represent the major findings. As presenting those correlations between the explanatory variables in the model, on the far left hand side, would not add any value to the model outcome and about the relationships between the explanatory variable by SN, AT and PBC in the context of this study. However, in the background those correlations between different explanatory variables were examined to satisfy the model criteria.



Model Fit indices	Model result	Adequate threshold	Interpretation
Chi-square p	0.000	> 0.05	NOT Satisfied
CFI	0.928	> 0.95	NOT Satisfied
AGFI	0.926	> 0.95	NOT Satisfied
RMSEA	0.097	< 0.08	NOT Satisfied

* = statistically significant parameter at 95% confidence level

Model $R^2 = 0.03$

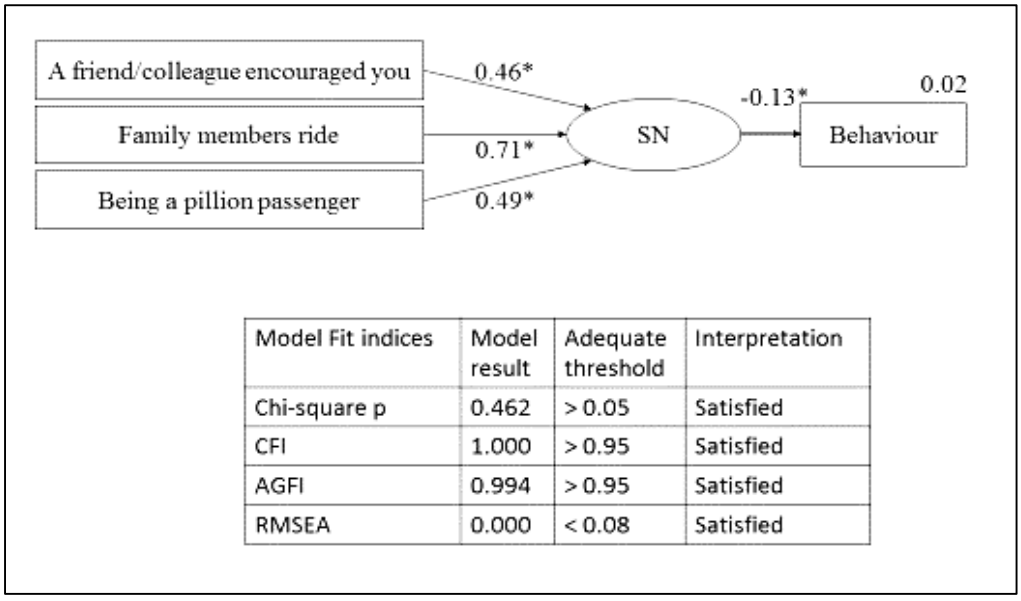
The criteria of the number of cases per variable is satisfied (240/7 is greater than 5)

Figure 8.2. Initial measurement model for SN including the behaviour of the study

The final model constructed for SN is presented in Figure 8.3. The final SN model resulted a R-squared value comparable to that in the initial model (initial SN model; 0.03; final SN model: 0.02). Consequently, the final SN model has the same capability of explaining variations across novice riders' travel behaviour as the initial model when adequate level of goodness of fit is obtained. The goodness of fit requirements were met across all four indices. The model chi-square p value (0.462) was greater than 0.05, CFI value (1.00) and AGFI value (0.994) were greater than 0.95 and the RMSEA had a value of zero, which is less than the required 0.08.

In the final SN model, three descriptive variables were found to have a statistically significant relationship ("b" stands for regression weight):

- Others' impression
  - A friend/colleague encouraged you ($b_1 = 0.46$)
  - Family members ride ($b_2 = 0.71$)
- Past experience
  - Being a pillion passenger ($b_3 = 0.49$)



Model Fit indices	Model result	Adequate threshold	Interpretation
Chi-square p	0.462	> 0.05	Satisfied
CFI	1.000	> 0.95	Satisfied
AGFI	0.994	> 0.95	Satisfied
RMSEA	0.000	< 0.08	Satisfied

* = statistically significant parameter at 95% confidence level

Model $R^2 = 0.02$

The criteria of the number of cases per variable is satisfied (240/5 is greater than 5)

Figure 8.3. Final measurement model for SN including the behaviour of the study

Positive values for the regression weights between these three parameters, which were classified as descriptive norms in Section 7.5 and the SN reflects the positive role of descriptive norms and their extent of importance to motivate novice riders to ride a PTW. However, as in this study, only one parameter from injunctive norms was studied, it is irrational to conclude that in total injunctive norms do not influence novice riders social norms. Need further study, which could be a scope for future research. The variable of "family members ride" (b_1 = 0.71) had a greater value of regression weight compared with being a pillion passenger (b_3 = 0.49) or encouragement by a friend or colleague (b_2 = 0.46). This demonstrates that of the SN variables analysed, having family members who ride PTWs had an important influence on novice riders' riding travel behaviour, more so than having friends or colleagues who rode or having experience riding as a pillion passenger.

Overall, the SN model achieved a poor R-squared value (0.02) reflecting the limited capacity of the SN variables explored in this study to explain variations across novice riders' travel behaviour. This was not entirely unexpected according to the results obtained from the analysis of social norm variables (see Chapter 7, Figure 7.12). Fewer than half the participants had identified the SN parameters as being important in their travel behaviour choices.

A few key parameters may explain the limitations of SN variables in explaining novice riders' travel behaviour in this study. First, the questions asked, both in content and structure, may not have adequately addressed the SN parameters in a way that participants related to or reflected their experiences. Secondly, variables explored might have influenced novice riders to ride a PTW but they

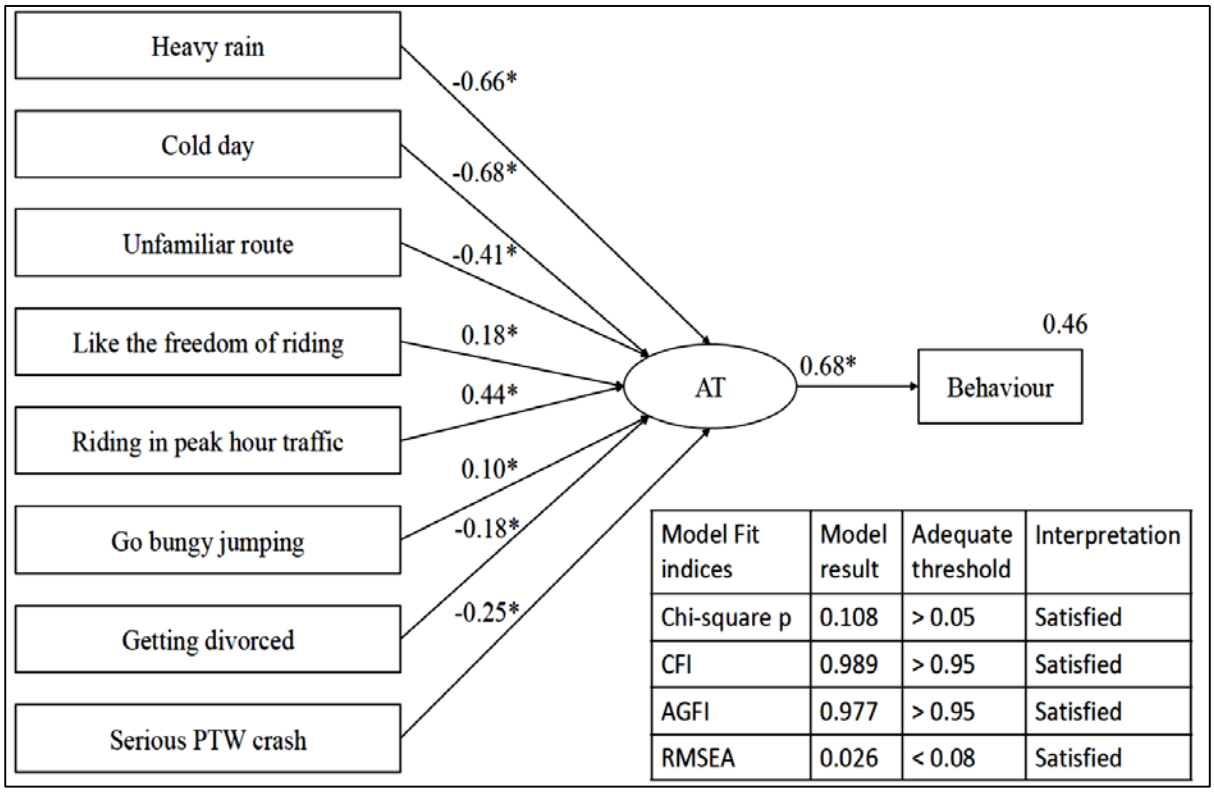
might not largely impact their use of PTWs, the behaviour studied in the model developed here. Thirdly, as discussed in Chapter 2, in a global comparison, PTW ownership and use in Australia is low compared with other countries, particularly Asian countries (e.g. China, India and Indonesia). Therefore, at the broader community level, social norm may not encourage people to ride a PTW in Australia as much as what people experience in other countries. Meanwhile, there have been other studies, which they found that SN has not been a strong indicator of individuals' intention and behaviour (Linden 2011). Recognition and discussion of the limitations related to SN highlight that further research is required to better understand the role of SN variables among novice riders in Australia.

8.2.2. Attitudes (AT)

The process for building the measurement model described for SN was repeated for the variables that explored respondents' attitudes (see Table 8.1). All 34 explanatory variables were included in the initial measurement model of AT. None of requirements of the four goodness of fit indices were met (chi-square p value: 0.00; CFI 0.774; AGFI: 0.743; RMSEA: 0.129) and the model had a poor R-squared value (0.07). Therefore, model was refined, which involved estimating to more than 40 different model formulations to develop a model with adequate goodness of fit and best R-squared value achievable.

