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## Accident Research Centre

### **ACCEPTABILITY OF IN-VEHICLE INTELLIGENT TRANSPORT SYSTEMS TO YOUNG NOVICE DRIVERS IN NEW SOUTH WALES**



**MOTOR ACCIDENTS  
AUTHORITY**



**ACCEPTABILITY OF IN-VEHICLE INTELLIGENT  
TRANSPORT SYSTEMS TO YOUNG NOVICE  
DRIVERS IN NEW SOUTH WALES**

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Acceptability of In-Vehicle Intelligent Transport Systems to Young Novice Drivers in NSW

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**Abstract:**

This report describes the outcomes of a study funded by the Motor Accidents Authority (MAA) of New South Wales (NSW) to assess the acceptability, to a sample of young novice drivers from metropolitan and rural NSW, of seven in-vehicle ITS technologies: Intelligent Speed Adaptation; Forward Collision Warning; Following Distance Warning; Lane Departure Warning; Fatigue Warning; Alcohol Interlock and Sniffer systems and the Drink Driving Performance Test; Seat Belt Reminder; and Electronic Licence. This was achieved by conducting eight focus groups, four in Sydney (metropolitan) and four in Wagga Wagga (rural), involving 58 drivers aged 17 to 25 years who, from examination of NSW crash data, were likely to derive the greatest safety benefits from the selected technologies. For each technology discussed, the acceptable attributes of the system, as well as the barriers to their acceptance that were raised by participants, were identified. Differences in the acceptability of the systems that emerged between the metropolitan and rural participants were also identified. Overall, the Alcohol Interlock and Seat Belt Reminder systems were deemed the most acceptable to young drivers, while the Fatigue Warning (for rural participants only), Intelligent Speed Adaptation and Lane Departure Warning had the lowest levels of perceived acceptability. The metropolitan and rural participants' attitudes towards the systems were generally very similar, however a number of differences in the acceptability of several technologies were observed. Suggestions for enhancing the acceptability of ITS technologies to young novice drivers are offered. The report concludes with recommendations for further research.

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**Key Words:**

Acceptability, Advanced driver assistance systems, Intelligent Transport Systems, Young Drivers, Effectiveness, Usefulness, Usability, Willingness to Buy, Social Acceptability

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# Executive Summary

## Introduction

Young novice drivers constitute a significant road safety problem worldwide. Deaths due to transport related accidents are higher in the 15 to 24 year age group than in any other age group (Williamson, 1999). In an effort to reduce the rate of young driver fatalities, a number of road safety strategies and training and education approaches have been developed. More recently, the potential for in-vehicle ITS systems to reduce the number and severity of young novice driver crashes has also been proposed (Regan et al., 2001). These systems will have little impact on young driver's road safety, however, unless they are deemed acceptable by young drivers. It is acknowledged that a failure of drivers to accept a technology can result in them not using the technology in the manner intended, or not using it at all. Despite this, only a very limited number of studies to date have examined the acceptability of ITS technologies to young drivers and of these, none have focused *specifically* on young novice drivers. Moreover, while these studies have examined age and gender differences in acceptability, none have examined whether and how the acceptability of ITS technologies differs across drivers from different geographical areas. In order for the full safety potential of in-vehicle ITS technologies for young drivers to be realised, it is therefore essential that young drivers' acceptability of these devices be established and those barriers that may prevent them from purchasing the technologies and using them in the intended manner be identified. It is also important that the perceived acceptability of ITS technologies to young drivers from diverse geographical locations be compared and contrasted, as this may differ considerably as a result of the different driving and traffic conditions they experience.

This report describes the outcomes of a study, which examined the acceptability, to young novice drivers from rural and metropolitan NSW, of seven in-vehicle ITS technologies: Intelligent Speed Adaptation; Forward Collision Warning; Following Distance Warning; Lane Departure Warning; Fatigue Monitoring system; Alcohol Interlock and Sniffer systems and the Drink Driving Performance Test; Seat Belt Reminder system and Electronic Licensing. A total of eight focus groups was conducted, four in Sydney and four in Wagga Wagga, involving 58 participants aged 17 to 25 years, who were likely to derive the greatest safety benefit from the selected technologies. The focus groups were held in the rural city of Wagga Wagga and in various locations around inner Sydney and Parramatta. Participants were recruited through a random number telephone survey. None of the participants had prior experience or interaction with the technologies under discussion. During each focus group, participants completed a questionnaire that obtained demographic information, information about participants' driving behaviour, and information about participants' experience with in-vehicle and other everyday technologies. A functional description describing the operation of each system was read to participants and they viewed a short video presentation demonstrating how each system functioned. Finally, a discussion guide was used to facilitate the group discussions.

## Results

The key issues that emerged from the focus group discussions are described in the following section for each ITS technology separately.

***Intelligent Speed Adaptation (ISA)*** (males aged 17-25 years from Sydney and Wagga Wagga). Two variants of ISA were discussed: a speed alerting variant and a speed limiting variant. The key findings were:

- a reluctance to embrace the ISA system, particularly the speed limiting variant;
- a concern that young drivers may become over-reliant on the technology and no longer monitor their own speed;
- a concern that the speed limiting system could be potentially dangerous if it prevented a driver from accelerating out of danger;
- young drivers will not accept the system if it is not reliable;
- to be acceptable, the speed limits contained in the ISA system digital map must correspond exactly with those in the road network;
- drivers felt that it should be easy to update the digital speed-zone map as the speed limits change or they move to another jurisdiction;
- a concern that the auditory warning could be distracting;
- a consensus that the system would be useful for recidivist speeders and P-plate drivers;
- a consensus that the system should be capable of being enabled and disabled as drivers please;
- participants were against the compulsory fitting of the technology, but suggested that if it was compulsory, this should be for new cars only, for certain driver groups such as recidivist speeders; and the system should be subsidised;
- Wagga Wagga participants were willing to pay no more than \$1,000 to purchase the system; and
- Sydney participants were willing to pay no more than \$2,000 to purchase the system.

***Forward Collision Warning System*** (males and females aged 17 to 20 years from Sydney and Wagga Wagga). The key findings were:

- drivers were unwilling to accept the controlling variant, which automatically initiates braking if a collision is imminent, as this was deemed as being potentially dangerous;
- Sydney participants felt that the system would be effective to help drivers avoid collisions if they were not concentrating or were momentarily distracted;
- Wagga Wagga participants felt that the system would only be effective if installed on every vehicle, including trucks;
- the system must be able to be enabled and disabled at will;
- the system must be reliable, particularly in terms of having a low false alarm rate;
- the system would be most effective if it also functioned as a Following Distance Warning system;
- Wagga Wagga participants believed the system would only be useful around town;
- the Sydney participants believed the system would only be useful on country roads;
- the system must be ergonomically designed;
- proven effectiveness and cost were the critical factors influencing participants' decision to purchase the system;
- Sydney participants would pay no more than \$500 to purchase the system; and
- Wagga Wagga participants would pay no more than \$1,000 for the system.

***Following Distance Warning System*** (males and females aged 17 to 20 years from Sydney and Wagga Wagga). The key findings were:

- Wagga Wagga participants believed the system would be effective in reducing tailgating, but would be even more effective if incorporated with the Forward Collision Warning system;
- Sydney participants held negative attitudes towards the system, as they felt it would be annoying in heavy traffic;
- The system must be reliable and have a low false alarm rate;
- The system would be useful on long distance trips and on country roads;
- the system must be ergonomically designed;
- if compulsory, the system should be subsidised;
- Sydney participants willing to pay \$500 for the system; and
- Wagga Wagga participants willing to pay \$1,000 for the system.

***Lane Departure Warning System*** (males and females aged 17 to 20 years from Sydney and Wagga Wagga). The key findings were:

- participants reluctant to embrace the system as a fatigue warning device, as they felt that measures such as rumble strips are already in place to warn drivers that they are veering out of their lane;
- participants unwilling to accept the controlling variant that would steer drivers back into the correct lane, as they viewed this as potentially dangerous;
- must be reliable and not issue false warnings when changing lanes or turning corners;
- useful for drivers on long trips or on country roads;
- must be tamper proof;
- neither group were willing to purchase the system; and
- participants were adamant that the system should not be compulsory under any circumstances.

***Fatigue Warning System*** (males and females aged 17 to 20 years from Sydney and Wagga Wagga). The key findings were:

- participants would not accept the controlling system which automatically parked the car for them if they fell asleep.
- Wagga Wagga participants were reluctant to embrace the system as it was seen as too technical and expensive;
- Sydney participants felt that the system would be effective;
- system should focus on numerous signs of fatigue, not just blinking;
- must be 100% reliable;
- participants concerned about the potential for over-reliance on the system;
- useful for drivers who drive long distances or at night;
- must be ergonomically designed;
- Wagga Wagga participants not willing to pay any amount to purchase the system;
- Sydney participants willing to pay \$1,000 for system;

- Wagga Wagga participants felt that the system should not be compulsory; and
- Sydney participants felt the system should be compulsory for people who drive a lot such as truck drivers.

***Alcohol Interlock and Sniffer Systems and the Drink Driving Performance Test*** (males aged 17 to 25 years from Sydney and Wagga Wagga). The key findings were:

- a reluctance to embrace the Drink Driving Performance Test and Sniffer systems;
- the Interlock system would be more acceptable if it was able to be engaged and disengaged at will;
- must have a low false alarm rate;
- the systems must be reliable; engine immobilisation by Sniffer viewed as dangerous and unacceptable;
- the systems must be ergonomically designed;
- a consensus that the Interlock should be compulsory, particularly for recidivist drink drivers;
- Wagga Wagga participants willing to pay between \$100 and \$200 for the system; and
- Sydney participants willing to pay \$500 for the Interlock and \$200 for the Sniffer system.

***Seat Belt Reminder System*** (males aged 17 to 25 years from Sydney and Wagga Wagga). The key findings were:

- participants held positive attitudes towards the reminder system, but not the Interlock;
- must be inexpensive to repair and maintain;
- system would be useful for parents and as a reminder on the odd occasion drivers forget to put their seat belt on;
- must be ergonomically designed;
- a consensus that the system should be subsidised if made compulsory; and
- participants willing to pay only \$50 to purchase the system.

***Electronic Licensing System*** (males aged 17 to 25 years from Wagga Wagga). The key findings were:

- must have identification system connecting card to driver, such as a fingerprint or PIN system;
- must have a low false alarm rate;
- must be ergonomically designed;
- must not be easily circumvented;
- drivers generally in favour of compulsory fitting of the Electronic Licensing system if reliable and subsidised; and
- participants willing to pay no more than \$100 for the system.

Overall, the following emerged from the focus group discussions as general barriers that may prevent the ITS technologies being purchased or used properly by young drivers:

- Young drivers are less likely to accept a technology if they are unsure of how it operates or its full capabilities.
- Young drivers are more accepting of technologies if they can see that they can serve more than one purpose. For example, the participants appeared to be more accepting of the Electronic Licensing system because they could see that it would be useful as a security device, as well as a system that would prevent unlicensed driving.
- Young drivers are cautious of technologies on which they may become over-reliant. In particular, they are concerned that young drivers may no longer monitor their own driving or ability to drive, which could be dangerous in the event of a system malfunction.
- Young drivers are unlikely to embrace a technology unless they have evidence that the infrastructure exists to support the proper functioning of the system. For example, there was concern among the participants that the speed limit data contained in the ISA system digital map would not be consistent with the speed limits in the actual road network, or that this information would not be updated regularly. There was also concern that the database required to store driver information for the Electronic Licensing system was not feasible given the enormous amount of storage space that would be required.
- Young drivers are unlikely to accept a technology if it is not 100% reliable or very close to it. It is important that the limitations of the system are conveyed to consumers through their operating or user manuals.
- Young drivers are reluctant to accept a technology if it has a high rate of false alarms. Although many of the participants agreed that false alarms are less of an issue than the system not issuing warnings when it is supposed to, they felt that false alarms would annoy them and would reduce their confidence in the system.
- Young drivers are unlikely to embrace a technology if they perceive that the system could be potentially dangerous. For instance, the participants felt that by not allowing them to exceed a certain speed, the ISA system could be potentially dangerous in the event that they needed to accelerate out of a hazardous situation.
- Young drivers are aware of how their passengers may react to different technologies and generally feel that many technologies would provide passengers with extra confidence to tell the driver that they are not driving safely.
- Young drivers are more likely to purchase a technology if they feel that it will help save their passengers lives as well as their own.
- Young drivers will more readily accept a technology if they perceive that it will be personally useful for them. However, the findings from this study suggest that drivers may underestimate the usefulness of some technologies due to their lack of knowledge regarding the crash types that the technologies address.
- Young drivers are more likely to accept a technology if they can turn it on or off, or at least over-ride it temporarily. They are also more likely to accept a technology if it is compact and does not take up too much room in their car or interfere with any other controls. The systems that the participants appeared to have particular concerns with regarding their physical design were the Alcohol Interlock and Sniffer systems and the Electronic Licensing system.
- Young drivers are unlikely to accept a technology if they feel that they could be easily tampered with or circumvented. This was a particular concern for the Seat Belt Reminder and Electronic Licensing systems.
- Young drivers are unlikely to accept a technology if they feel that it may provide access for authorities to monitor their driving or that may record their driving offences.

- Young drivers are unlikely to embrace systems that take away control from them, particularly if they feel that it may be dangerous if a system does take control of the vehicle. The participants generally stated that they want systems that will help them gain control of their car, not take their control away.
- Young drivers are willing to accept making some technologies compulsory, but usually only if they are subsidised, have been proven effective and reliable, and are only compulsory for certain sub-groups of drivers, namely recidivist offenders.
- Young drivers are unlikely to accept those systems that they view are too expensive to purchase, install and maintain for the majority of young drivers. Generally, young drivers are willing to pay only a small amount (up to \$200) at the most to purchase technologies, even if they deem these technologies as acceptable.
- Young drivers generally want more detailed information on the safety benefits of the technologies and evidence that they are reliable and effective in saving lives before they are willing to purchase them.

Based on the focus group findings it was also possible to determine, from the discussed technologies, those attributes that are deemed acceptable to young novice drivers. These attributes are illustrated in the following table for each technology.

Table Executive Summary.1. Acceptable attributes and the perceived level of acceptability of each ITS technology.

ITS	Acceptability Rating	More acceptable if:
ISA	Low	<ul style="list-style-type: none"> <li>• not limiting;</li> <li>• can be enabled/disabled at will;</li> <li>• speed limit data in digital map corresponds to speed limits in the road network;</li> <li>• speed limit data can be easily updated;</li> <li>• have a 5 to 10 km/h leeway above the limit before system issues warnings;</li> <li>• reliable;</li> <li>• compulsory for new cars only and subsidised;</li> <li>• cost no more than \$1,000<sup>1</sup>;</li> <li>• cost no more than \$2,000<sup>2</sup>.</li> </ul>
FCW	Medium	<ul style="list-style-type: none"> <li>• does not automatically initiate braking if a collision is imminent;</li> <li>• also function as FDW system;</li> <li>• can be enabled/disabled at will;</li> <li>• inexpensive to repair and maintain;</li> <li>• reliable;</li> <li>• low false alarm rate;</li> <li>• display located so drivers can easily see warnings;</li> <li>• installed on every vehicle, including heavy vehicles;</li> <li>• subsidised if made compulsory;</li> <li>• cost no more than \$1,000<sup>1</sup>;</li> <li>• cost no more than \$500<sup>2</sup>.</li> </ul>

Table Executive Summary.1. continued.

FDW	Medium	<ul style="list-style-type: none"> <li>• combined with FCW system;</li> <li>• have low false alarm rate;</li> <li>• reliable;</li> <li>• display located so drivers can easily see warnings;</li> <li>• visual warnings presented in eye-catching colours;</li> <li>• subsidised if made compulsory;</li> <li>• cost no more than \$1,000<sup>1</sup>;</li> <li>• cost no more than \$500<sup>2</sup>.</li> </ul>
LDW	Low	<ul style="list-style-type: none"> <li>• does not take control of vehicle;</li> <li>• able to detect different road surfaces;</li> <li>• have low false alarm rate, particularly when turning corners and changing lanes;</li> <li>• reliable;</li> <li>• tamper proof;</li> <li>• not compulsory;</li> <li>• cost nothing to purchase.</li> </ul>
FWS	Low <sup>1</sup> Medium <sup>2</sup>	<ul style="list-style-type: none"> <li>• does not take control of vehicle;</li> <li>• detects various signs of fatigue;</li> <li>• reliable;</li> <li>• low false alarm rate;</li> <li>• auditory warning loud enough to wake drivers<sup>2</sup>;</li> <li>• display located so drivers can easily see warnings;</li> <li>• compulsory only for drivers who drive long distances (e.g., truck and taxi drivers);</li> <li>• cost nothing to purchase<sup>1</sup>;</li> <li>• cost no more than \$1,000<sup>2</sup>.</li> </ul>
ALC	Medium to high (interlock) Low (Sniffer & Performance Test)	<ul style="list-style-type: none"> <li>• Interlock system only;</li> <li>• gives drivers BAC reading, not judgment of ability to drive;</li> <li>• gives option of taking the test;</li> <li>• breathalyzer compact and unobtrusive;</li> <li>• compulsory, particularly for recidivist drink drivers and P-plate drivers;</li> <li>• cost no more than \$200<sup>1</sup>;</li> <li>• cost no more than \$500<sup>2</sup>.</li> </ul>
SBR	Medium to high	<ul style="list-style-type: none"> <li>• not seat belt interlock;</li> <li>• low false alarm rate;</li> <li>• not too sensitive to weights on seat;</li> <li>• sensitive enough to detect small children;</li> <li>• inexpensive to repair;</li> <li>• subsidised if made compulsory;</li> <li>• cost no more than \$50.</li> </ul>
LIC*	Low to medium	<ul style="list-style-type: none"> <li>• card works on all cars, but option of restricting it to less cars;</li> <li>• has identification system linking card to owner (e.g., PIN or fingerprint system);</li> <li>• card small enough to hook onto key ring;</li> <li>• low false alarm rate;</li> <li>• compulsory only if reliable and subsidised;</li> <li>• cost no more than \$100.</li> </ul>

Note. ISA = Intelligent Speed Adaptation; FCW = Forward Collision Warning; FDW = Following Distance Warning; LDW = Lane Departure Warning; FWS = Fatigue Warning system); ALC = Alcohol Sniffer, Interlock & Drink Driving Performance Test; SBR = Seat Belt Reminder; and LIC = Electronic Licence.

\*Wagga Wagga participants only

1 = Wagga Wagga participants, 2 = Sydney participants

These issues should be brought to the attention of the relevant road authorities and manufacturers and incorporated as much as possible into the design of the systems in order to enhance their acceptability to young drivers.

## **The Future**

### **Future Directions**

In order, to enhance the acceptability of ITS technologies to younger drivers, the following suggestions can be made:

- From the results of the focus group discussions it appears that young drivers are generally unaware of the existence of in-vehicle ITS technologies. It is therefore important for manufacturers and road authorities to develop education and advertisement campaigns to educate young drivers about the purpose and operation of these systems and their potential safety benefits.
- It is important to make young drivers more aware of the crash types (including their incidence and severity) that are addressed by the technologies. One of the issues that emerged from the focus group discussions was the participants' lack of knowledge about the frequency and severity of certain crash types, particularly rear-end crashes, and this appeared to influence participants' opinions regarding how useful certain technologies would be.
- It is clear from the current research that increasing young driver acceptability of in-vehicle ITS technologies will require a commitment from road authorities to develop the required infrastructure to support these technologies. One theme that emerged from the focus group discussions, particularly in relation to Intelligent Speed Adaptation, is that young drivers were aware of the need to have appropriate infrastructure to support the deployment of this technology. The participants mentioned that in order for Intelligent Speed Adaptation to be deemed acceptable, the speed limits contained in the on-board digital map would need to correspond exactly to the posted speed limits in the road network. They also stressed that updating the digital map to reflect changes in speed zones, or when moving to another jurisdiction, would need to be straightforward.
- In order to facilitate the acceptability of ITS technologies among young drivers, it is important for manufacturers to consider the issues raised by the young drivers in this study regarding the design and location of the systems' hardware, particularly the visual display screen, and incorporate these suggestions into the design of the systems.
- It is important for road authorities and ITS manufacturers to consider the differences observed between the metropolitan and rural drivers in the acceptability of several technologies. These differences suggest that these two groups of drivers have different driving needs that must be considered in the design of the technologies if they are to be deemed acceptable by different driving populations.

### **Future Research**

Based on the results of the present study, the following suggestions can also be made for further research:

- Further research is required using a larger sample of participants from the young driver population to establish the critical issues that influence the acceptability of in-vehicle ITS. It is also important for research to focus on identifying the needs of young drivers from

different geographical locations and to determine exactly how these needs may differentially influence their acceptability of ITS technologies.