The final model of AT (Figure 8.4) satisfied model criteria and achieved the R-squared value of 0.46, which means the model explained 46 percent of variations in riding attitude of novice riders. All four goodness of fit indices requirements were met, the model chi-square p value (0.108) was greater than 0.05, CFI value (0.989) and AGFI value (0.977) was greater than 0.95 and the RMSEA had a value of 0.026, which is less than the required 0.08. In this model, 8 variables had a statistically significant relationship with AT and riding PTW travel behaviour:

- Variables that influence **not** riding a PTW in a day
  - Heavy rain (b_1 = -0.66)
  - Cold day (b_2 = -0.68)
  - Unfamiliar route (b_3 = -0.41)
- Variables that make riding enjoyable
  - Like the freedom of riding (b_4 = 0.18)
- Variables related to potentially risky riding behaviour
  - Riding in peak hour traffic (b_5 = 0.44)
- Variables related to non-riding risk taking behaviour
  - Go bungy jumping (b_6 = 0.1)
- Variables related to life stage
  - Getting divorced (b_7 = -0.18)
- Variables related to stopping PTW riding in the future
  - Serious PTW crash (b_8 = -0.25)



Model Fit indices	Model result	Adequate threshold	Interpretation
Chi-square p	0.108	> 0.05	Satisfied
CFI	0.989	> 0.95	Satisfied
AGFI	0.977	> 0.95	Satisfied
RMSEA	0.026	< 0.08	Satisfied

* = statistically significant parameter at 95% confidence level

Model $R^2 = 0.46$

The criteria of the number of cases per variable is satisfied (240/10 is greater than 5)

Figure 8.4. Final measurement model for AT including the behaviour of the study

In the survey questionnaire, the importance of different variables discouraging respondents from riding on a commuting day were explored (listed in Table 8.1). Of the eight variables, only three variables were statistically significant: heavy rain, cold day and unfamiliar route and were negatively correlated with AT. A cold day (-0.68) and heavy rain (-0.66) had a greater influence than unfamiliar route (-0.44). While parameters including "heavy rain", "cold day", "hot day" and so on could also contribute on the PBC, in this study they were classified as AT. There are factors, which depending on the individual's perception and experiences and their living environment could contribute on the individuals' attitude or their level of confidence to perform a behaviour. Therefore, these parameters might either be classified as AT or PBC, which needs to be examined. For instance, while there are many people who might go running under the rain, there are others would not run under the rain while it is not because they cannot run in the rain or cannot control their running behaviour under those conditions. There could be two different perspectives on this issue. For some, it could be the case that they might be afraid of getting cold and slip on the wet surfaces (from the perceived behavioural control point of view); whereas for others, it can be a mental issue (personality matter) and they do not like to get wet or run in the rain at all (attitudinal matter). Therefore, parameters including "heavy rain", "cold day", "hot day", "strong wind" and so on were examined in the model. Once they were classified as AT and once were grouped as PBC parameters; to see how they fit better in the model to explain PTW riding behaviour. It was found that they can much better explain the usage pattern of PTWs if are used as parameters explaining individuals' AT than their PBC. The model, which had employed those parameters to explain individuals' PBC, achieved the R-squared value of 26 percent whereas the model, which used them to explore the AT, was able to explain 55 percent of variations in the PTW usage pattern of novice riders (as presented later in the Section 8.2.4). Therefore, they were classified as AT in this study and all the discussions through the thesis and the classification of these parameters were elaborated based on that finding.

Five parameters in the survey questionnaire explored what made riding enjoyable for respondents (see Table 8.1). Across those variables only one variable, like the freedom of riding, was statistically significant to reflect the influence of "riding enjoyment" on AT in the model. While this variable did influence the model, the regression weight associated with the "like the freedom of riding" (0.18), was to smaller extent than those variables that influenced **not** riding. This presents that the importance of parameters to not ride in a day are greater than the rider enjoyment of the riding.

A series of six statements each describing a riding situation were asked to be rated by novice riders according to their perception of how risky each situation was (listed in Table 8.1). Only one of those parameters ("riding in peak hour traffic") was found to be significant in the model with the regression weight of 0.44. This parameter found to have the greatest positive value of regression weight in the model. Perhaps reflecting that those who regarded riding in peak hour traffic as a safe behaviour, had a greater attitude towards riding a PTW than those who regarded the freedom of riding as an

important motivator to ride a PTW or were more likely to go bungy jumping as is discussed in the next paragraph.

Four parameters in the form of statements each describing a situation, examined the novice riders' attraction to take risky behaviour. Only one of those parameters ("go bungy jumping") is found to be significant in the mode, which is observed to have the least extent of influence on the novice riders AT as the regression weight calculated equalled to 0.10 lower than other values of regression weights in the model.

Significant life events and experiences were also explored in relation to attitudes and PTW use. Those variables ranged from experiencing "serious PTW crash" and "changing work location" to "purchasing a car" and "getting divorced" (listed in Table 8.1). However, only two variables in that range were statistically significant in the model: "getting divorced" and "serious PTW crash". "Getting divorced" reflects the importance of changes in life stage on the riding travel behaviour of respondents. However, "getting married" and "becoming a parent" were not found to be significant in the model.

"Serious PTW crash" explored the severity of individuals to continue riding even if they experience a physical deterrent. Those respondents who were more likely to stop riding in future in case of experiencing a serious PTW crash were less likely to ride a PTW and the negative impression of this parameter is greater than getting divorced (-0.25 versus -0.18).

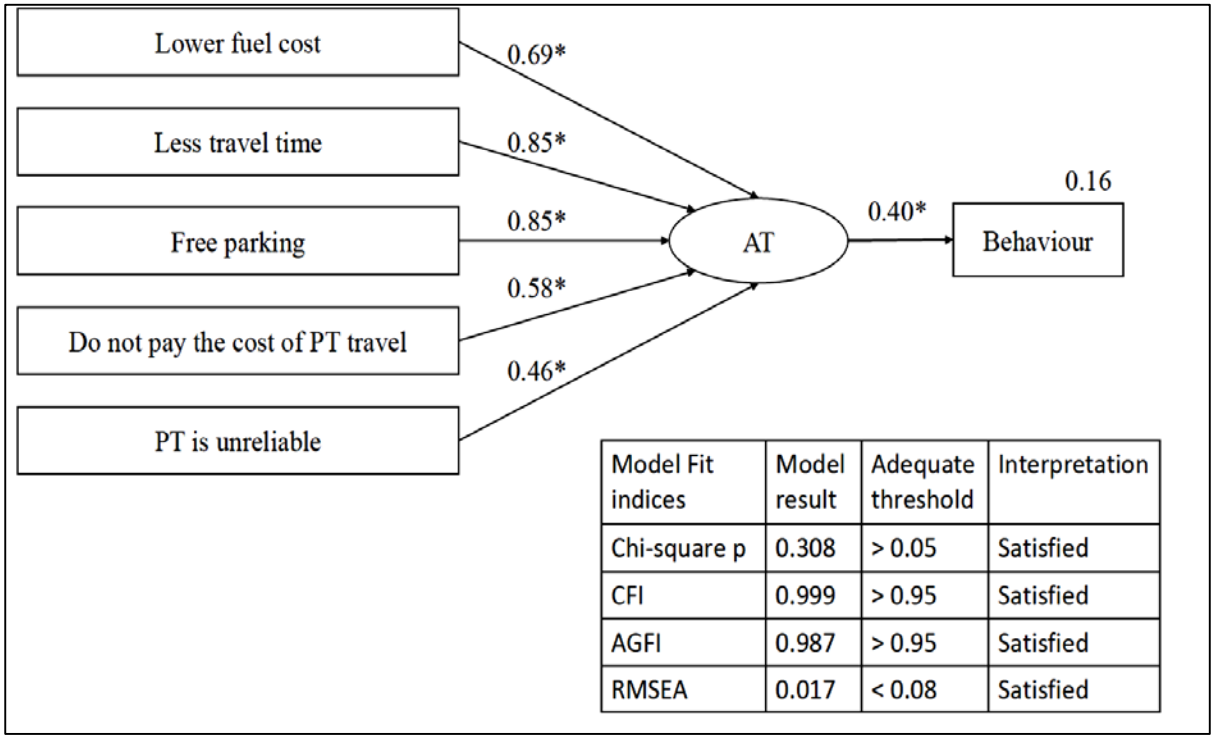
8.2.3. Perceived behavioural control (PBC)

The process for building the measurement model as described above was repeated for a third time to construct the initial measurement model of PBC, which included 18 variables (see Table 8.1). Similar to the initial models for SN and AT, PBC initial model did not satisfy goodness of fit criteria and resulted in poor R-squared (0.06). All the fit indices examined including chi-square p value (0.00), CFI value (0.692), AGFI value (0.621) and RMSEA value (0.146) were out of the satisfactory threshold. Therefore, model was refined, which involved estimating to more than 40 different model formulations to develop a model with adequate goodness of fit and best possible R-squared value.

The final model of PBC (Figure 8.5) satisfied model criteria and achieved the R-squared value of 0.16, which was greater than the initial model (0.06). The model chi-square p value (0.308) was greater than 0.05, CFI value (0.999) and AGFI value (0.987) was greater than 0.95 and the RMSEA had a value of 0.017, which is less than the required 0.08. In this model 5 of the 18 parameters had a statistically significant relationship with PBC expressing the advantages of using PTW in comparison with driving a car or using public transport (PT):

- Advantages of PTW in comparison with car
  - Lower fuel cost ($b_1 = 0.69$)
  - Less travel time ($b_2 = 0.85$)
  - Free parking ($b_3 = 0.85$)

- Advantages of PTW in comparison with public transport
  - Do not pay the cost of PT travel (b_4 = 0.58)
  - PT is unreliable (b_5 = 0.46)



Model Fit indices	Model result	Adequate threshold	Interpretation
Chi-square p	0.308	> 0.05	Satisfied
CFI	0.999	> 0.95	Satisfied
AGFI	0.987	> 0.95	Satisfied
RMSEA	0.017	< 0.08	Satisfied

* = statistically significant parameter at 95% confidence level

Model $R^2 = 0.16$

The criteria of the number of cases per variable is satisfied (240/7 is greater than 5)

Figure 8.5. Final measurement model for PBC including the behaviour of the study

The variables of “lower fuel cost”, “less travel time” and “free parking” had the greatest influence on the respondents’ PBC having the highest value of regression coefficient.

In the PT context, of the seven parameters explored, two parameters of “do not pay the cost of PT travel” and “PT is unreliable” were significant and able to reflect respondents’ perception of the advantages of using PTW in comparison with PT. However, these variables had less influence than those that compared car use on PTW riding travel behaviour.

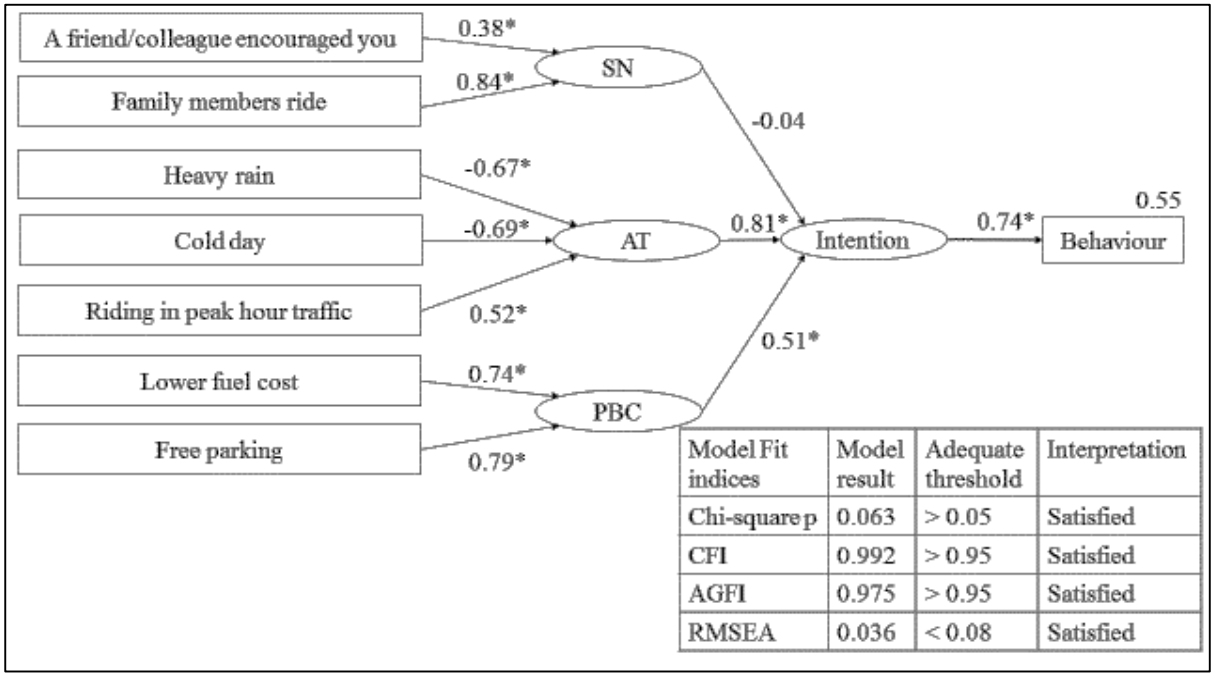
8.2.4. Developing the behavioural model

After constructing the measurement models for SN, AT and PBC, they were combined into a single model to develop the full behavioural model following the framework of the TPB. In this study, the Intention was measured in Survey 1 (Question 15), and the behaviour was measured in the Survey

2. But intention data collected has not been entered in the model as in the SEM, intention is a latent variable measured indirectly by SN, AT and PBC.