- It is important to measure young drivers' acceptability of ITS technologies before, during and after exposure to them, to determine those aspects of acceptability that are most likely to change after short or long term exposure to the systems.
- It is important that research be conducted to establish the most effective means of enhancing the acceptability to young drivers of in-vehicle ITS technologies, particularly those such as Intelligent Speed Adaptation, which had low perceived acceptability by young drivers in this study, but appears to have the potential to confer substantial safety benefits for this population based on the findings of overseas trials (e.g., the Swedish ISA trials, Biding & Lind (2002)).
- Further research is needed to establish the acceptability of in-vehicle ITS to other road user groups, such as heavy vehicle drivers, motorcyclists, bicyclists and pedestrians. A project funded by Austroads is currently being undertaken to assess the potential costs and benefits of an Intelligent Speed Adaptation (ISA) limiting system for heavy vehicles and to evaluate the effectiveness of such a system through a trial with heavy vehicles. This is expected to yield some data on the acceptability of ISA to heavy vehicle drivers.
- Further research is required to better establish whether and how factors such as age, gender, socioeconomic status, driving style and geographical location affect drivers' perceptions of acceptability of in-vehicle ITS technologies.
- To the knowledge of the authors, at present no research has been conducted in Australia to assess driver's acceptance of the large range of out-of-vehicle ITS technologies (e.g., variable message and speed limit signs) that are beginning to emerge.
- There is a need for research to better establish the constructs that underlie acceptability, determine the dimensions of acceptability that are most important to consumers in choosing certain ITS technologies and to determine the constructs underlying acceptability that are most likely to change over time and with exposure to the systems.
- A priority for research in the acceptability area is the development of a valid and reliable tool that can be used to measure the various constructs underlying acceptability.
- Finally, there is a need for further investigation of how ITS technologies can be utilized to support young drivers. In particular, field and on-road trials of ITS technologies need to be conducted to determine young drivers' acceptability of these system after experience with them and to assess young drivers' behavioral adaptation to ITS.



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# Chapter 1. ITS AND YOUNG DRIVERS: INTRODUCTION

## 1.1 Intelligent Transport Systems

During the past 30 years the road accident fatality rate in Australia has reduced from being one of the highest among motorised countries to one of the lowest. It has dropped from 8.0 deaths per 10,000 registered vehicles in 1970, to 1.4 in 2001 (ATSB, 2002a). Nevertheless, road crashes continue to account for over 90 percent of the total cost of transport-related accidents across all modes in Australia (Booz-Allen & Hamilton, 1997). Each year, over 1,700 people die on Australian roads and over 60,000 are injured. In NSW, while the road toll decreased by almost half from 1988 (1,037 deaths) to 1998 (556 deaths), approximately 600 people have died on NSW roads each year since 1998 (ATSB, 2002a, 2002b). The various strategies implemented in New South Wales since the late 1980s have been successful in cutting the road toll significantly; however, the rate of improvement is beginning to plateau. At the national level, it is recognised that the deployment of Intelligent Transport System (ITS) technologies has the potential to yield a new wave of road safety and other benefits for Australian States and Territories. To this end, a national ITS strategy known as 'E-Transport' (Austroads, 1999) was launched in December 1999 by the Federal Government of Australia. The strategy brings a strategic and coordinated focus to the planning, application and assessment of ITS technologies in Australia.

The term ITS refers to the bringing together of advanced information processing, communications, sensing and computer control technologies to produce systems that are capable of addressing various surface transportation problems. ITS technologies have been designed, for instance, to improve travel efficiency and mobility, enhance safety, conserve energy, provide economic benefits, and protect the environment. ITS technologies have been installed both in vehicles and in the road infrastructure. Examples of in-vehicle ITS that are now available in Australia include in-vehicle route navigation systems and adaptive cruise control systems. The former system provides drivers with turn by turn instructions on how to reach a selected destination while the latter system automatically slows the vehicle to a safe following distance if the cruise control function has been activated and the car approaches a vehicle ahead that is travelling at a slower speed than it. Electronic tolling systems and variable message signs are examples of ITS applications that have been embedded within the road infrastructure.

World developments in ITS have been driven primarily by research and development programs in Europe, North America and Japan. Intensive ITS research and development programs started in the late 1980s in Europe (through the PROMETHEUS and DRIVE programs) and in Japan (through the AMTICS and RACS programs), and some time later in the United States. DRIVE (Dedicated Road Infrastructure for Vehicle Safety) in Europe aimed to improve traffic efficiency and safety and the environmental effects of motor vehicles, focussing on the infrastructure requirements, traffic operations and technologies of the road transport system. PROMETHEUS (PROgraM for European Traffic with Highest Efficiency and Unprecedented Safety) was an initiative aimed at developing information technology, telecommunications, robotics and transport technology to provide information to drivers, aid drivers in an informative way, establish a network of communication between vehicles, and to establish systems for the efficient use of the road network (Hulse, Dingus, &

Barfield, 1998). The European programs have since progressed under a succession of European Union Telematics Frameworks, and there are currently a number of projects being conducted under the umbrella of the 5<sup>th</sup> Telematics Program, which commenced in 1998 and will conclude in 2002. Many of the projects within this, and earlier Frameworks are discussed elsewhere (see Regan, Oxley, Godley, & Tingvall, 2001).

In Japan, recent ITS research and development efforts have been conducted primarily under the umbrella of the Advanced Safety Vehicle Initiative (Phases 1 and 2), the Advanced Cruise-Assist Highway Systems Initiative and the Smartway Initiative (Kikuchi, Kawasaki, & Nakazato, 2000). Recent efforts in Japan have been characterised by an increasing emphasis on developing communication links between the road infrastructure, ITS-equipped vehicles and vulnerable road users - to provide innovative solutions to specific and localised road safety problems. Relevant initiatives in Japan are described elsewhere (see Regan et al., 2001).

In the US, ITS efforts have traditionally been focussed on the areas of organisation and strategic planning, electronic tolling and commercial fleet management - although in the last 2 or 3 years there has been a significant change in the direction of federally funded ITS research and development. The US Department of Transportation (DOT) appears to have recognised that research into automated highway systems would inevitably lead to the need for huge infrastructure investment. It has determined that a more appropriate approach would be to focus on making individual vehicles safer, and this is reflected in the recent funding by the US DOT of a number of government-industry partnering projects to encourage faster deployment of safer ITS-equipped vehicles. These include the so called CAMP (Crash Avoidance Metrics Partnership), which developed functional requirements and test procedures for forward collision warning systems, the Intelligent Vehicle Initiative (IVI), which will involve enabling technology research in the areas of advanced on-board map databases, driver workload and further forward collision warning research deriving from the CAMP project, and the ACAS project (Automotive Collision Avoidance Systems), which will involve the first community-based trials and evaluations of collision warning systems in the US. These and other US initiatives are described elsewhere (see Regan et al., 2001).

In Australia, ITS research, development and deployment efforts have occurred primarily through the provision of advanced traffic management systems (e.g., the Sydney coordinated adaptive control system; SCATS), the provision of advanced traveller information systems (such as the NSW variable message sign system) and in the provision of electronic tolling systems (such as those systems operating in the Melbourne City Link road network). Australia has been at the forefront of world ITS developments in these areas. However, to date, Australia has lagged behind the rest of the world in relation to the design, development and deployment of in-vehicle ITS technologies. A notable exception, however, is the *TAC SafeCar* project that has recently been commissioned by the Victorian Transport Accident Commission (TAC) in Melbourne (Regan, Mitsopoulos, Triggs, & Tingvall, 2002). This project is being undertaken by the TAC, the Monash University Accident Research Centre (MUARC) and the Ford Motor Company of Australia. When completed, this project will put Australia at the forefront of world research into the longer-term safety and performance benefits of in-vehicle ITS technologies.

A wide range of in-vehicle ITS technologies are already commercially available in Japan, Europe and North America (see Regan et al., 2001, for a review). As noted above, very few of these systems are available in Australia. Systems available overseas vary from those that provide the driver with information, for example about congestion or obstacles on the road

ahead, to more complex systems that take over driving tasks in hazardous situations. It is estimated that many of these systems, and others currently being developed, have great potential to enhance the safety of road users (Regan et al., 2001). At this point in time, however, it is not known for certain whether a given ITS application will, or will not, enhance safety, as crash studies, which are the traditional measure of change in road safety, are not (yet) appropriate for deriving safety information in the ITS context. This is because ITS technologies have never been deployed in vehicles on a large enough scale and over a long enough period of time in traffic for the crash numbers to be a reliable indicator of a change in safety (Rumar et al., 1999). In the meantime, long term on-road studies such as the Australian TAC SafeCar project and other similar studies being conducted overseas (see Regan et al., 2001 for a review) will shed some light on the probable safety benefits of these systems (Regan, Mitsopoulos, Haworth et al., 2002).

It is widely recognised among ITS researchers and manufacturers that in order for in-vehicle ITS technologies to be successful in reducing the incidence and severity of road crashes, the technologies must be deemed to be acceptable by their eventual users. It is counterproductive to invest effort in designing and building in-vehicle ITS technologies if the systems are never purchased by the consumer – or if the technologies purchased, are never switched on or are disabled (Van de Laan, Heino & De Waard, 1997). The acceptability of in-vehicle ITS technologies to drivers is a vital issue to consider in the design and development of these technologies. The acceptability of several in-vehicle ITS applications to young novice drivers is the focus of the work documented in this report.

## **1.2 ITS and Young Drivers**

Young novice drivers constitute a significant road safety problem worldwide. Deaths due to transport related accidents are higher in the 15 to 24 year age group than in any other age group (Williamson, 1999). In Australia, 16 to 24 year old drivers constitute around 14 percent of the driving population, however, they account for around 30 percent of fatal, and 50 percent of injury crashes (Australian Transport Safety Bureau, 2001; Regan et al., 2001). Moreover, although the number of road injury deaths in Australia has decreased markedly over the past two decades for all age groups, the difference between the death rates for young drivers and other age groups has remained the same - approximately twice the rate for young drivers than for other age groups (National Injury Surveillance Unit, 1997). In an effort to reduce the rate of young driver fatalities, a number of road safety strategies and training and education approaches have been proposed or developed. These include the Young Driver Research Program (Triggs & Smith, 1996); the DriveSmart CD-ROM (Regan, Triggs & Godley, 2000); and graduated licensing. More recently, the potential for in-vehicle ITS systems to reduce the number and severity of young novice driver crashes has also been proposed (Regan et al., 2001). This section of the report will discuss the types of road crashes in which young novice drivers are over-represented and will consider the causes of these crashes. The current literature relating to ITS and young novice drivers will also be discussed, along with the potential for ITS systems to enhance road safety for young novice drivers.

### **1.2.1 Young Novice Driver Crashes**

In any given year, young novice drivers have a greater risk of being involved in a traffic crash than older or more experienced drivers. Reports from countries such as the United States, Sweden, Canada, the Netherlands and New Zealand confirm that the “young driver problem”

applies to most motorised countries around the world (Catchpole, Macdonald & Bowland, 1994). Young novice drivers are represented in all crash situations, however there are several crash types in which they are over-represented. The two main types of crashes in which young novice drivers are over-represented are single vehicle accidents, where the vehicle runs off the road both on curves as well as straight sections, and crashes in which the driver fails to respond appropriately to hazards created by the actions of other road users. Examples of the latter include accidents where a driver collides with drivers emerging from driveways, U-turn accidents, and accidents where drivers collide with pedestrians (Catchpole, 1997). Younger drivers are also over-represented in speed-related crashes. In 1999, 38 percent of drivers involved in speed-related fatal crashes were aged under 25 years (RTA, 2002c). Young novice drivers are also at higher risk for sleepiness or fatigue-related crashes, particularly because they are typically sleepier than older adults and drive more often at times of increased sleepiness (RTA, 2002c; Smith & Trinder, 2002). Finally, night time crashes are higher among young novice drivers, with many of these crashes alcohol-related (Regan et al., 2001; Williamson, 1999).

### **1.2.1.a Factors Influencing Young Novice Driver Crashes**

The increased crash risk for young novice driver is often attributed to two major factors: age and inexperience (Regan et al., 2001). However, there is a considerable number of other situational, environmental and behavioural factors that interact to influence crash risk for young drivers. Williamson (1999) divides the major factors that have been demonstrated to contribute to young novice driver crashes into three broad categories: Situational factors, Environmental or Exposure factors and Young Driver factors. Williamson's model is illustrated in Figure 1.1. Each of the three categories of factors will be discussed in turn. However, as the number of factors influencing young driver crash risk are too numerous to discuss here, only those factors which have received a large amount of interest in the literature and/or are the major factors influencing crash risk will be discussed.

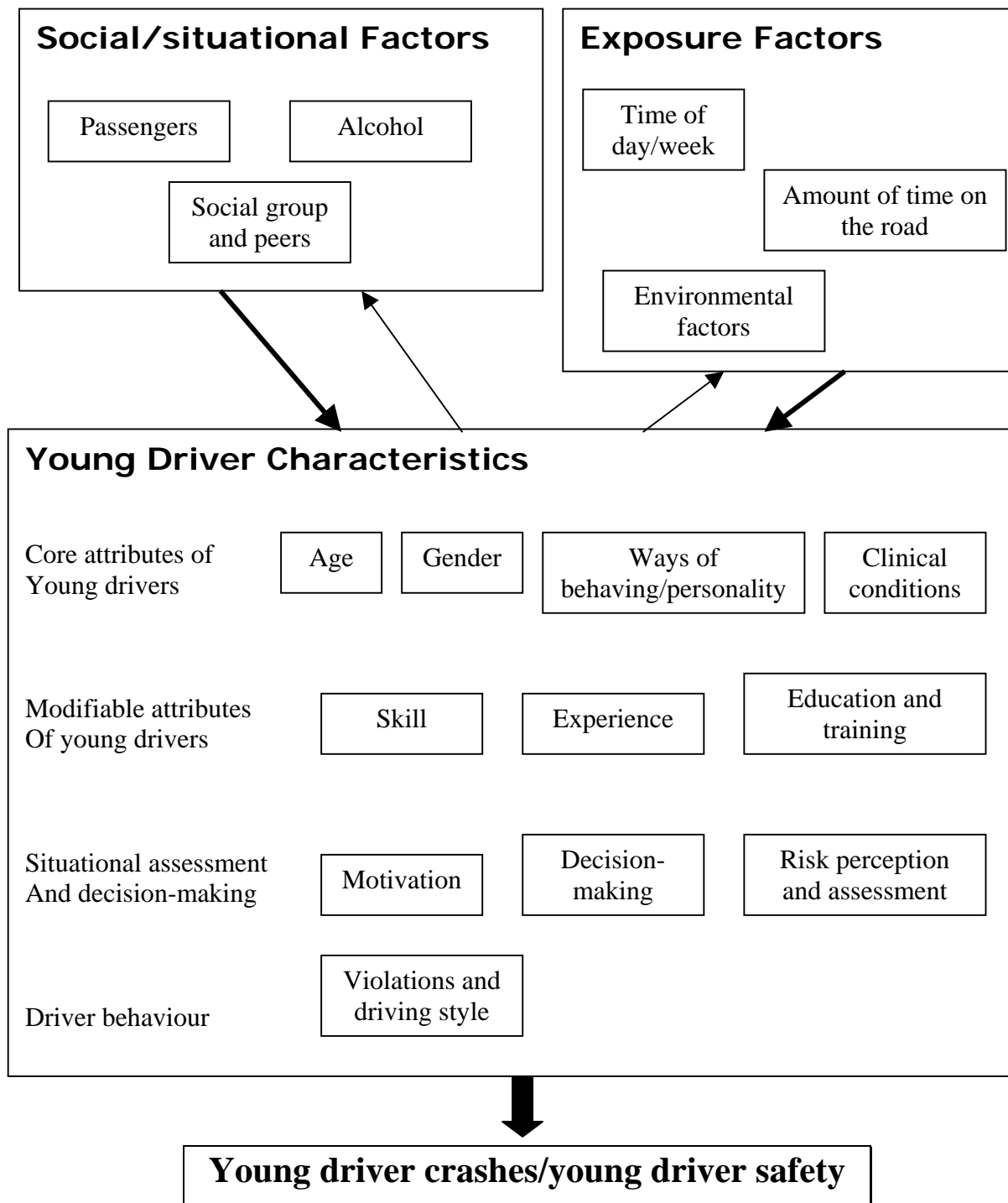
#### **Young Driver Characteristics**

**Age** Age or immaturity is one of the major factors contributing to young novice driver crashes. Indeed, there is a wealth of evidence demonstrating the relationship between age and crash risk. Research indicates that crash risk is between 60 and 70 percent higher for the 17 to 19 year old age group compared to 20 to 24 year olds and two to four times higher than that of older drivers (aged 25 and above) (Williamson, 1999). Moreover, within the young driver group, crash rates vary considerably. From an examination of NSW crash data, Williamson (1999) concluded that the crash risk increases markedly over the first year of licensing, so that 18 year old drivers have the greatest crash risk of all. These rates then decrease for 19-year-old drivers and continue to decrease with age. Researchers argue that the over-representation of young drivers in crashes reflects the fact that teenagers and young adults, as a group, are more willing to engage in risk taking or reckless driving behaviours such as speeding and tailgating (Regan et al., 2001; Williamson, 1999). This increased risk taking, combined with young drivers' inexperience on the road, creates a lethal combination, as young drivers, due to their inexperience, are less likely to be able to cope with the hazardous situations created by their reckless driving (Insurance Institute for Highway Safety (IIHS), 2002). Other factors believed to contribute to the relationship between age and increased crash risk are teenagers' and young adults' tendency to rebel against the advice of adults, peer pressure from their friends and passengers and their tendency to see themselves as immune from harm (IIHS, 2002).

**Gender** The road crash rate for males is disproportionately higher than that for females. Indeed, as both passengers and drivers, the death rates are around three times higher for males than for females (NISI, 2002). Research suggests that one reason underlying males' greater involvement in road crashes is their greater exposure to risk as a result of greater time spent driving (Catchpole et al., 1994). Other factors contributing to the higher crash rates of males are believed to be their tendency to be more reckless and engage in more risky behaviours such as excessive speeding compared to females, as well as their tendency to view the driving task as less risky than females and as something which is a 'natural male skill' (Twisk, 1996; Williamson, 1999).

**Personality** A number of personality factors have been linked with higher crash risk in young novice drivers. These include sensation seeking, aggressiveness and egocentrism (Williamson, 1999). Sensation seeking has been linked to increased risk taking while driving and is at its peak between 16 and 19 years of age. Aggressiveness has also been linked to increased risk taking, as risk taking can often be an expression of anger and hostility. Finally, egocentrism is linked with crash risk in as far as adolescents tend to perceive themselves as being less vulnerable to harm and are therefore generally willing to engage in more risky behaviour than older drivers (Williamson, 1999).

**Driving Skill** A lack of driving skill is believed to be a major factor contributing to the high crash rates of young novice drivers. Driving skill refers to the ability to operate and physically manoeuvre a vehicle without having to devote the majority of one's attentional resources to performing each step in the task (Williamson, 1999). Many young novice drivers, particularly in their first year of driving, have not developed the basic skill of vehicle operation to the extent that it requires little attention and cognitive effort to perform. Young novice drivers are therefore more vulnerable to accidents as they do not possess the required attention to pay to other aspects of the driving task such as impending hazards. Indeed, two of the most salient characteristics of young novice driver crashes is that they are often single vehicle crashes and that they often occur because of driver error in areas such as responding to the unexpected actions of other road users (Catchpole, 1997; Twisk, 1996). Researchers suggest that these types of crashes are mainly due to the lack of driving skill and inefficient hazard scanning skills of young drivers (Catchpole et al, 1994).



**Figure 1.1.** A framework describing the factors relating to young driver safety (Williamson, 1999, p. 5).

***Inexperience*** One of the most important risk factors contributing to young novice driver's over-involvement in crashes is lack of driving experience. Research suggests that compared to more experienced drivers, inexperienced drivers have underdeveloped attentional control, decision making skills, risk perception and time sharing skills (Triggs & Regan, 1998). With regard to attentional control, research suggests that young novice drivers have a deficit in being able to attend to the right tasks in sufficient amounts at the required time compared to experienced drivers and this increases their crash risk. Novice drivers also have difficulty with time sharing, or dealing with multiple tasks, and adjusting their behaviour to meet the more critical demands of the driving task. This is related to novice drivers' lack of driving skill and their inability to perform basic vehicle handling tasks without much conscious effort, leaving little attentional capacity to focus on demands in the road environment.

Young driver crashes are also attributed to young drivers tendency to underestimate the risks involved in driving and their poor risk perception. Risk perception refers to the ability of the driver to detect, perceive and evaluate impending traffic hazards. Research shows that young novice drivers detect fewer hazards, concentrate on non-moving objects at close range and their search patterns are more error prone (Twisk, 1996). Young drivers, particularly young males, also tend to perceive dangerous driving (e.g., excessive speeding) as less hazardous than do experienced drivers and they tend to over-estimate their ability to cope with impending hazards (Twisk, 1996; Williamson, 1999).

In addition to poor risk perception, decision-making is a factor related to inexperience and one that contributes to novice driver crashes. Novice drivers often lack the capacity to cope with all the information required to make critical decisions such as decisions about the timing and speed of an overtaking manoeuvre or the best course of action when faced with a traffic hazard. This is due in part to novice drivers focusing on vehicle handling tasks and, therefore, having less attentional capacity to make crucial decisions in the event of a hazardous situation (Williamson, 1999).

***Driving Violations*** There are several characteristics of young novice drivers' driving behaviour that increases their crash risk. A number of studies have shown that compared to older drivers, young drivers are more likely to drive at excessive speeds (particularly young males), travel too close to the vehicle in front and fail to signal correctly (Baxter, Manstead, Stradling, Campbell, Reason & Parker, 1990; Twisk, 1996). Crash statistics support these findings, particularly in the case of speeding. In 1999, 38 percent of speed-related fatal crashes involved drivers aged under 25 years compared with drivers aged over 39 years, who only constituted 25 percent of drivers involved in these crashes (RTA, 2002).

### **Social/situational factors**

***Passengers and Peer/social Group Pressure*** Accident risk for young novice drivers increases when they carry certain types of passengers. More specifically, when novice drivers carry teenage passengers and when there is more than one teenage passenger in the vehicle, the risk of being involved in a crash increases (Regan & Mitsopoulos, 2000; Williamson, 1999). The presence of passengers can influence driving behaviour for male and female novice drivers resulting in excessive speeding, poor signalling, smaller gap acceptance at intersections and driver distraction, all of which increase crash risk (McKenna, Waylen & Burkes, 1998). The negative effect of passengers on novice driver behaviour, however, appears to be confined to teenage passengers, not to older passengers such as parents (Regan & Mitsopoulos, 2000). One explanation put forward to explain the negative effects of young passengers on driving behaviour is that young passengers exert a controlling role on young

novice drivers, who then alter their driving behaviour to match the perceived expectations of their passengers (Baxter et al., 1990).