The initial behavioural model developed did not satisfy the goodness of fit criteria. All the fit indices examined including chi-square p value (0.00), CFI value (0.753), AGFI value (0.842) and RMSEA value (0.093) were out of the satisfactory thresholds. Approximately 50 more iterations to refine the behavioural model took place to develop a model with adequate goodness of fit and best possible R-squared value achievable securing the adequate goodness of fit.

The final behavioural model developed including all the SN, AT and PBC following the framework of TPB and satisfying model criteria was able to explain 55 percent of variations observed in the travel behaviour across different respondents (Figure 8.6). In this model, the SN of respondents was explored through examining the contribution of their family members and their friends/colleagues in encouraging them to ride a PTW while their past experience, "being pillion passenger", did not play a significant role and was removed. The greater value of regression weight for the variable of "family members ride" as opposed to the variable of "a friend/colleague encouraged you" (0.84 versus 0.38) reflects family members' greater influence on the riding travel behaviour of respondents than their friends/colleagues encouragement. However, overall SN was not statistically significant in the model and had a very small influence on the respondents' intention to ride a PTW according to the small and statistically insignificant value of regression weight estimated in the model (-0.04).



Model Fit indices	Model result	Adequate threshold	Interpretation
Chi-square p	0.063	> 0.05	Satisfied
CFI	0.992	> 0.95	Satisfied
AGFI	0.975	> 0.95	Satisfied
RMSEA	0.036	< 0.08	Satisfied

* = statistically significant parameter at 95% confidence level

Model $R^2 = 0.55$

The criteria of the number of cases per variable is satisfied (240/12 is greater than 5)

Figure 8.6. Final model of novice riders travel behaviour including all the SN, AT and PBC

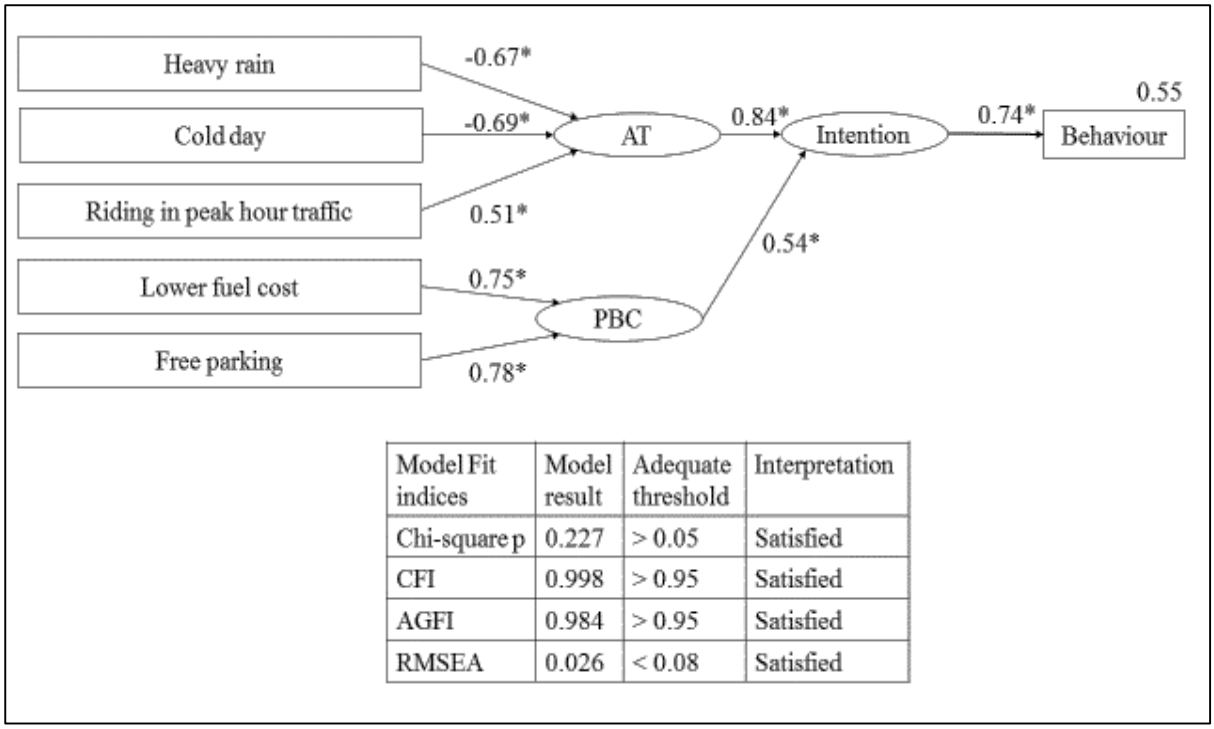
Therefore, a final round of model refinement involved estimating to more than ten different model formulations was undertaken to produce a parsimonious model, which achieved adequate explanatory power while incorporating only statistically significant variables (Figure 8.7). The final model included only AT and PBC and was able to explain the variations in respondents' riding travel behaviour to the same extent as the earlier combined model.

In this final combined model both regression weights of AT (0.84) and PBC (0.54) were very close to their values (respectively 0.81, 0.51) in the earlier combined behavioural model, which included SN. It reflects that removing SN from the model, due to obtaining similar value of R-squared as the earlier model, has not influenced the explanatory power of the model.

In this model, the AT of respondents were able to be explored only through three explanatory parameters while the earlier AT measurement model included eight explanatory parameters. The importance of potential deterrents, heavy rain and cold day and respondents' level of perceived risk about riding in peak hour traffic could estimate novice riders' AT towards riding travel behaviour. The respondents who regarded heavy rain or cold day as a less deterrent variable to ride in a day and those who did not perceive riding in peak hour traffic as much risky behaviour had a greater attitude towards riding a PTW. Therefore, they were more likely to use PTW on greater proportion of their commuting travel days. However, the risk perception of respondents about riding in peak hour traffic had slightly less impact on their attitude in comparison with the importance of heavy rain and cold day to not ride a PTW in a day (0.51 versus -0.67 and -0.69).

The PBC of respondents were represented through two explanatory variables while the PBC measurement model included five explanatory variables. The respondents' level of importance dedicated to the parameters including lower fuel cost and free parking associated with the PTW use in comparison with car could estimate their PBC towards their riding travel behaviour. Those respondents who were more concerned about their travel costs including fuel cost and parking fee were more likely to use a PTW in greater proportion of their commuting travel days. Both the fuel cost and free parking were observed to have similar influence on the respondents' PBC as their regression weights were relatively close (0.75 and 0.78).

Comparing the influence of AT and PBC on respondents intention and consequently their riding travel behaviour revealed that AT had a greater influence on the riding travel behaviour than PBC (regression weight of 0.84 in comparison with 0.54). Therefore, the attitude of respondents had the greatest role on their riding travel behaviour when the SN was found to be insignificant and the PBC had a smaller value of regression weight than AT. This reflects that the travel behaviour of respondents is more dependent on their attitudes than their concerns over travel costs and their social norm.



Model Fit indices	Model result	Adequate threshold	Interpretation
Chi-square p	0.227	> 0.05	Satisfied
CFI	0.998	> 0.95	Satisfied
AGFI	0.984	> 0.95	Satisfied
RMSEA	0.026	< 0.08	Satisfied

* = statistically significant parameter at 95% confidence level

Model $R^2 = 0.55$

The criteria of the number of cases per variable is satisfied (240/9 is greater than 5)

Figure 8.7. Final model of novice riders' riding travel behaviour

8.3. Discussion

In this chapter, the research involved developing a model consistent with the framework of TPB to examine the strength of the relationship between novice riders' SN, AT and PBC with their commuting use of a PTW. Developing a SEM based on the framework of TPB provided a rigorous approach for understanding the riding travel behaviour of novice riders. SEM provided the capacity to identify significant relationships between novice riders' SN, AT and PBC and their riding travel behaviour.

The in-depth modelling conducted and discussed in this chapter has addressed the first and third research questions. The final novice riders' behavioural model, which included all the SN, AT and PBC presented that unlike AT and PBC, novice riders' SN were insignificant and had a little impact on their riding travel behaviour (usage pattern of PTW).

In that model, it was found that being encouraged by friends/colleagues or having PTW riders in the family were significant parameters that had motivated novice riders to ride a PTW and explain their SN. Between them having a family member was found to have a greater role than friends/colleagues in motivating novice riders to ride a PTW, but overall the SN was not significant in novice riders' riding travel behaviour. It could have happened due to couple of reasons. First, the

questions asked, both in content and structure, may not have adequately addressed the SN parameters in a way that participants related to or reflected their experiences. Secondly, variables explored might have influenced novice riders to ride a PTW but they might not impact their commuting use of PTWs, the behaviour studied in the model developed here. Thirdly, as discussed in Chapter 2, in a global comparison, PTW ownership and use in Australia is low compared with other countries, particularly countries like China, India and Indonesia. Therefore, at the broader community level, social norm may not encourage people to use a PTW in Australia as much as what people experience in other countries.

When the SN was not significant in the model of novice riders' riding travel behaviour, which included all the SN, AT and PBC variables, it was removed from the model through a final round of model refinement.

In the final model, novice riders' AT is found to be the most significant parameter having the greatest impact on the novice riders' riding travel behaviour (usage pattern of PTWs). The novice riders' AT itself is found to be explainable through exploring three parameters including:

- Importance of heavy rain in discouraging novice riders to ride on a day
- Importance of cold day in discouraging novice riders to ride on a day
- Novice riders' perception of risk associated with riding in peak hour traffic

Those novice riders who regarded heavy rain and cold day as a less deterrent parameter to ride on a day and considered riding in peak hour traffic to be safer were more likely to undertake their commuting trips by PTW than using other modes of transport.

Finally, the PBC had influence on novice riders' riding travel behaviour as was significant in the final novice riders' riding travel behaviour model. On the basis of that model, the parameters, which could explain novice riders' PBC included the extent that novice riders regarded lower fuel cost and free parking associated with the use of PTW, important to ride a PTW than a car.

Those novice riders who were more concerned about their travel costs comprising fuel cost and parking fee, were more likely to undertake their commuting trips by PTW than using other modes of transport.

The final model of novice riders' riding travel behaviour was able to explain 55 percent of variations in riding travel behaviour of novice riders. Therefore, there is scope for future research to identify other parameters associated with novice riders' SN, AT and PBC, which have not been explored in this study. Next chapter summarises this research findings and the gaps identified directing the future research.

Chapter 9. Conclusions and research directions

This chapter reviews the results from this research to identify its key contributions to the field. Future research directions are also identified.