**Alcohol** It is well documented that alcohol use is a major risk factor for crashes in young novice drivers. In 1999, 16.5 percent of fatal crashes in NSW involved drink driving. Of the total number of drink drivers involved in fatal crashes, 87 percent were males and 13 percent were females. Of these males, 71 percent were aged less than 40 years and, of these, 55 percent were aged under 25 years. Of the female drivers aged 40 years or less involved in fatal crashes, 40 percent were aged less than 25 years (RTA, 2002a). One interesting finding to emerge from research, however, is that young drivers involved in alcohol-related crashes tend to have lower Blood Alcohol Concentration (BAC) levels than do older drivers involved in crashes (Macdonald, 1994). One explanation why alcohol related crashes are high among young drivers despite their lower overall BAC levels is that the same BAC level has a greater impact on driving performance for young drivers relative to older drivers because of younger drivers inexperience. In other words, the effects of alcohol on driving performance is compounded by young drivers lack of experience and underdeveloped driving skills, resulting in a greater inability to drive after drinking (Mayhew, Donelson, Beirness & Simpson, 1986).

### **Exposure factors**

**Time of day/week** Several studies have demonstrated that time of day and time of week are important risk factors contributing to young novice driver crashes. Many crashes involving young drivers occur over the weekend period and during the late afternoon and night time, times when young drivers are more likely to be travelling (Clark, Ward & Truman, 2000; RTA, 2002a). However, night time driving has been demonstrated to be risky for young drivers even when the amount of night time driving has been controlled for (Crettenden & Drummond, 1994). The large amounts of driving undertaken during the night time hours by young drivers therefore cannot fully account for their increased crash rates during this period. Researchers have suggested that the elevated crash risk for young drivers during the night time period is due to tiredness or fatigue (Clark et al., 2000; Smith & Trinder, 2002).

**Amount of Time on the Road** The amount of time spent on the road is a risk factor for young novice drivers, as more time spent driving increases their exposure to the hazardous road environment. Crash statistics indicate that accident rates, per million kilometres travelled, are highest for young novice drivers and, hence, those young drivers who spend more time on the road have a greater risk of being involved in an accident (Williamson, 1999). However, for young drivers, too little time spent driving is also a risk factor for crashes, as the opportunity to gain experience is limited. Researchers suggest that the solution to this problem seems to be striking a balance between gaining sufficient experience and managing the hazards of the on-road environment (Williamson, 1999).

In summary, young drivers have a higher crash risk compared to their older counterparts for a number of reasons. They have limited driving skills and experience, but tend to over-estimate their driving ability. They tend to be on the road a lot and at the most risky times. They engage in risky driving behaviours, but they often fail to appreciate the consequences of their behaviour and they have underdeveloped risk perception skills. Finally, they tend to be immature, and want to rebel against the advice of adults, yet they are easily influenced by their peers, particularly when these peers are passengers.

### **1.2.1.b ITS for Young Novice Drivers**

To date, no in-vehicle ITS technologies have been designed specifically to enhance the safety of young novice drivers. However, there are several ITS technologies, which are currently on the market or exist as prototypes, that have the potential to confer substantial safety benefits for young drivers. In this section those ITS technologies which would appear to benefit young novice drivers are discussed. Also discussed is the limited amount of research that has examined the behavioural effects and acceptability of ITS technologies among young novice drivers.

Variable speed alerting and limiting systems are likely to offer substantial safety benefits for young drivers given their over-involvement in speed-related crashes. Alerting Intelligent Speed Adaptation (ISA) systems warn drivers when they exceed the speed limit for a given area by issuing the driver a series of visual and auditory warnings. ISA limiting systems, on the other hand, actually limit the speed of the car to the prevailing speed limit, making it impossible for the driver to exceed the speed limit (van Boxtel, 1999). Speed limiting systems and, in particular, limiting systems which incorporate information on current weather and road conditions are likely to be of greatest benefit to young novice drivers, whose driving skills are underdeveloped in terms of being able to adjust their driving behaviour to meet the demands of different driving conditions (Regan et al., 2001). Moreover, to the extent that deliberate speeding is the major contributing factor, speed limiting systems would be more effective in reducing young driver speed crashes, as these systems actually limit the speed of the driver rather than merely provide warnings which can be ignored or drowned out with the radio.

A study conducted by Regan, Mitsopoulos, Haworth and Young (2002) provides some indication of the acceptability of ISA limiting and alerting systems to young drivers aged 18 to 24 years. Drivers' attitudes to, and acceptance of, ISA were obtained through focus group discussions. The results revealed that young drivers believed that only those drivers who inadvertently speed would benefit from the systems. They were also reluctant to embrace the systems unless they had proof that it saved lives, was reliable, encompassed all speed limits in all jurisdictions, could be over-ridden and was fairly inexpensive to install and maintain. Young drivers were also less likely to embrace ISA systems that deliver warnings through upward pressure in the accelerator than systems which deliver warnings auditorily. Finally, there were also concerns raised that young drivers may become over-reliant on the speed system and this may adversely affect their driving skills.

While the results of the Regan, Mitsopoulos, Haworth et al. (2002) study give some indication of the acceptability of ISA systems to young drivers, the participants in that study never actually experienced the ISA systems. It is possible that the acceptability of these systems to young drivers may differ after they have gained experience with them over a period of time.

Forward Collision Warning systems are likely to have substantial safety benefits for young novice drivers given their over-involvement in rear-end collisions in which they are the rear driver. Young drivers are generally more likely to tailgate or adopt shorter headways from the car in front than more experienced drivers and this is believed to be a major contributing factor to their over-involvement in rear-end collisions (Twisk, 1996). Inattention and underdeveloped risk perception skills are also believed to play a major role in young drivers' over-representation in rear-end crashes and, thus, warnings of imminent collisions are likely to be of particular benefit to young drivers. An on-road study conducted by the University of Iowa (1995) examined the effect of a rear-end crash warning system on the following time

gaps of 16 drivers aged 18 to 24 years. Drivers drove a vehicle equipped with a forward collision warning system over two 25-mile test routes. Each driver was tested first under a baseline condition and then under a collision warning condition in which drivers received visual and auditory warnings via a LCD mounted on the vehicle dashboard. On each run the drivers were instructed to follow a confederate vehicle at their normal following distance while the confederate vehicle initiated different braking and constant speed events. The results revealed an increase in mean following distance gaps from 1.5 seconds under the baseline condition, to 2.1 seconds under the collision warning condition. The results of this study highlight that Forward Collision Warning systems are likely to be of particular benefit to young drivers in helping them maintain safer following distances from lead vehicles.

Given that a large majority of young novice driver crashes are single vehicle and run off the road crashes, lane departure warning systems are likely to confer considerable safety benefits for this driver group. Lane Departure Warning control systems are likely to have greater safety benefits than systems that merely warn the driver, for those young drivers who deliberately engage in risky driving behaviour and who may ignore or drown out the auditory warnings. The study by Regan, Mitsopoulos, Haworth et al. (2002) provides an indication of the acceptability of the Lane Departure Warning system to young drivers. The young drivers in the focus group commented that, in order to be acceptable, Lane Departure Warning systems would need to be 100 percent reliable, effective under all driving conditions and ergonomically designed. Concern was also raised that the system might make passengers question young drivers' fitness to drive and there was a reluctance to accept a system, which not only warned them that they were driving off the road, but initiates corrective steering actions. Overall, however, the over-riding factor influencing the acceptability of the system and young drivers' willingness to buy it was the cost.

Alcohol Ignition Interlocks and Sniffer Systems are likely to yield safety benefits for young drivers; particularly those who are recidivist drink drivers. As discussed earlier, it is well documented that alcohol use is a major risk factor for crashes in young novice drivers. By preventing drivers from starting their car if they have a BAC above a certain level, Alcohol Ignition Interlocks and Sniffer Systems have the potential to prevent many alcohol related crashes. The findings of the Regan, Mitsopoulos, Haworth et al. (2002) study give some indication of the acceptability of these systems to young drivers. Generally, the young drivers felt that, in order to be acceptable, the Alcohol Interlock and Sniffer Systems would have to be 100 percent reliable and not prone to false alarms. The young drivers also indicated that engine immobilization by the Sniffer System would be unacceptable, as would the alcohol interlock, as it would be irritating to have to blow into the breathalyser each time they start the car. The drivers indicated that they would not be willing to buy either of the systems; however, they may be willing to accept a system that can be turned on and off as the driver wishes.

Electronic drivers' licenses have the potential to confer substantial safety benefits for young novice drivers. Electronic licenses can prevent unlicensed drivers from driving, but they also have the ability to enforce driving restrictions for certain drivers or driving sub-groups, such as preventing driving at night or not driving with passengers (Regan et al., 2001). However, at this stage it is not known whether young drivers will accept the electronic licensing technology.

Route navigation systems are another ITS technology that has the potential to increase young novice driver safety, by helping to reduce the amount of mental capacity previously used by young drivers to navigate in unfamiliar areas. This will in turn generate a greater capacity to

detect hazards in the road environment (Regan et al., 2001). The acceptability of navigation systems by young novice drivers and their potential to result in negative behavioural adaptation is currently not known; nor is it known if use of the system would encourage more driving, which would increase exposure to risk.

Several other ITS technologies, such as Vision Enhancement Systems and Fatigue Monitoring Systems, also have the potential to increase the safety of young novice drivers; however, these systems are still not widely commercially available (Regan et al., 2001). Hence, little is known about their potential safety benefits for young novice drivers, or whether these drivers would find them acceptable.

Overall, there has been little research conducted to date that has examined in-vehicle ITS technologies and their potential to increase road safety for young novice drivers. This is surprising given that young novice drivers, along with the rest of the driving population, are likely to derive significant safety benefits from the deployment of ITS applications. The potential safety benefits of ITS for the young novice driver population and the acceptability of these technologies to young novice drivers is therefore an important area of research.

## **1.3 What is Acceptability?**

### **1.3.1 Introduction**

Over recent decades several models have been developed to explain and predict user acceptability of various technologies. The vast majority of this work on user acceptability has been conducted in the Information Technology domain. While several studies in the area of ITS have been conducted to examine the acceptability of ITS technologies to drivers, almost all of these studies failed to provide an operational definition of what is meant by the term acceptability (Regan, Mitsopoulos, Haworth et al., 2002). In the following sections of the report, acceptability is defined and the constructs that underlie it are discussed. Following this, research conducted in Australia and overseas which has examined the acceptability of ITS technologies to drivers is reviewed.

### **1.3.2 Acceptability: A Definition**

Acceptability has been defined by Nielsen (1993, p.24) as “...basically the question of whether the system is good enough to satisfy all the needs and requirements of the users and other potential stakeholders”. In addition to this definition, a number of constructs have also been proposed to underlie acceptability. For the purpose of their research on ITS acceptability to Victorian car drivers, Regan, Mitsopoulos, Haworth et al. (2002) partitioned acceptability into the following key constructs::

- *Usefulness* – the system must serve some goal or purpose. Perceived usefulness has been defined as “the degree to which a person believes that using a particular system will enhance his/her performance” (Davis, 1989, p. 320).
- *Ease of Use* – This is often equated with Usability. Ease of use can be defined as the ability for users to use the system successfully and with minimal effort.
- *Effectiveness* – This refers to the system functioning according to its design specifications, or in the manner it was intended to function.

- *Affordability* – This refers to whether users are willing to purchase the system and how much they are willing to pay for the system.
- *Social Acceptability* – This addresses more global social issues of acceptability that are taken into account by users when they judge the acceptability of technologies. Within the ITS context this may refer to issues of deployment (e.g., should these systems be optional or compulsory).

### **1.3.3 Acceptability Testing and ITS**

Several studies have been conducted to examine the acceptability of ITS technologies to drivers. However, there is little consistency across the vast majority of these studies as to what acceptability is or how it should be measured. Making comparison across studies as to the acceptability of specific ITS technologies is therefore difficult. To date, only one study known to the authors has attempted to develop a tool for measuring driver acceptance of ITS technologies.

Van de Laan et al. (1997) developed a scale to measure driver acceptance of ITS technologies. The questionnaire contained 9 items each consisting of a 5-point rating scale (-2 to +2) and polar opposite words at each end of the scale (e.g., useless and useful). Van de Laan et al. employed the scale to elicit user opinions on the acceptability of six ITS technologies: a system that monitored drivers' law abiding behaviour; a simulated adaptive cruise control system; two variants of a simulated intelligent speed adaptation system; and two variants of a forward collision warning system that were tested both on the road and in a driving simulator. The scale was administered before and after use of the technologies or just after use of the technologies. The results from a factor analysis revealed that the items loaded on two factors: one relating to usefulness and the other to satisfaction. While this scale was a useful step towards developing a measure of acceptability, it was limited in that it only provided a measure of acceptability on two dimensions.

The following sections review studies from Australia and overseas, which have examined driver acceptance of ITS technologies. One thing that is noteworthy about this research is that almost every study fails to provide an operational definition of acceptability, making it difficult to determine what aspects of acceptability they have measured and thus to compare the results across studies (Regan, Mitsopoulos, Haworth et al., 2002).

### **1.3.4 Australian Research on ITS Acceptability**

To date only four Australian studies have examined the acceptability of ITS technologies to drivers.

#### **1.3.4.a Cairney (1995) Study**

One of the first studies undertaken in Australia on the acceptance of ITS was conducted by Cairney (1995). This study aimed to elicit consumer opinions of several ITS technologies. The technologies examined included: a vehicle monitoring system; a route guidance system; emergency notification "Mayday" systems; congestion avoidance systems and adaptive cruise control. Participants' views on the acceptability of night vision enhancement and fatigue monitoring systems were also discussed, although in less detail. A total of 16 focus groups was conducted in 5 Australian cities (Melbourne, Sydney, Perth, Bendigo and Katanning).

During the focus groups, participants completed a questionnaire, which asked them to rate the perceived usefulness of each technology, how much they would be willing to pay for it and how often they might need it. Participants were also shown a video describing the functional operation of each system and then asked to discuss each of these systems in turn.

The results revealed that many participants felt that the route guidance system had value in unfamiliar environments and for road users such as taxis and couriers, but did not feel that they personally needed this system in their vehicle. With regard to the vehicle monitoring system, which was assumed to provide information on system malfunctions such as a flat battery, participants felt that this system could be very useful and could save them money on repair bills by ensuring that maintenance is carried out in a timely fashion. The emergency notification “Mayday” system was valued by the participants for ensuring that help got to injured family members quickly and to ensure a quick recovery of stolen vehicles. Participants recognised the value of the congestion avoidance system, however they were sceptical that the system would make it possible to avoid congestion in many instances. With regard to the adaptive cruise control system the participants felt that this system was the least useful of all the systems discussed and felt that it would make drivers complacent and unprepared to deal with an emergency situation. Finally, the participants felt that the night vision enhancement system would be beneficial for detecting hard to see objects such as pedestrians and cyclists at night and felt that the fatigue monitoring system would be useful, particularly on long trips (Cairney, 1995).

#### **1.3.4.b Harrison, Senserrick & Tingvall (2000) Study**

A more recent study examining ITS acceptability was conducted by Harrison, Senserrick and Tingvall (2000). This study focused specifically on seatbelt reminder systems and aimed to develop a research method that could be used to assess the likely effects of these systems on drivers. Seatbelt reminder systems alert the driver when they, or one of their passengers, is unrestrained. The seatbelt reminder system fitted to the TAC SafeCar (Regan, Mitsopoulos, Triggs et al., 2002) is the only system of its kind known to exist in Australia. For greater detail on the seatbelt reminder system and other ITS technologies fitted to the TAC SafeCar, the reader is referred to Regan, Mitsopoulos and Triggs (2002).

A total of 12 focus groups involving 72 participants were conducted. During the groups participants completed a questionnaire designed to collect information on their seatbelt use and the motivational factors influencing seatbelt use. Following this, there was a group discussion where participants discussed their first reactions to the system, their thoughts about circumventing the technology, how other drivers might react to the technology and predictions about how the technology would affect behaviour.

Analysis of the discussion group data revealed that most participants were positive about the system, particularly as many of them attributed their non-use of seatbelts to forgetfulness and would find the warnings provided by the system useful. In addition, there were few participants who expressed that they would tamper with, or attempt to circumvent, the technology. There was concern raised that the sensors in the seats may not detect light children or that they may detect and trigger seatbelt warnings for heavy objects such as luggage. Overall, however, there was a general consensus among participants that the system would provide positive safety benefits.

#### **1.3.4.c Gray (2001) Study**

A survey commissioned in 2001 by the National Roads and Motorists Association (NRMA) examined the acceptability of four ITS technologies. The results of this survey were reported in a paper by Gray (2001) at the 8<sup>th</sup> World Congress on Intelligent Transport Systems.

The telephone survey was designed to elicit consumers' attitudes toward four in-vehicle ITS technologies: forward collision warning, route guidance system and two variants of intelligent speed adaptation (alerting and limiting). Intelligent speed adaptation (ISA) is a generic term for a range of speed reducing systems, in which the driver is warned when he or she is travelling, intentionally or inadvertently, over the posted speed limit for a given location. ISA systems establish the position of the vehicle, compare the current speed and location of the vehicle with the maximum local speed limit for that location and respond if the vehicle exceeds this posted limit. There are two main variants of ISA, speed alerting and speed limiting systems. The former variant merely warns the driver if he or she is exceeding the posted speed limit; the latter limits the speed of the vehicle to the posted speed limit. Forward collision warning systems rely on frontal radar or laser technologies to detect if the vehicle is travelling too close to the vehicle ahead and alert the driver, via visual and auditory warnings, if a collision is imminent. Route guidance systems, as noted previously, allow the driver to program into an on-board computer the street and number of a desired destination and then issue turn-by-turn visual and verbal instructions (e.g., "turn right in 50 metres") for reaching the destination.

The telephone survey was conducted on a sample of 1,200 people in Melbourne, Sydney, Brisbane, Adelaide and Perth. Survey respondents were provided with a brief description of each technology over the phone and were then asked several questions regarding the perceived effectiveness of the technologies: whether they think they would be distracted by the systems; if they would use the technologies if they were equipped to vehicles and how much they would be willing to pay for the systems. Between 75 and 85 percent of respondents indicated that the technologies would be effective, with the route navigation system deemed as the most effective and useful. In addition, 30 to 60 percent of respondents indicated that they would be distracted somewhat or a great deal by the four systems, with the level of predicted distraction lowest for the speed alerting system and equal highest for the route navigation and speed limiting systems. With regard to whether they would be prepared to pay more for vehicles fitted with each of the four technologies, between 27 and 43 percent of respondents said that they would, with the speed alerting system being the system most respondents would be prepared to pay more to purchase. Overall, support for the four technologies discussed was generally high, with only 4 percent of respondents opposed to the introduction of the technologies.

#### **1.3.4.d Regan, Mitsopoulos, Haworth & Young (2002) Study**

The most recent Australian study to examine ITS acceptability was carried out by Regan, Mitsopoulos, Haworth et al. (2002). This study was concerned with the acceptability of seven in-vehicle ITS technologies to Victorian car drivers. In contrast to the other Australian studies described previously, this study provided an operational definition of what was meant by the term "acceptability" and allowed for the examination of which dimensions of acceptability are of most importance to drivers in choosing to purchase particular ITS technologies.

The seven ITS technologies examined in this study were: forward collision warning; intelligent speed adaptation; emergency notification (Mayday); electronic licensing; alcohol

interlock; fatigue monitoring and lane departure warning. A total of eight focus groups was conducted and involved 52 Victorian car drivers ranging in age from 18 to 83 years. The participants were recruited through a telephone survey and by word of mouth. During each focus group participants completed a questionnaire which obtained information on participants' driving behaviour and their prior experience with ITS and other technologies. Participants also viewed a video that described the functional operation of each technology under discussion and were then asked to discuss these technologies. A maximum of two technologies were discussed in each focus group session in order to obtain detailed information about the participants' attitudes towards each technology. The technologies chosen for discussion in each focus group were based on a consideration of which group of drivers would be likely to confer the greatest safety benefit from each system.

With regard to the forward collision warning system the participants indicated that the system would be useful, particularly for those drivers who habitually tailgate. However, the participants also indicated that, in order for this system to be acceptable, it must be technically effective in all driving conditions, be reliable, have a low false alarm rate, be capable of detecting pedestrians and hazards in addition to vehicles and have evidence that it is effective in reducing the incidence and severity of crashes.

Many participants felt that the alerting and limiting intelligent speed adaptation systems would be effective, particularly for those drivers who inadvertently exceed the speed limit, but not those drivers who intentionally speed. Participants also indicated that, to be acceptable, the speed limit information provided must coincide exactly with posted speed limits, the speed limiting system must be able to be over-ridden and have evidence that the systems save lives. Over-reliance on the system was cited as one drawback of system use, particularly by the younger drivers.

Participants agreed that they liked the idea of the emergency notification (Mayday) system and felt that it would be of greatest benefit to them when they are driving in rural areas. However, there was some concern over whether the system would function effectively in country areas where mobile phone reception is generally poor or non-existent. There were also concerns over the potential for the system to be abused, the cost of the system itself and of individual calls and the reliability of the system and whether it would function in certain accident conditions.

The participants voiced concerns over the use of the electronic licensing system including how the technology worked, the potential for the system to be cheated and misused by some drivers, and the legal implications that might result from use of the system. The participants did, however, agree that the system would be useful in preventing drink driving, theft and unlicensed driving.