9.1. Research aim and questions

Globally the rapid growth of motorization and private vehicle use is creating increasing concerns that impact urban mobility (Tollman and Rose 2008; United Nations, Bureau International des Expositions et al. 2011). While considerable research attention has been focusing on the use of private car in urban areas (Sperling and Gordon 2010), relatively little research has been conducted on the use of Powered-Two-Wheel (PTW) vehicles (Victoria Government 2012). Particularly when there has been a rapid increase in the sales of road motorcycles in recent years (17.3% between 2010 and 2014) (FCAI 2014), which are more likely to be used for utilitarian transport than ATVs and off-road motorcycles, whereas for the same period of time the rate of sale of passenger cars decreased by almost 10 percent (ABS 2015). It emphasizes the need for paying greater attention to PTWs use. Increased utilitarian use of PTWs (Haworth 2012), in coincidence with growth in PTW sales and decrease in car sales, might be an underlying reason for obtaining a motorcycle riding permit. The major areas of PTW research attention, internationally and particularly in Australia, has been largely in the context of their safety (Christie and Harrison 2001; Harrison and Christie 2005; Ibrahim and Sukardi 2011; Barbani, Pierini et al. 2012; French, Gumus et al. 2012; Otte, Jansch et al. 2012; Crundall, van Loon et al. 2013; Barbani, Baldanzini et al. 2014) and to smaller extent to their environmental impacts (Chiou, Wen et al. 2009) and riders' protective clothes (Pierini 2005; Pierini 2009). The safety of PTW riders, which has attracted the attention of the majority of PTW researches, is a function of PTW use; yet limited research has been focused on exploring PTW use. The increase in PTW sales in coincidence with their increased utilitarian use would have safety implications. Therefore, understanding the underlying reasons of PTW use and their pattern of use would be valuable from the safety perspective.

This research aimed to generate new knowledge and insights about novice riders' intentions and their travel behaviour (usage pattern of PTWs). The behaviour studied explored the commuter use of PTW quantified in the form of the proportion of commuting travel days when a PTW was used as the predominant mode of travel by novice riders.

However, to study about novice riders, many studies sought to engage PTW riders in travel related research, struggled to recruit participants. Therefore, an explicit dimension (scope) of this research was to examine the effectiveness of strategies designed to maximise the recruitment of study participants. Therefore, the three research questions (RQ) were developed to address the aim and the scope of the study:

RQ1: What are novice riders' characteristics, motivations and attitudes towards ownership and use of PTWs in Victoria?

RQ2: How can novice riders be engaged (e.g. examining different recruitment strategies) in surveys given the low response rates in previous studies?

RQ3: To what extent do differences in characteristics, attitudes and motivations of novice riders explain variations in their riding travel behaviour?

9.2. Research questions, approaches undertaken and findings

In this section, the approach employed to answer each research question and findings associated with each research question are discussed in detail.

9.2.1. RQ1: What are novice riders' characteristics, motivations and attitudes towards ownership and use of PTWs in Victoria?

Reviewing the literature identified the limitation of knowledge about novice riders' travel behaviour (usage pattern of PTWs) particularly in the Australian context. Therefore, in this research, the first step was to focus on analysing existing PTW data followed by the next step as undertaking focus groups and interviews.

The existing PTW data only included some socio-demographic characteristics of PTW riders and some trip details and it provided no details about PTW riders' attitudinal characteristics, perceptions and motivations. Yet the analysis provided important initial insights into the parameters contributing to PTW ownership and use in local context (Victoria). However, that insight was obtained from the broader population of PTW riders, but the parameters identified have been explored with more detail in this research, in the context of novice riders.

Analysing exiting PTW data revealed that PTW riders' gender, age, residential location, income, pattern of car ownership and household structure could contribute to their PTW ownership. Males, aged 25-54 years old, non-metropolitan residents, who owned two or more passenger cars and lived in a household comprising the structure of "couple with kids", were more likely to own a PTW. In the context of PTW use, males, individuals aged 25-54 years old or non-metropolitan residents were less likely to use a PTW than a car for commuting trips.

However, efforts to develop models using this data found they had limited capacity to explain the variability in the PTW ownership and use pattern, due to not including any details about PTW riders' attitudinal characteristics and motivations to ride a PTW. To address this concern, at the next step undertaking focus groups and interviews were planned to provide qualitative insights into attitudes, motivations and intentions of novice riders to ride a PTW. This was an important next step in the

research because the insights from focus groups and interviews helped to shape the survey undertaken in this study.

The focus groups and interviews were undertaken from novice riders who had recently taken up riding, owned a PTW and predominantly rode for utilitarian use. The thematic analysis of collected qualitative data revealed that there was a combination of novice riders' social norms (SN), attitudes (AT) and perceived behavioural control (PBC) that motivated them to ride a PTW and consequently influenced their pattern of PTW use:

- Social norms:

  Most novice riders were encouraged by a family member, relatives or friends to ride a PTW (particularly for females than males), reflecting the role of social norms on motivating people to ride a PTW.

- Attitudes:

  The pleasure of riding mentioned by many novice riders and a range of attitudinal characteristics were found to be important motivators to ride. Many said they like riding, feel "alive" and "energized" when riding, enjoy the "thrill" of riding and close contact with the "environment", riding is "fun" for them and they like the "image/style" of riding"

- Perceived behavioural control:

  The relative advantages of riding a PTW in comparison with other modes of transport and novice riders' prior riding experience found to be important motivators to ride a PTW. These parameters, through the lens of Theory of Planned Behaviour, could be regarded as the impact of perceived behavioural control. The relative advantage of PTW in comparison with car or PT can be represented by:

  - lower purchase and running costs of PTWs than for cars,
  - free or reduced toll costs for PTWs than for cars,
  - and free parking for PTWs
  - less travel time by PTWs than for cars
  - greater reliability of PTW as a mode of travel than PT,
  - less travel time by PTW than car,
  - being able to change route by PTW while PT routes are fixed,
  - and avoid the crowded PT when travelling by PTW (was a bigger concern for females than males)

Drawing on the parameters identified in the PTW literature in combination with the new insights obtained into novice riders' attitudes and motivations (gained from the rich qualitative data generated by the focus groups and interviews) surveys were designed. The surveys were designed to capture all those parameters in a quantitative format making it possible to explore the novice riders' social norms, attitudes and perceived behavioural control and their PTW usage pattern.

Then, analysing quantitative data collected from surveys undertaken from novice riders revealed that PTW usage pattern varied considerably across them as it is found that 56 percent of respondents had never used PTW on commuting trips whereas for almost a quarter of them (21.2%), PTW was the predominate mode to undertake commuting trips. The survey data revealed that the majority of respondents (99.6%) had some form of car driving permit and 82.4 percent of them owned a car. Therefore, obtaining PTWs by respondents for commuting trips could reflect either that there has been a shift into the PTW use or PTW has been the additional option for travel.

Analysing the gender and age of respondents found that they had significant relationship with the usage pattern of PTWs. Males or younger riders were more likely to undertake their commuting trips by PTW, whereas the likelihood of undertaking commuting trips by PTW decreased gradually with increasing age and noticeably if the rider was a female. This perhaps could be as a consequence of changes happening in the novice riders' intentions, attitudes and perception towards the use of a PTW by their age and gender. In this study, novice riders' social norms, attitudes and perceived behavioural control towards riding a PTW were investigated using the parameters explored in the survey questionnaires. These findings would help to identify the parameters influencing novice riders' PTW usage pattern. The Structural Equation Models for each of the social norms, attitudes and perceived behavioural control variables were developed, then they were combined into a single model to explain novice riders' PTW usage pattern. Next, the survey results are discussed.

9.2.1.1. Social norms (SN)

Factors of "a friend/colleague encouraged you" and "family members ride" were significant in the novice riders travel behaviour model to explain the individuals' social norms. However, having a family member who rides a PTW played a greater role than being encouraged by friend/colleagues on novice riders to ride a PTW. Because the regression weight associated with the impact of "family members ride" was more than twice for "a friend/colleague encourage you" (0.84 versus 0.38).

Analysing the residential location of respondents revealed that those who lived in a non-metropolitan area were more likely to be motivated to ride a PTW by someone in the family who riders than those who lived in the Melbourne metropolitan area.

Overall, the social norms was not significant in the model exploring variations in the novice riders' PTW usage pattern. Perhaps as the social norms explored in this study examined the role of different parameters in motivating people to ride a PTW rather than exploring parameters, which contribute to the commuting usage pattern of PTW. However, there are many studies in the literature where social norms were relatively weak to explain intentions and behaviour (Farley, Lehmann et al. 1981; Terry and Hogg 1996; Terry, Hogg et al. 1999; Armitage and Conner 2001; Johnston and White 2004) including researches, which studied the behaviour of road users (Rutter, Quine et al. 1995).

Similarly, Watson et al. (2007) in their research to explore the role of psychological and social parameters on motorcycle rider intention and behaviour, found that social norms had relatively poor influence on the behaviour.

9.2.1.2. Attitudes (AT)

In the context of attitudes, a series of questions in the survey explored novice riders' enjoyment of riding, importance of different parameters to NOT ride in a day or in the future, novice riders' safety perception and their attraction to take risky behaviours. In the literature, it is reported that motorcyclists' attitude influences their riding behaviour. The "thrill of riding" was reported influencing on the motorcyclists' risky riding behaviour (e.g. Watson et al, 2007). In this study, across the attitudinal parameters studies to predict novice riders' PTW usage pattern, a couple of them were found to be significant, which included the importance of "heavy rain" and "cold day" to NOT ride in a day and the extent that novice riders considered "riding in peak hour traffic" safe.

Apart from the "heavy rain", which was regarded as important by the greatest proportion of respondents (82%), the parameters including "must dress formally", "strong windy day" and "long trip" were regarded as important to NOT ride in a day by greater proportion of respondents than the "cold day" (respectively 78%, 77% and 52% versus 44%). But in the novice riders' travel behaviour model, the contribution of "heavy rain" and "cold day" along with "riding in peak hour traffic" better explained novice riders' attitudes towards the commuting use of PTWs than other parameters. "Riding in peak hour traffic", which came up as significant parameter in the model to explain novice riders' attitudes was regarded risky by the majority of respondents (80.7%). These findings are consistent with findings in the literature. When the novice riders' perception of the risk associated with riding in peak hour traffic is found significant affecting their PTW usage pattern, it was reported in the literature that motorcycle riders are more likely to be risk seekers than non-riders. And, those motorcyclist who were more likely to be thrill-seekers, had a greater contribution on performing risky behaviours while riding (Zuckerman, Kolin et al. 1964; Hartman and Rawson 1992; Horvath and Zuckerman 1993; Zuckerman 1994), which could either reflect their greater likelihood of riding a PTW even in peak hour traffic or under heavy rain.

Undertaking statistical test revealed that those who were younger than 25 years did not consider the "heavy rain" parameter as important as those who were 25 years and older; perhaps reflecting their greater likelihood to ride a PTW even in more challenging weather condition. This finding is consistent with what was reported in the literature that younger people are more likely to take risks than people older in age (Fitzgerald, Harrison et al. 1998; Fergusson, Swain-Campbell et al. 2003; Stradling, Meadows et al. 2004).

Comparing these parameters in explaining novice riders attitudes revealed that "heavy rain" and "cold day" had more influence than "riding in peak hour traffic" on the novice riders' attitudes as

their regression weight were -0.67 and -0.69, higher than for “riding in peak hour traffic”, which was 0.51.

9.2.1.3. Perceived behavioural control (PBC)

In the literature, the perceived behavioural control of respondents is reported playing significant role towards their behaviour including speed driving (Parker, Manstead et al. 1992), safe or unsafe PTW riding behaviour (Watson, Tunnicliff et al. 2007) and wearing helmet (Quine, Rutter et al. 1998).

In this study, PBC of respondents was explored through four questions comprised different parameters investigating the advantages of using PTW compared with a car and public transport, novice riders’ previous riding experience and their pattern of travel prior to obtaining their riding learner permit.

Across all those parameters only two parameters of “lower fuel cost” and “free parking” associated with the advantages of PTW use in comparison with a car were found to be significant in the model. Therefore, novice riders’ priority given to the “lower fuel cost” and “free parking” associated with the use of PTWs overcomes the parameters explored in the survey. “Lower fuel cost” and “free parking” were regarded as important by more than 60 percent of respondents and both revealed similar influence on the perceived behavioural control of novice riders having relatively close regression weights (0.75 versus 0.78). Undertaking statistical tests revealed that respondents who lived in the Melbourne-metropolitan area, considered “free parking” more important than those who resided in non-metropolitan area (77.7% versus 49.2%). Perhaps those who lived in Melbourne metropolitan area undertook more commuting trips to the Melbourne CBD where parking costs are higher. Greater proportion of riders under 34 years of age regarded “lower fuel cost” as important than those aged over 34 years (81.1% versus 49.2%) reflecting their greater concern over travel costs.

After exploring the social norms, attitudes and perceived behavioural control, next in Section 9.2.3, their contribution in the behavioural model is discussed.

9.2.2. RQ2: How can novice riders be engaged (e.g. examining different recruitment strategies) in surveys given the low response rates in previous studies?

As part of undertaking the surveys a range of recruitment strategies were explored including different incentive structures and different options to facilitate response (hard copy survey, web link and a scan-able QR code). That component of the research has resulted in useful findings, which can be used to encourage novice riders to participate in future surveys.

Analysing the response rates obtained in this study revealed that females, older riders or those who lived in the Melbourne metropolitan area were more likely to participate in the PTW survey than others. Therefore, gender split, age distribution and residential location of individuals in the target

population can be an indicator of the number of survey invitations required to be distributed to achieve the intended number of respondents. For instance a researcher dealing with a target group comprising young riders, needs to distribute greater number of survey than when dealing with a target group with a greater proportion of older riders to obtain the intended number of responses.

Changes in the incentive values between TG1 (10 x $50) and TG2 (1 x $500) did not reveal increase in the response rate when there was a big time lag in recruitment of TG2, which was largely out of our control. But considering the big time lag in recruitment of TG2 (in average ten months for TG2 versus five months for TG1), if we did not have changed the incentive values we could result to a much lower value of response rate than what we have achieved now.

In the context of reminders, it is found that their impact is largely dependent to the time they are sent from the first contact. Findings of this research confirmed the literature recommendation that adequate time to distribute the first reminder is within two weeks from the time the survey was distributed.

Overall, there did not appear to be any strong preference towards the method of contact (hardcopy or postcard). However, females or older riders (particularly greater than 44 years old) were more likely to return the hard copy than complete the survey on-line. This might reflect that sending survey questionnaires in the form of hard copy rather than a postcard, to females or older riders could increase their likelihood to respond to a survey.

In addition, the use of QR code could also be useful as there were respondents who used the QR code to access the survey web link, more likely to be male or aged between 20 to 44 years old. In this context, Summer Gould, director of customer service for Santee, California, found that QR codes fare well with people under 44 years old (Elise Hacking 2012) but unlike what we found in this study, he found that females were more likely to use QR code than males.

9.2.3. RQ3: To what extent do differences in characteristics, attitudes and motivations of novice riders explain variations in their riding travel behaviour?

In the novice riders' travel behaviour model that explored the novice riders' usage pattern of PTWs, the social norms was removed as it was found to be insignificant and did not influence novice riders' usage pattern of PTW. But unlike the social norms, the attitudes and perceived behavioural control of respondents were significant in the model. However, novice riders' attitudes had more impact on their usage pattern of PTWs than their perceived behavioural control as the regression weight associated with attitudes was greater than for perceived behavioural control (0.084 and 0.54). Similarly, in the study conducted by Watson et al. (2007) exploring the riding risky behaviour of motorcyclists, it was found that riders AT had the strongest predictor role. Also it was found that PTW riders' attitude had the strongest impact on their speeding intention (Chen and Chen 2011).

When the attitudes of respondents had the greatest influence on their commuting usage pattern of PTW in this study, the SN was found to be insignificant and the PBC had a smaller value of regression weight than attitudes. This reflects that the travel behaviour of respondents is more dependent on their attitudes than their concerns over travel costs or the influence of social norms. The best model of novice riders' travel behaviour was able to explain 55 percent of the variations observed in the usage pattern of PTWs across different respondents. In the literature, TPB models are accounted to explain variance in the actual behaviour between 16% to 42% (Godin and Kok 1996; Sutton 1998; Sheeran and Orbell 1999) with 26% for PTW riders (predicting their stop behaviour at red light) (Jou, Hensher et al. 2011), reflecting good result (55%) have been achieved in this study.

9.3. Summarised research findings and Contributions to Knowledge

The key findings of this research, which contributes to knowledge could be divided into two main disciplines:

- Increase the number of participants (insights from testing different recruitment approaches)
- Explore commuter use of PTWs by novice riders (Insights from novice riders' social norms, attitudes and perceived behavioural control and modelling novice riders' commuter usage pattern of PTWs)

9.3.1. Increase in number of participants (addressing the second research question)

Many studies, which have sought to engage PTW riders in travel related research, have struggled to recruit participants. Across those studies, incentives and reminders were the predominant techniques to encourage participants. But there has been little systematic evaluation of the effectiveness of different strategies on the recruitment of participants in PTW rider studies. In this research, different recruitment approaches were examined across different target groups. Findings provided insights into the range of techniques, which can be employed to increase the number of participants:

- One high value incentive may attract more respondents than many low value incentives (e.g. more respondents to incentive for 1 x $500 than 10 x $50). This finding is supported by the literature reported that the value of incentive is more important than the number of incentives (Gneezy, Meier et al. 2011) and higher incentive value seems to attract greater number of respondents (Cobanoglu and Cobanoglu 2003; Gneezy, Meier et al. 2011; Singer and Ye 2013).
- Professionally designed postcards are effective to attract more males and younger respondents than printed letters of invitation/hard copy of survey. Therefore, they are recommended in recruiting participants who are particularly male or young.

- QR codes are recommended particularly when recruiting young people supported by findings in the literature as discussed earlier in section 9.2.2.
- Reminders can increase the response rates if do not experience long delay to get distributed. In the literature, those studies, which used reminders achieved a higher response rate (Scott 1961; Kanuk and Berenson 1975; Wermuth 1985; Brennan 1992; Richardson and Ampt 1993; Sillaparcharn 2007; Stopher 2012).
- Characteristics least likely to respond: male; non-metropolitan residents; younger people (18-24 years). Similarly in Queensland, in the study conducted by Tunnicliff et al. (2012) only small percent of respondents aged less than 25 years old. (Therefore, recruiting individuals who meet this gender, age or residential location criteria is more challenging and requires the use of different recruitment approaches:
    - Invite more number of riders to participate in the survey,
    - Increase the value of incentive,
    - Use a minimum of two wave of reminders.

9.3.2. Commuter use of PTWs by novice riders (addressing the first and third research questions)

As discussed earlier in this chapter, the major areas of PTW research attention has been in the context of their safety and relatively little research has been conducted on the commuter use of PTWs, whereas PTWs safety is a functions of their use. Therefore, there is a need for greater attention to the commuter use of PTWs. Particularly the rapid increase of road motorcycle sales between 2010 and 2014 (17.3%) would have safety implications as the consequence of greater PTW use.

This research focused to explore commuting usage pattern of PTWs, particularly by novice riders, who have recently taken up riding a PTW. In this context a range of parameters, which influenced novice riders PTW usage pattern for commuting are identified.

It is found that commuter usage pattern of PTWs is a function of novice riders' social norms, attitudes and perceived behavioural control. In overall social norms had a little impact on the commuting use of PTWs by novice riders. Attitudes had the greatest influence on novice riders' travel behaviour, specifically riders':

- Likelihood to **not** ride in heavy rain or on cold days
- Level of perceived risk about riding in peak hour traffic

Perceived behavioural control had influence on novice riders' travel behaviour, specifically:

- Importance of lower cost of travel compared with driving a car (e.g. lower fuel costs, free parking)

Therefore, findings of this research provides new and valuable insights for the researches aiming to develop travel mode choice models, travel assignment models and PTW safety models. Highlighting that, apart from the parameters, which are commonly used in the transport models, there

are other parameters, which influence individuals' decision to ride and use a PTW, which are not explored in the literature.

9.3.3. Generalising the findings

Jamson et al (2009) reported that motivations underlying PTW purchase and use decisions have changed in last decades. He found that concerns about independence and leisure use of PTW have been changed to concern about running costs of PTWs (Coxon 2002; Jamson and Chorlton 2004; Prabnasak and Taylor 2008; Blackman and Haworth 2010; Kepaptsoglou, Milioti et al. 2011; Lee, Pino et al. 2013) and avoid congestion (Wigan 2002; Hsu, Dao et al. 2003; Leong and Sadullah 2007; Priyantha Wedagama 2009; Priyantha Wedagama 2009) along with attitudinal characteristics of riders (Calabrese 1996; Choo and Mokhtarian 2004; Andersson 2005; Broughton and Stradling 2005; Johansson-Stenman and Martinsson 2006; Plax, Kearney et al. 2008; Chen and Chen 2011; Kopp 2011; Haworth 2012). Similarly, in our study, it is found that commuting use of PTWs for novice riders in Victoria, Australia is a function of riders' attitudinal characteristics and the travel costs associated with the use of PTWs (emerged as fuel costs and parking fees in the model developed in this study). However, the attitudinal characteristics reported in the literature differ from our research, but the concept is similar and findings of this study could be generalised to the broader population of PTW riders and those from other countries.

9.4. Limitations of this research and future research direction

9.4.1. Recruitment approaches and incentives:

In this study, recruitment of novice riders particularly for the second target group experienced long delays, which were largely out of our control. Long delays to recruit novice riders were experienced due to delay in sending the list of novice riders from VicRoads to TAC, which was our source of access to the list of novice riders who had recently taken up riding a PTW. Obtaining a relatively close rate of response between TG1 and TG2 for survey 1, considering the bigger unexpected time lag to recruit TG2 novice riders than TG1, could reflect the positive impact of changes in the incentives, but it cannot be statistically proved.

Therefore, to provide a clear insight into the effectiveness of changes in the incentive values and their numbers, it would be adequate to distribute surveys across different target groups following similar time frame, in future research. Also there is a capacity for future research to explore the best value of incentive, which is still under question as higher incentive values could increase the response rates but what would be the best value not producing any bias responses.

9.4.2. Factors exploring novice riders' social norms, attitudes and perceived behavioural control

The model developed in this research was able to explain 55 percent of variations in the novice riders' PTW usage pattern. This might reflect that

- There are other parameters, which have not been identified in this research, which influence the PTW usage pattern of novice riders and/or,
- The questions asked in the survey may not have been adequately designed to address and explore the SN, AT and PBC of novice riders influencing their PTW usage pattern.

Therefore, there is a capacity for future research to identify the parameters and/or to design the questions in the form, which could better explore and represent novice riders' social norms, attitudes and perceived behavioural control in relation to their commuting usage pattern of PTWs.