Participants agreed that the alcohol interlock and sniffer systems would be useful, particularly for repeat drink driving offenders. There was concern however, that the sniffer system might pose a potential danger to car occupants when it disables the car's engine two minutes or more into the drive. They also suggested that a voluntary sniffer or interlock system, which drivers can choose to disable, would be more acceptable and more appealing to buy than a mandatory system which cannot be turned off by the driver.

Participants thought that the fatigue monitoring system was a good idea and would be effective in reducing fatigue related accidents, particularly for those drivers who drive long distances. Concerns were raised, however, over the ability of the system to accurately detect

when the driver is showing signs of fatigue. The reliability of a system that takes over control of the car was also of concern to participants, as they felt that this system had the potential to be very dangerous. Participants were not against compulsory introduction of the technology for cars less than 20 years old, provided it was government subsidised and provided mandatory installation of the technology was well enforced.

Finally, participants felt that the lane departure warning system was a good idea and would be useful, particularly for country driving and when driving for long periods of time. They did however, raise some concerns as to whether the system would function effectively on different road types and under different weather conditions. With regard to the usability of the system, the participants felt that the visual warning would be distracting to the driver and possibly even dangerous and that the size and location of the visual display would also pose similar problems.

Several common themes emerged through the discussions about each technology. These were that all of the systems must be 100 percent reliable or close to it, there must be evidence that each system saves lives and they must be inexpensive to purchase and maintain. Overall, the participants were willing to pay between \$80 and \$1,500 for the various systems.

### **1.3.5 Overseas Research on ITS Acceptability**

Several studies have been conducted overseas to examine the acceptability of ITS technologies. The methods used varied considerably across studies, with some studies employing focus groups to elicit information on driver acceptance, while others have conducted their research in driving simulators or in actual vehicles on the road. In the following sections overseas research on ITS acceptability is reviewed. The focus is on those technologies for which the greatest amount of acceptability data has been collected.

Numerous studies have examined the acceptability of alerting and limiting intelligent speed adaptation (ISA) systems to drivers. Much of this research has been conducted in Sweden, the United Kingdom, the Netherlands, Denmark and Finland, but more recently countries such as Japan have begun examining consumer attitudes towards ISA. Further on-road studies will commence shortly in Australia, the United Kingdom, Sweden (involving buses in the city of Gothenburg), the Netherlands, Finland, Hungary, Spain, Belgium and France. It is beyond the scope of this report to review findings of these studies in detail. For a state-of-the-art review of these studies, the reader is referred to Regan, Young and Haworth (2002). It is worth noting, however, some of the key findings that have emerged from these studies.

To date, studies that have investigated user acceptance of intelligent speed adaptation technologies have demonstrated that the acceptance of speed alerting systems is fairly high (Várhelyi, 2002). Feedback obtained from test drivers in a number of trials revealed that driving a vehicle equipped with a speed alerting system leads to an increased awareness of current speed limits and makes it easier to adhere to these speed limits, particularly on low-speed roads (e.g., 30 km/h) (Sundberg, 2001). Moreover, despite the lower average speeds, there is little evidence that drivers engage in compensatory behaviours such as running red lights and inappropriate speeds at intersections and around bends. Driver acceptance of informative systems is generally quite high, with 70 to 80 percent of test drivers reporting a favourable attitude towards the system. There is also no evidence to suggest that use of speed alerting systems increases cognitive workload or distracts the driver. However, although not found in all studies, there is evidence that informative systems lead to a decrease in driving

pleasure, increased frustration at the lower overall speeds and increases in travel times (Sundberg, 2001).

Research on the acceptability of speed *limiting* systems, however, is less promising. One negative behaviour that has been observed with use of the speed limiter system is the tendency for drivers to adopt shorter time-headways when following a slow lead car (Várhelyi, Comte & Mäkinen, 1998), although in some studies it was observed that drivers tended to keep a greater distance from other road users when driving a speed limited vehicle (Almqvist & Nygård, 1997; Duynstee Katteler & Martens, 2001). Driver acceptance of variable speed limiting systems has been quite mixed. Some drivers report an increase in frustration and irritation from other drivers (e.g., tailgating) as a result of the system (Carsten & Fowkes, 2000; Päätaalo, Peltola, & Kallio, 2002), while others do not (Almqvist & Nygård, 1997). Similarly, some drivers report that they engaged in compensatory behaviours such as running red lights or driving faster when turning left or right (Almqvist & Nygård, 1997), while others report that they did not attempt to compensate for the lower overall speeds (Duynstee et al., 2001). Finally, some drivers reported that they paid more attention to the driving task when driving a car equipped with a speed limiter (Carsten & Fowkes, 2000), however other drivers have reported that they found this system demanding in terms of required attention and concentration and some even reported that they found the system dangerous (Päätaalo et al., 2002). Overall, it appears that while the variable speed limiting systems are the most effective means of speed reduction when compared to variable speed alerting systems, speed limiting systems are deemed as less acceptable by drivers. Várhelyi (2002), in summarising the results of a number of ISA studies, comes to a similar conclusion. He suggests that intelligent speed adaptation systems, which adaptively inform the driver that he or she is exceeding the posted speed limit, have the highest degree of acceptance by drivers, while systems that adaptively limit the speed of the car to the posted limit (or some other threshold speed) have the lowest acceptance. However, after trying the different systems, drivers seem to become less positive towards informative systems and less negative towards limiting systems.

A paper by Brackstone and McDonald (2000) in the United Kingdom, reviewed studies on driver acceptability of three in-vehicle Advanced Vehicle Control and Safety Systems (AVCSS): forward collision warning systems (FCW), in which drivers receive warning information when they are travelling too close to the vehicle in front; forward collision avoidance systems (FCA), which allow the vehicle to take control and decelerate in situations where a collision is imminent; and adaptive cruise control (ACC) systems, where control is exerted on the accelerator and/or brakes in order to maintain a fixed headway from the vehicle ahead. Brackstone and McDonald review several studies on ACC acceptability. The findings from these studies suggest that drivers generally feel “comfortable” with ACC, with many rating driving with the device as preferable to driving unaided (e.g., Fancher, Bareket, Bogard, MacAdam, & Ervin, 1997). This finding has been confirmed for many different versions of ACC, with drivers indicating high acceptance on dimensions of usefulness (McLaughlin and Serafin, 1997), comfort (Hogema, Janssen, Coemet, & Soeterman, 1996), and stress reduction and softness (Nilsson, 1995). Becker et al. (1995; cited in Brackstone & McDonald, 2000) found that following distance warning systems, which warn drivers if they are following the vehicle in front too closely, are viewed with a similar degree of acceptance as ACC systems (consistently rating at or over 5 out of 7 for quality, comfort, benefit and safety). Brackstone and McDonald also reviewed several studies that have examined acceptable purchase prices to consumers. For ACC systems, these prices have ranged from around \$300 to \$600. Consumers are likely to pay less for collision warning systems. Overall,

Brackstone and McDonald conclude that there is clear evidence that the three systems reviewed are viewed positively by drivers.

In another study, Mankinen, Anttila, Penttinen, Marchau and Stevens (2001) examined driver preferences regarding the implementation of three in-vehicle ITS technologies. The study was conducted as part of the European Commission Fifth Telematics Framework funded project known as ADVISORS (Action for advanced Driver assistance and Vehicle control systems Implementation, Standardisation, Optimum use of the Road network and Safety). The ITS technologies examined were adaptive cruise control (ACC), intelligent speed adaptation (ISA) and route navigation. A total of 911 car and heavy vehicle drivers throughout Europe were questioned about their expectations and preferences regarding these systems. Information on the willingness of users to adopt these systems were obtained by assessing the preferences of these user groups to different system characteristics, different levels of automated intervention, and different levels of system price. Among the private and professional car drivers, the navigation function was judged to be the most important ITS function (Schmeidler, 2001). Heavy vehicle drivers also judged the route navigation system as the most important, but not on motorways and rural roads where the ACC function was deemed to be the most important function. The most preferred attribute of a route navigation system was its ability to be able to receive and utilise real-time information about traffic congestion and other traffic conditions and use this to plan an appropriate detour for the driver. Drivers of all vehicles preferred ACC and ISA systems that warned the driver rather than systems which controlled driver behaviour. Drivers regarded an ISA warning system as especially attractive in non-motorway environments, such as urban areas.

In 1995, Goldberg developed and tested an electronic smart card or license that can store information about the driver (e.g., identification details, traffic offence details, relevant health and medical details in the event of a crash, class of vehicles authorised to be driven, etc.). The card is used in place of an ignition key and the vehicle will only start if the driver is authorised to drive the vehicle. A few studies known to the authors have examined the acceptability of electronic licensing technology to drivers. The Swedish National Road Administration conducted a field trial involving 15 vehicles equipped with a smart card system. Myhrberg (1997; cited in Rumar et al., 1999) concludes that the concept works in practice and that it could have considerable effect on traffic safety by preventing unauthorised driving and car theft. The users in the study experienced no difficulties getting used to the electronic licensing system and their attitude was generally positive. In another study, Marwah, Gifford, Maggio, and Stough (1998) interviewed 106 truck and bus drivers about the acceptability of electronic commercial driving licences in the US. They found neither overwhelming support nor opposition to the licences. Most truck drivers had positive attitudes towards the security they offered. However, 60 percent of respondents were concerned about the loss of personal, financial and job-related privacy. The largest threat to privacy for most drivers was the potential for abuse and misuse of the system and its data by the government. For instance, it was considered that they could be used erroneously and lead to the misidentification of a driver, or that information could be provided to insurance companies.

### **1.3.6 Summary**

In summary, a number of Australian and overseas studies have examined the acceptability of in-vehicle ITS technologies. The methods used to measure acceptability have varied considerably across studies. Some studies have employed focus groups or telephone surveys with respondents who have never experienced the ITS technologies to obtain information on

acceptability. Other studies have examined the acceptability of particular ITS technologies after participants had limited or extended experience with the systems in driving simulators or in actual vehicles on the road. A common theme in almost all of these studies, however, is the lack of an operational definition of the term acceptability (Regan, Mitsopoulos, Haworth et al., 2002).

Overall, the findings from the Australian and overseas studies reviewed suggest that the acceptability of in-vehicle ITS technologies is generally high. Provided that ITS technologies are reliable under all circumstances, are reasonably priced, do not take away too much control from the driver and have been demonstrated to reduce the incidence and severity of crashes, they are likely to be deemed acceptable by many drivers.

## 1.4 Purpose of the Current Study

The research documented in the current report constitutes Stage 1 of a proposed three-stage project. Stage 1 of the project was funded by the Motor Accident Authority (MAA) of NSW. The purpose of the three-phase project is to select, trial and evaluate the effectiveness of several in-vehicle Intelligent Transport System (ITS) technologies, which are estimated to have the potential to significantly reduce the incidence and severity of young novice driver crashes in NSW.