9.4.3. Future transport studies

This research findings revealed that commuter usage pattern of PTWs is a function of novice riders' social norms, attitudes and perceived behavioural control. These findings emphasises that researchers aim to explore the use of PTWs by individuals, are required to study attitudinal characteristics of individuals along with their perceived behavioural control to improve their predictability of PTW use. However, to include these variables in the studies and models of PTW use, there is a need to predict these parameters. Predicting the changes in the explanatory parameters exploring individuals attitudes would be much more challenging that the parameters commonly studied in the transport models including socio-demographic characteristics of individuals and the travel characteristics associated with each mode of travel (e.g. travel time, travel distance, travel costs and so on). Therefore, a big area of future research would be to understood deeper into attitudinal characteristics of individuals and the pattern they might change over time and can be adequately represented in the transport models.

In addition, in this study, the survey invitations included logos and names of authorities, which had funded this research project. While there was not a clear understanding of the riders' impression of those organization, which could have contributed to the response rate, there is also a capacity for future research to investigate whether including the logos of those organizations could negatively impact response rate or not. Also, in this study, it has not been possible to examine the changes in response rates by removing the ethical approval details from the survey forms sent to potential participants, which can be another scope for future research.

9.4.4. Usefulness for traffic managers and policy planners

In this research, it is found that commuting use of PTWs is a function of riders' attitudinal characteristics and the travel costs associated with the use of PTWs (emerged as fuel costs and parking fees in the model developed in this study). While it might not be easy to change the attitudinal characteristics of riders, especially in a short term, also the extent that changes in fuel costs or PTW parking fees can impact the commuting use of PTWs is not clear particularly in Victoria. Therefore, there can be a capacity for future research to identify the extent of changes in commuting use of PTWs in association with changes in the PTWs travel costs. Findings would help traffic managers and policy planners worldwide to decide about the fuel price and parking fees, depending on their decision to encourage or discourage the use of PTWs for commuting.

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Appendix – 1 (Survey 1)

March 2014

Invitation to participate in a study of new motor scooter/motorcycle riders

Hello

I am a PhD student at Monash University and just like you, I recently passed my motorcycle riding learner permit. In my case, I did a learner rider course as part of my research, found I really loved it and then went on to get my licence and buy a motorcycle. My experience as a novice rider has influenced the direction of my research and I am now focussed on the motivations and experiences of people who are starting to ride on the road.

I invite you to participate in my study on new motor scooter/motorcycle riders.

Participating in the study involves completing a survey. My research is being conducted in partnership with VicRoads, the Victorian Department of Transport, the Transport Accident Commission (TAC), the RACV and the Federal Chamber of Automotive Industries. By participating in this study which rarely happens to explore riders' perceptions and priorities, you can help us to broaden the understanding about your riding intentions and experiences. Complete details of the study are provided in the Explanatory Statement printed on the back of this sheet.

Privacy

This information (survey) is being forwarded to everyone in Victoria who successfully passed their motorcycle learner's permit test in 2013. Please note that this package is being forwarded to you directly from the TAC. Your personal details have **NOT** been given to the researchers.

Choose one of these easy ways to complete the survey:

1. Scan the QR code provided

2. Or go to the web link at - http://www.surveymonkey.com/s/RidersTG2S1HC

2. Or complete the enclosed hard survey copy then
   - Fold along the lines on the back page
   - Use the double sided tape to hold the survey in place and display the return mail address
   - Put it in a post box – we pay for the return postage

Go into the prize draw and double your chance to win by responding on-line

By returning the completed survey by 14th of April 2014, you will be eligible to go into a prize draw to win a **$500** Coles-Myer gift voucher. If you complete the survey on-line (using the link above or QR code), rather than posting back the hard copy, you will get two entries into the prize draw.

Yours Sincerely [redacted]

Institute of Transport St
Department of Civil Engineering
Building 60
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ABN 12 377 614 012 CRICOS provider number 00008C

MONASH University Engineering

Institute of Transport Studies (Monash)

The transition to owning and/or riding a motor scooter or motorcycle

1. Please write your participant number (ID) .....

2. Today's Date: Day ☐☐ Month ☐☐ Year ☐☐☐☐

3. When did you get your motorcycle riding learner permit? Month ☐☐ Year ☐☐☐☐

4. What type of motorcycle permit do you hold? ☐ Learner Permit (go to Q5) ☐ Probationary or Full Licence (go to Q6)

5. If you do not have a motorcycle riding licence, when do you expect you will go for the riding licence test?

- ☐ Within the next 3 months
- ☐ In the next 3 to 6 months
- ☐ In the next 6 to 9 months
- ☐ In the next 9 to 12 months
- ☐ In the next 12 to 15 months
- ☐ I may not go for the licence test

6. If you have a motorcycle riding licence, when did you get it? Month ☐☐ Year ☐☐☐☐

7. How many motor scooters and/or motorcycles do you own? ☐None (go to Q9) ☐ 1 ☐ 2 ☐ 3 ☐ 4+

8. Details of the motor scooters/motorcycles you own. If you own more than two, tell us about the two you ride most often.

Details of motor scooter/motorcycle	**The most frequently ridden**	**The second most ridden**
Make/Model		
Engine size (circle, using the code below)	**1 2 3 4 5 6 7 8**	**1 2 3 4 5 6 7 8**
Type (circle, using the code below)	**1 2 3 4 5 6 7 8**	**1 2 3 4 5 6 7 8**
(Month/Year) you purchased/obtained it	Month ☐☐ / Year ☐☐☐☐	Month ☐☐ / Year ☐☐☐☐
Purchased price or value		
Did you buy it or was it given to you?	☐ Bought it ☐ Given to me	☐ Bought it ☐ Given to me
Was it new or second hand?	☐ New ☐ Second-hand	☐ New ☐ Second-hand

Engine size: 1=(1 - 74) cc, 2=(75 - 124) cc, 3=(125 - 249) cc, 4=(250 - 499) cc, 5=(500 – 660), 6=(661-749) cc, 7=(750 - 999) cc, 8=(1000+) cc

Type: 1=Moped, 2=Motor Scooter, 3=Traditional/Naked, 4=Sports, 5=Cruiser, 6=Trail, 7=Other (please state type).....

9. Did getting a motor scooter/motorcycle have any implications for the cars you own(ed)?

- ☐ Did not own a car before and did not buy a car
- ☐ Sold car(s) but I still have one or more cars
- ☐ Sold car(s) so I no longer have a car
- ☐ Did not change the number of cars, the motor scooter/motorcycle was an additional vehicle
- ☐ Bought car(s)

10. How likely are you to purchase a motor scooter/motorcycle in the near future? That purchase could be your first one, a replacement, or an additional motor scooter/motorcycle. (Please select one option in each row below)

	Very unlikely	Unlikely	Slightly unlikely	Slightly likely	Likely	Very likely
Within the next 3 months	☐	☐	☐	☐	☐	☐
In the next 3 to 6 months	☐	☐	☐	☐	☐	☐
In the next 6 ot 9 months	☐	☐	☐	☐	☐	☐
In the next 9 to 12 months	☐	☐	☐	☐	☐	☐
Beyond 12 months	☐	☐	☐	☐	☐	☐

11. What type of motor scooter/motorcycle might you purchase?

☐Moped ☐Motor Scooter ☐Traditional/Naked ☐Sports ☐Cruiser ☐Trail ☐Other (please state below)

12. What do you expect its engine capacity would be?

☐1-74 cc ☐75-124 cc ☐125-249 cc ☐250-499 cc ☐500-660 cc ☐661-749 cc ☐750-999 cc ☐1000+ cc

13. Will purchasing a motor scooter/motorcycle in the future, have any implications for the cars you own?

- ☐ Do not own a car now and will not buy one in the near future
- ☐ Will sell car(s) but I will still have one or more cars
- ☐ Will sell car(s) so I will no longer have a car
- ☐ Will not change the number of cars, the motor Scooter/motorcycle will be an additional vehicle
- ☐ Will buy car(s)

14. How did you commute to your work or place of study (e.g. TAFE, University) <u>before</u> you got your motorcycle learner permit?

	Not at all	Rarely	1 or 2 days a week	3 or 4 days a week	5 days a week	6 or 7 days a week
Car driver	☐	☐	☐	☐	☐	☐
Car passenger (Not Taxi)	☐	☐	☐	☐	☐	☐
Motor scooter/motorcycle rider	☐	☐	☐	☐	☐	☐
Motor scooter/motorcycle pillion	☐	☐	☐	☐	☐	☐
Bicycle	☐	☐	☐	☐	☐	☐
Public transport (e.g. bus,tram, train)	☐	☐	☐	☐	☐	☐
Taxi	☐	☐	☐	☐	☐	☐
Walk only	☐	☐	☐	☐	☐	☐

15. Beyond the next 6 months, how many days a week do you expect to ride your motor scooter/motorcycle for each of the following purposes? (Please provide one option in each row)

	Not at all	Rarely	1 or 2 days	3 or 4 days	5 days	6 or 7 days
Commute to work	☐	☐	☐	☐	☐	☐
Commute to place of study/Uni	☐	☐	☐	☐	☐	☐
Shopping	☐	☐	☐	☐	☐	☐
Solely for the purpose of recreation	☐	☐	☐	☐	☐	☐
Other (please specify).....	☐	☐	☐	☐	☐	☐

16. What is your gender? ☐ Female ☐ Male

17. In what year were you born? ☐☐☐☐

18. What is your home postcode? ☐☐☐☐

19. If you wish to participate in the prize draw, and receive information about future surveys, please provide your contact details below:

First Name: _____

Email address (preferred) or phone number: _____

Thank you for your participation.
Using the dotted lines on the back page as a guide, fold the questionnaire so the mailing address is on the outside and use the double sided tape to secure it. You can then put it in the post – no stamp is needed.

Explanatory Statement

March 2014

Transition Behaviour to Motor Scooter/Motorcycle Ownership and Use
We are interested in people who have recently taken up riding a motor scooter or motor cycle.

My name is Babak Amani Jordehi and I am conducting a research project with Professor Geoff Rose and Dr. Marilyn Johnson in the Department of Civil Engineering towards a PhD degree at Monash University. This means that I will be writing a thesis which is the equivalent of a 300 page book. We have funding from the Australian Research Council, the Victorian Department of Transport, VicRoads, and the Transport Accident Commission to conduct research on the ownership and use of motor scooters/motorcycles in Victoria.

Why were you chosen for this research: This questionnaire has been sent to you because you recently obtained your learner permit for a motor scooter/motorcycle.

Aim of the research: The aim of the research is to gain a better understanding of attitudes, perceptions, motivations and expectations of motor scooter/motorcycle riders in Victoria.

Possible benefits: Survey responses will improve understanding of the usage patterns of motor scooters/motorcycles in Victoria along with the attitudes and perceptions of motor scooter/motorcycle riders. That knowledge may assist in developing policies to improve the transport system.

What does the research involve: Completing the enclosed survey; it should take less than 10 minutes.

Inconvenience/discomfort: It is unlikely that you will experience any inconvenience or discomfort in completing the survey.

Payment: By completing and returning the survey by 14th of April 2014, you will be eligible to go into a prize draw to win a $500 Coles-Myer gift voucher.

You can withdraw from the research: Being in this study is voluntary and you are under no obligation to consent to participation. Consent will be assumed if we receive a completed questionnaire. However, we are not able to withdraw any anonymous surveys. You may withdraw only if you have provided your name on the completed questionnaires, up until the data is analysed.

Confidentiality: Findings from this research will only be published in a summary format which will not include any personally identifying information.

Storage of data: Data collected will be stored in accordance with Monash University regulations, kept on University premises, in a locked filing cabinet for 5 years. A report of the study may be submitted for publication, but individual participants will not be identifiable in such a report.

Results: If you would like to receive a copy of the any publications from this study, please contact Professor Geoff Rose. A paper based on this research is expected to be available in 2014.

If you would like to contact the researchers about any aspect of this study, please contact the Chief Investigator:	If you have a complaint concerning the manner in which this research (Number CF13/1032 - 2013000515) is being conducted, please contact:
Professor Geoff Rose Institute of Transport Studies Department of Civil Engineering Monash University VIC 3800 [redacted]	Executive Officer Monash University Human Research Ethics Committee (MUHREC) Building 3e Room 111 Research Office Monash University VIC 3800 [redacted]

Appendix – 2 (Survey 2)

1. Introduction

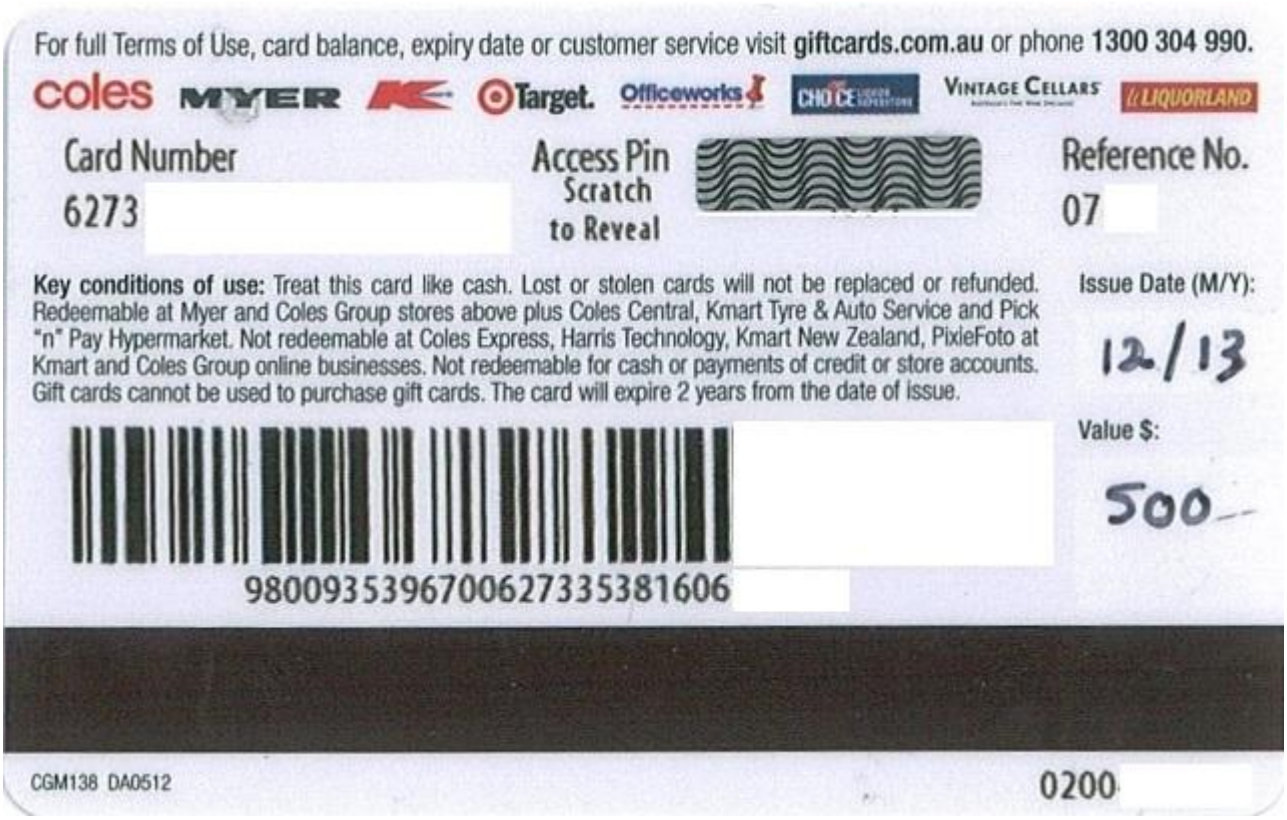
Thank you very much for completing the first survey.
Key results of that survey are presented in the final section of this survey.

This second and final survey asks about your riding experiences.
It should take about 20 minutes to complete.

Complete this survey by 1 July 2014 and you will go into the prize draw to win a voucher valued at $500.
You can use the voucher at Coles, Myer, Liquorland, Vintage Cellars, 1st Choice Liquor, Kmart, Target etc.

Your participation is much appreciated.

Babak Amani
Faculty of Engineering, Monash University, Clayton, Vic, 3800
[redacted]



***1. Please enter your participant number (ID) as shown in the email/message.**

2. Vehicle ownership and kilometers driven or ridden

1. How many of the following types of vehicles do you own?

	0	1	2	3+
Motor scooter	◯	◯	◯	◯
Motorcycle	◯	◯	◯	◯
Passenger car	◯	◯	◯	◯
4WD vehicle	◯	◯	◯	◯
Bicycle	◯	◯	◯	◯
Other	◯	◯	◯	◯

2. Do you have access to any of the vehicles listed below to commute to work or place of study which you do not own? (you can tick multiple boxes)

- ☐ Motor scooter
- ☐ Motorcycle
- ☐ Passenger car
- ☐ 4WD vehicle
- ☐ Bicycle
- ☐ Other

3. In the last 12 month, how many kilometers have you ridden and driven (approximately)?

Ridden a motor scooter/motorcycle	
Driven a motor vehicle (e.g. car, van etc)	

3. Changes in motor scooter/motorcycle ownership

1. How many motor scooters/motorcycles have you purchased or been given in the LAST 9 MONTHS?

- ◯ 0
- ◯ 1
- ◯ 2+

4. Details of motor scooter/motorcycle obtained within the last 9 months

All the questions on this page are about the motor scooter/motorcycle you bought or were given in the last 9 months.

1. What type of motor scooter/motorcycle did you get (bought or were given) in the last 9 months?

- ◯ Moped
- ◯ Motor scooter
- ◯ Traditional/Naked
- ◯ Sports
- ◯ Cruiser
- ◯ Trail

Other (please specify type here)

2. When did you get it?

	Month	Year
Month and Year		

3. Did you buy it or it was given to you?

- ◯ I bought it
- ◯ It was given to me (e.g. gift)

4. Was it brand new or second hand?

- ◯ Brand new
- ◯ Second hand

5. What is its engine size?

- ◯ 1 - 74 cc
- ◯ 75 - 124 cc
- ◯ 125 - 249 cc
- ◯ 250 - 499 cc
- ◯ 500 - 660 cc
- ◯ 661 - 749 cc
- ◯ 750 - 999 cc
- ◯ 1000+ cc

6. How much did you pay for your motor scooter/motorcycle or how much was it worth when you got it?

- ◯ Up to $1,999
- ◯ $2,000 - $3,999
- ◯ $4,000 - $5,999
- ◯ $6,000 - $8,999
- ◯ $9,000 - $11,999
- ◯ $12,000 - $14,999
- ◯ $15,000 - $19,999
- ◯ $20,000 or more

7. Is this the motor scooter/motorcycle that you ride to commute to work or place of study?

- ◯ Yes, I usually ride this motor scooter/motorcycle
- ◯ No, I ride another motor scooter/motorcycle
- ◯ No, I rarely ride a motor scooter/motorcycle to work or place of study

8. Did getting the motor scooter/motorcycle influence your car ownership?

- ◯ Yes
- ◯ No

9. If yes, how did getting the motor scooter/motorcycle influence your car ownership?

- ◯ Sold car(s) but I still have one or more cars
- ◯ Sold car(s) so I no longer have a car
- ◯ Bought car(s)

5. Type of motorcycle riding permit/licence

1. What type of motorcycle riding permit/licence do you hold?

◯ Learner permit

◯ Probationary/full licence

6. Timing of motorcycle riding licence

1. When did you get your probationary motorcycle riding licence?

	Month	Year
Month and Year		

7. Driving learner permit/licence

1. What type of car driving permit/licence do you hold?

- ◯ No permit
- ◯ Learner permit
- ◯ P1 (Red) Probationary licence
- ◯ P2 (Green) Probationary licence
- ◯ Full licence

8. Timing of driving learner permit

1. In what year did you get your driving learner permit?

9. Work status

1. Do you ... (please select one option)

- ◯ Work full-time
- ◯ Work part-time
- ◯ Work casually
- ◯ Work as a volunteer
- ◯ Other type of work
- ◯ Do not work

10. Work trip

***1. Please indicate how you traveled to work within the last 7 days? (if you used more than one mode, select the one you used to travel the longest distance)**

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Motor scooter/motorcycle (rider)	☐	☐	☐	☐	☐	☐	☐
Motor scooter/motorcycle (pillion)	☐	☐	☐	☐	☐	☐	☐
Car (driver)	☐	☐	☐	☐	☐	☐	☐
Car (passenger)	☐	☐	☐	☐	☐	☐	☐
Public transport	☐	☐	☐	☐	☐	☐	☐
Bicycle	☐	☐	☐	☐	☐	☐	☐
Walk	☐	☐	☐	☐	☐	☐	☐
Other	☐	☐	☐	☐	☐	☐	☐
Did not travel to work	☐	☐	☐	☐	☐	☐	☐

2. What is the postcode or name of the suburb where you work?

3. On average, how long (in minutes) does your trip to work take on a motor scooter/motorcycle (one way)?

- ◯ Up to 9 minutes
- ◯ 10 to 19 minutes
- ◯ 20 to 39 minutes
- ◯ 40 to 59 minutes
- ◯ 60 to 89 minutes
- ◯ 90 minutes and above

4. On average, how far (in kms) is your trip to work on a motor scooter/motorcycle (one way)?

- ◯ Less than 1.9 km(s)
- ◯ 2 to 4.9 km(s)
- ◯ 5 to 9.9 km(s)
- ◯ 10 to 19.9 km(s)
- ◯ 20 to 29.9 km(s)
- ◯ 30 to 49.9 km(s)
- ◯ 50 km(s) and more

5. If it was not possible for you to ride your motor scooter/motorcycle to work on a day when you would usually ride, how would you travel on that day? (if you used more than one mode, select the one you used to travel the longest distance)

- ◯ Car (driver)
- ◯ Car (passenger)
- ◯ Motor scooter/motorcycle pillion
- ◯ Public transport
- ◯ Bicycle
- ◯ Walk
- ◯ Would not travel
- ◯ Not applicable (e.g. Do not have a motor scooter/motorcycle)

Other (please specify)

11. Student status

1. Are you a student?

- ◯ Yes, I am a full-time student
- ◯ Yes, I am a part-time student
- ◯ No, I am not a student

12. Travel to place of study

***1. Please indicate how you traveled to place of study within the last 7 days? (if you used more than one mode, select the one you used to travel the longest distance)**

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Motor scooter/motorcycle (rider)	☐	☐	☐	☐	☐	☐	☐
Motor scooter/motorcycle (pillion)	☐	☐	☐	☐	☐	☐	☐
Car (driver)	☐	☐	☐	☐	☐	☐	☐
Car (passenger)	☐	☐	☐	☐	☐	☐	☐
Public transport	☐	☐	☐	☐	☐	☐	☐
Bicycle	☐	☐	☐	☐	☐	☐	☐
Walk	☐	☐	☐	☐	☐	☐	☐
Other	☐	☐	☐	☐	☐	☐	☐
Did not travel to work	☐	☐	☐	☐	☐	☐	☐

2. What is the postcode or name of the suburb where you study?

3. On average, how long (in minutes) does your trip to place of study take on a motor scooter/motorcycle (one way)?

- ◯ Up to 9 minutes
- ◯ 10 to 19 minutes
- ◯ 20 to 39 minutes
- ◯ 40 to 59 minutes
- ◯ 60 to 89 minutes
- ◯ 90 minutes and above

4. On average, how far (in kms) is your trip to place of study on a motor scooter/motorcycle (one way)?

- ◯ Less than 1.9 km(s)
- ◯ 2 to 4.9 km(s)
- ◯ 5 to 9.9 km(s)
- ◯ 10 to 19.9 km(s)
- ◯ 20 to 29.9 km(s)
- ◯ 30 to 49.9 km(s)
- ◯ 50 km(s) and more

5. If it was not possible for you to ride your motor scooter/motorcycle to place of study on a day when you would usually ride, how would you travel on that day? (if you used more than one mode, select the one you used to travel the longest distance)

- ◯ Car (driver)
- ◯ Car (passenger)
- ◯ Motor scooter/motorcycle pillion
- ◯ Public transport
- ◯ Bicycle
- ◯ Walk
- ◯ Would not travel
- ◯ Not applicable (e.g. Do not have a motor scooter/motorcycle)

Other (please specify)

13. Group riding

1. How often do you ride a motor scooter/motorcycle in a group of three or more riders for any trip purpose?

- ◯ Never
- ◯ Less than once a month
- ◯ Once a month
- ◯ A couple of times a month
- ◯ A few times a week
- ◯ Everyday

14. Riding preferences

1. How important are the following factors in deciding NOT to ride a motor scooter/motorcycle to work or place of study?

	Very unimportant	Unimportant	Slightly unimportant	Slightly important	Important	Very important
Heavy rain	◯	◯	◯	◯	◯	◯
Strong wind	◯	◯	◯	◯	◯	◯
Cold day (low temp)	◯	◯	◯	◯	◯	◯
Hot day (high temp)	◯	◯	◯	◯	◯	◯
Long trip (e.g. 100 km+)	◯	◯	◯	◯	◯	◯
Unfamiliar route	◯	◯	◯	◯	◯	◯
Going to gym/sporting activity	◯	◯	◯	◯	◯	◯
Must dress formally	◯	◯	◯	◯	◯	◯

2. How important are the following factors when choosing to ride your motor scooter/motorcycle rather than drive a car for the same trip?

	Very unimportant	Unimportant	Slightly unimportant	Slightly important	Important	Very important
Lower fuel cost of motor scooter/motorcycle	◯	◯	◯	◯	◯	◯
Much less travel time	◯	◯	◯	◯	◯	◯
Pay less for tolls	◯	◯	◯	◯	◯	◯
Do NOT need to pay for parking	◯	◯	◯	◯	◯	◯
Lower maintenance cost	◯	◯	◯	◯	◯	◯

3. How important are the following factors when choosing to ride your motor scooter/motorcycle rather than take public transport?

	Very unimportant	Unimportant	Slightly unimportant	Slightly important	Important	Very important
Nearest public transport station/stop is too far	◯	◯	◯	◯	◯	◯
Do not have to pay public transport fares	◯	◯	◯	◯	◯	◯
Avoid crowded public transport	◯	◯	◯	◯	◯	◯
Public transport service is not reliable	◯	◯	◯	◯	◯	◯
Trip time by public transport is much longer	◯	◯	◯	◯	◯	◯
Cannot change route when using public transport	◯	◯	◯	◯	◯	◯
Dislike public transport	◯	◯	◯	◯	◯	◯

4. How would you describe your riding experience prior to getting your riding learner permit?

◯ None (had never ridden before getting my learner permit)

◯ Minimal (rode less than 5 times before getting my learner permit)

◯ Moderate (rode between 5 to 20 times prior to getting my learner permit)

◯ Experienced (rode regularly prior to getting my learner permit)

15. Purchasing priorities

1. How important would the following factors be if you were purchasing a motor scooter/motorcycle?

	Very unimportant	Unimportant	Slightly unimportant	Slightly important	Important	Very important
Easy to manoeuvre to avoid objects on the road	◯	◯	◯	◯	◯	◯
Seat height	◯	◯	◯	◯	◯	◯
Heavier bike	◯	◯	◯	◯	◯	◯
Size of tyres	◯	◯	◯	◯	◯	◯
Noisier bike	◯	◯	◯	◯	◯	◯
Having ABS brakes	◯	◯	◯	◯	◯	◯
Having automatic gear box	◯	◯	◯	◯	◯	◯
Can carry pillion passenger	◯	◯	◯	◯	◯	◯
Luggage capacity	◯	◯	◯	◯	◯	◯
Suitable for commuting trips	◯	◯	◯	◯	◯	◯
Suitable for recreation trips	◯	◯	◯	◯	◯	◯
Safer to ride	◯	◯	◯	◯	◯	◯

16. Crash experience

1. If you had a crash when riding on a motor scooter/motorcycle, what was the worst injury you experienced when riding a motor scooter/motorcycle?

- ◯ Not applicable (e.g. never had a crash riding on a motor scooter/motorcycle)
- ◯ Never injured
- ◯ Minor injury, did not need to seek medical treatment (e.g. sprains, bruises, small cuts)
- ◯ Minor injury, needed medical treatment (e.g. GP, attended emergency department but not admitted to hospital)
- ◯ Minor injury, admitted to hospital
- ◯ Serious injury, admitted to hospital

17. Safety gear

1. Please indicate which safety gear you would generally wear for the following types of trips? (You can tick multiple boxes)

	Helmet	Gloves	Jacket	Pants	Boots
Commute to work	☐	☐	☐	☐	☐
Commute to place of study	☐	☐	☐	☐	☐
Local trips	☐	☐	☐	☐	☐
Recreation only	☐	☐	☐	☐	☐

18. Your perceptions and attitudes

1. How important were the following factors in getting you interested in riding a motor scooter/motorcycle?

	Very unimportant	Unimportant	Slightly unimportant	Slightly important	Important	Very important
A family member encouraged you	◯	◯	◯	◯	◯	◯
A friend/colleague encouraged you	◯	◯	◯	◯	◯	◯
There are people in your family who ride	◯	◯	◯	◯	◯	◯
Being a pillion passenger	◯	◯	◯	◯	◯	◯
Need to ride for your job	◯	◯	◯	◯	◯	◯

2. How important are the following factors in explaining the enjoyment you get from riding a motor scooter/motorcycle?

	Very unimportant	Unimportant	Slightly unimportant	Slightly important	Important	Very important
Enjoy the thrill of riding	◯	◯	◯	◯	◯	◯
Being exposed to sounds and smells when riding	◯	◯	◯	◯	◯	◯
Get away from every day life	◯	◯	◯	◯	◯	◯
Like the image/style of riding	◯	◯	◯	◯	◯	◯
Like the freedom of riding	◯	◯	◯	◯	◯	◯

3. How would you rate the risk of the following riding behaviors?

	Very risky	Quite risky	Slightly risky	Fairly safe	Quite safe	Very safe
Riding a motor scooter/motorcycle in general is	◯	◯	◯	◯	◯	◯
Riding motor scooter/motorcycle for you personally is	◯	◯	◯	◯	◯	◯
Riding in peak hour traffic is	◯	◯	◯	◯	◯	◯
Not wearing any safety gear is	◯	◯	◯	◯	◯	◯
Wearing a helmet and gloves as your only safety gear is	◯	◯	◯	◯	◯	◯
Splitting/manoeuvring between fast moving traffic is	◯	◯	◯	◯	◯	◯

4. How likely you are to:

	Extremely unlikely	Unlikely	Slightly unlikely	Slightly likely	Likely	Extremely likely
Go whitewater rafting	◯	◯	◯	◯	◯	◯
Go on holiday without booking accommodation	◯	◯	◯	◯	◯	◯
Go bungy jumping	◯	◯	◯	◯	◯	◯
Spend up to the limit of your credit card without thinking about how you will repay it	◯	◯	◯	◯	◯	◯

19. Future plans

1. If you were to stop riding at some time in the future, how important do you think each of the following factors would be in that decision:

	Very unimportant	Unimportant	Slightly unimportant	Slightly important	Important	Very important
Purchasing a car	◯	◯	◯	◯	◯	◯
Attitudes of family members	◯	◯	◯	◯	◯	◯
Attitudes of friends	◯	◯	◯	◯	◯	◯
Changing home location	◯	◯	◯	◯	◯	◯
Changing work location	◯	◯	◯	◯	◯	◯
Changing type of work/job	◯	◯	◯	◯	◯	◯
Better access to public transport	◯	◯	◯	◯	◯	◯
Getting married	◯	◯	◯	◯	◯	◯
Becoming a parent	◯	◯	◯	◯	◯	◯
Getting divorced	◯	◯	◯	◯	◯	◯
Serious motor scooter/motorcycle crash	◯	◯	◯	◯	◯	◯

20. Finally we need a few details about you

1. What is your highest level of education?

- ◯ Primary school
- ◯ Partial secondary
- ◯ Secondary school
- ◯ Some tertiary study
- ◯ Technical school or TAFE
- ◯ Bachelor degree
- ◯ Postgraduate Degree (Master or PhD)

2. If you work, which category best describes your occupation?

- ◯ Labourer
- ◯ Machinery operator and driver
- ◯ Sales worker
- ◯ Clerical and administrative worker
- ◯ Community and personal service worker
- ◯ Technicians and trade worker
- ◯ Professional
- ◯ Manager

Other (please specify)

3. What is your relationship status?

- ◯ Single
- ◯ Married/Long term relationship
- ◯ Other

Other (please specify)

4. Do you live ...

- ◯ Alone
- ◯ With other adults (shared home)
- ◯ With your parents
- ◯ With your partner (no child/ren)
- ◯ With your child/ren only (no partner)
- ◯ With your partner and child/ren

Other (please specify)

5. What is your home postcode?

6. What is your personal income before tax?

- ◯ Nil Income
- ◯ $1 - $199 per week ($1 - $10,399 per annum)
- ◯ $200 - $299 per week ($10,400 - $15,599 per annum)
- ◯ $300 - $399 per week ($15,600 - $20,799 per annum)
- ◯ $400 - $599 per week ($20,800 - $31,199 per annum)
- ◯ $600 - $799 per week ($31,200 - $41,599 per annum)
- ◯ $800 - $999 per week ($41,600 - $51,999 per annum)
- ◯ $1,000 - $1,249 per week ($52,000 - $64,999 per annum)
- ◯ $1,250 - $1,499 per week ($65,000 - $77,999 per annum)
- ◯ $1,500 - $1,999 per week ($78,000 - $103,999 per annum)
- ◯ $2000 or more per week ($104,000 or more per annum)

21. Wrapping up

1. Do you have any other comments about your riding experience? (250 word limit applies)

2. If you are interested in a summary of the study results or participating in future research studies, please tick:

- [ ] Yes, please forward me a summary of the results of this research
- [ ] Yes, please contact me to participate in future research studies

Here the key results of the first survey are presented.

(Monash)

Thank you for completing this survey.

Your response will contribute to the outcome of this research.

When you click submit (Done), you will be entered into the prize draw a Coles Myer voucher valued at $500.