Stage 1 of the project, which is the subject of the current report, aimed to examine the acceptability, to a sample of young novice drivers from metropolitan and rural NSW, of several in-vehicle ITS technologies from which young drivers are likely to derive significant safety benefit. It is acknowledged that a failure of drivers to accept a technology can result in them either not using it in the manner intended, or not using it at all (Cairney, 1999) Despite this, only a very limited number of studies to date have examined the acceptability of ITS technologies to young drivers and of these, none have focused *specifically* on young novice drivers (Gray, 2001; Regan, Mitsopoulos, Haworth et al., 2002). Moreover, none of these studies have examined whether and how the acceptability of ITS technologies differs across drivers from metropolitan and rural areas. In order for the full safety potential of in-vehicle ITS technologies for young drivers to be realised, it is essential that young drivers' acceptability of these devices be established and those barriers that may prevent them from purchasing the technologies and using them in the intended manner be identified. It is also important that the perceived acceptability of ITS technologies to drivers from diverse geographical locations be compared and contrasted, as this may differ considerably as a result of the different driving and traffic conditions they experience.

The two subsequent proposed phases of the project would involve an on-road trial and evaluation of several ITS technologies to young novice drivers. In Stage 2 of the project, a prototype vehicle will be equipped with the ITS technologies selected in Stage 1. The third and final phase of the project will involve the conduct of a community trial and evaluation study in NSW, in which a number of vehicles are equipped with the selected ITS technologies and driven for an extended period of time by selected novice drivers. Such research involving on-road trials is essential as, to date, almost nothing is known about the potential impact of ITS technologies on young novice driver safety. This lack of research is alarming given that young novice drivers constitute an enormous road safety problem in Australia and overseas and are estimated to benefit substantially from the use of these technologies.

## 1.5 Phases of the Study and Structure of the Report

The aim of the current study was to assess the acceptability of several in-vehicle ITS technologies to young novice drivers from metropolitan and rural NSW, for whom the technologies were likely to confer the greatest safety benefit.

The study was conducted in two phases. The first phase was to determine the ITS applications that should be assessed for their acceptability among the young driver sub-groups. This involved the identification, through analysis of NSW crash data, of those young driver sub-groups who are over-involved in certain crash types. The driver sub-groups were categorised according to age and sex group (for example, males aged 17 to 20 years). Next, the causes of these crash type were determined and the ITS technologies that were capable of addressing these crash causes were identified. Finally, the composition of the focus groups, in terms of which young driver sub-groups would discuss which technologies, was determined. Phase 1 activities are documented in Chapter 2.

Phase 2 of the project involved assessing the acceptability of the ITS applications identified in Phase 1, using focus groups involving the young driver sub-groups also identified in Phase 1. A random number telephone survey to residents in the Sydney metropolitan area and the rural city of Wagga Wagga was used to recruit focus group participants. Chapter 3 details the recruitment process. The procedure followed in conducting the focus groups is discussed in Chapter 4. In Chapter 5, the results of the focus group discussions are presented and discussed. Finally, in Chapter 6 the results of the study are discussed in the context of previous research on acceptability and their implications for reducing road trauma.

# **Chapter 2. SELECTION OF ITS TECHNOLOGIES AND DRIVER SUB-GROUPS**

## **2.1 Introduction**

As discussed in Chapter 1, the purpose of this study was to assess the acceptability of several in-vehicle ITS technologies to young novice drivers who reside in metropolitan and rural NSW. Before the assessment of acceptability could begin, it was necessary to identify those young driver sub-groups who are over-involved in certain crash types; determine the possible causes of these crashes; identify the ITS technologies that are capable of addressing these causes; and then determine the composition of the focus groups, in order to ensure that the sub-groups which discuss a particular technology are those who are likely to derive the greatest benefit from its deployment.

This chapter identifies the young driver sub-groups that are over-involved in certain crash types in NSW through the examination of a crash database. The possible causes of each of the crash types examined are then discussed and the in-vehicle ITS technologies which are capable of addressing these causes are identified. Finally, the composition of the focus groups and the ITS technologies which will be discussed in each of these focus groups are determined.

## **2.2 Analysis of Young Novice Driver Crash Data**

A New South Wales crash dataset supplied by the Road Transport Authority (RTA) was used to determine which young driver sub-groups were over-involved in certain crash types in that state. The database contained data on all police-reported crashes involving drivers aged between 17 and 25 years that occurred in NSW during the 5-year period from 1996 to 2000. Before conducting the analyses several preliminary changes were made to the database in order to ensure that the crash data met several criteria important for the conduct of the focus groups.

First, those crashes where the driver was controlling a truck and motorcycle were removed from the database. This was because crashes involving trucks and motorcycles made up a small number of crashes in the database and the drivers of these vehicles were not going to be considered for inclusion in the focus groups. Second, drivers who held a learners permit were also removed from the database, as the number of these drivers involved in crashes was very small and, due to their limited driving experience, their opinions regarding the acceptability of ITS technologies may not have been meaningful.

Third, the database was categorised into four sub-groups according to age and gender in order to allow for the identification of crash over-involvement for each sub-group separately. The sub-groups created were males aged 17-20; females aged 17-20; males aged 21-25 and females aged 21-25 years. These were also the sub-groups that were examined and compared in the focus groups. The database was categorised further into those drivers who resided in metropolitan areas, rural areas, in states of Australia other than NSW and those drivers whose place of residence was unknown. However, as the focus groups only concerned those drivers who resided in metropolitan and rural NSW, drivers who resided interstate or whose place of

residence was unknown were excluded from the analyses. In order to determine which areas of NSW were classified as metropolitan and which were classified as rural, the National PreSort Plan developed by Australia Post to divide NSW postcodes into metropolitan and rural postcodes was used.<sup>1</sup> Based on this plan, the Sydney, Newcastle and Wollongong areas were classified as metropolitan and all other areas in NSW were classified as rural. It is important to stress that the metropolitan and rural categories in the database refer to the drivers' place of residence, not the area in which the crash occurred.

The types of crashes examined in the analyses were: speed-related crashes; fatigue-related crashes; alcohol-related crashes; crashes where the driver was not wearing a seatbelt; crashes where distraction inside and outside of the car was a contributing factor and crashes where the driver's licence was invalid (e.g., expired, disqualified or cancelled) or where the driver was unlicensed. Crashes where the contributing factor was coded as driver error were also initially examined; however, these crashes were often coded as involving excessive speeding and therefore offered little information beyond the speed-related crash data. These crashes were therefore not included in the analyses. Crashes where the driver's seatbelt was not fitted were also excluded from the analyses, as there are very few cars without a seatbelt fitted to the driver's seat and this category therefore made up a very small number of crashes in the database. In addition, although distraction-related crashes were divided into several different contributing factors, only those crashes coded as the driver being distracted by something inside the car or distracted by something outside the car were examined. This was because the other distraction categories accounted for very few crashes or they were similar to another category already being examined, such as fatigue.

Finally, it is important to note that, as the analyses did not take into consideration the total number of drivers on the road (e.g., all drivers, not just those involved in crashes), or the distances travelled by these drivers in each sub-group, they are not crash risk assessments. Rather, they simply identify the sub-groups that are over-involved in each crash scenario.

## **2.2.1 Involvement of Young Novice Drivers in NSW Crashes**

Analyses were conducted to identify the young driver sub-groups that are over-involved in those NSW crashes where the contributing factor was coded as excessive speeding, fatigue, alcohol, or distraction. Crashes that involved non-use of restraints and driving with an invalid or no licence were also examined. These analyses determined the percentage of drivers in the crash data set from each age/sex group who were involved in each crash type and compared this to both their involvement in all crashes, and the relative involvement of other sub-groups in crashes.

The number (and percentage) of drivers in the modified crash data set from each sub-group involved in *all* crashes in NSW between the years of 1996 and 2000 is displayed in Table 2.1 for the state as a whole and for the metropolitan and rural areas separately. As illustrated, almost twice as many young male drivers were involved in crashes compared with females. This pattern is reflected in the number of crashes for the whole of NSW, as well as for the metropolitan and rural areas separately. In addition, many more drivers involved in crashes resided in metropolitan areas compared to rural areas. More specifically, 87.4% of young

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<sup>1</sup> Postcodes were used to classify the rural and metropolitan regions, rather than RTA regional codes, as the crash database classed drivers place of residence in terms of a postcode, not a region or suburb. Therefore, in order to divide the database into metropolitan and rural areas, it was necessary to determine which postcodes, rather than which areas, were classified as metropolitan or rural.

drivers involved in crashes resided in metropolitan NSW. Only 12.6% of young drivers in crashes lived in rural areas.

**Table 2.1.** Number of drivers in the dataset from each age/sex group involved in crashes in NSW as a function of their residential status

	Age/sex group				Total
	Males 17-20	Females 17-20	Males 21-25	Females 21-25	
No. of total crashes for each sub-group	<b>36109</b>	<b>17546</b>	<b>34073</b>	<b>19380</b>	<b>107108</b>
% of total crashes for each sub-group	33.7	16.4	31.8	18.1	100
No. of metro driver crashes	<b>30985</b>	<b>14755</b>	<b>30637</b>	<b>17204</b>	<b>93581</b>
% of metro driver crashes	33.1	15.8	32.7	18.4	100
No. of rural driver crashes	<b>5124</b>	<b>2791</b>	<b>3436</b>	<b>2176</b>	<b>13527</b>
% of rural driver crashes	37.9	20.6	25.4	16.1	100

### *Speed-related Crashes*

Speed-related crashes were identified as those crashes in the database which were coded as having a speeding controller as a factor contributing to the crash. Table 2.2 displays the number of drivers from each sub-group who were involved in speed-related crashes. More than twice as many males than females were involved in crashes where excessive speed was coded as the contributing factor. Drivers from the younger age group were also involved in a greater number of speed-related crashes compared to the older age groups, regardless of gender.

**Table 2.2.** Number of drivers from each age/sex group involved in speed-related crashes

Age/sex group	No. of drivers in speed-related crashes
Males 17-20	5987 (46.5)
Females 17-20	1732 (13.5)
Males 21-25	3810 (29.6)
Females 21-25	1342 (10.4)
<b>Total</b>	<b>12871 (100)</b>

Percentage of drivers in crashes in parentheses

The number of drivers from each sub-group involved in speed-related crashes as a function of residential status is displayed in Table 2.3. A higher number of males and females who resided in metropolitan, as opposed to rural areas were involved in speed-related crashes. This pattern was consistent across age groups.

**Table 2.3.** Number of drivers from each age/sex group who were involved in speed-related crashes as a function of residential status

<b>Age/sex group</b>	<b>Residential Status</b>	
	<b>Metro</b>	<b>Rural</b>
Males 17-20	4807 (46.6) <sup>#</sup>	1180 (46.1) <sup>#</sup>
Females 17-20	1282 (12.4)	450 (17.6)
Males 21-25	3192 (31.0)	618 (24.2)
Females 21-25	1032 (10.0)	310 (12.1)
<b>Total</b>	<b>10313 (100)</b>	<b>2558 (100)</b>

Percentage of drivers in crashes in parentheses

<sup>#</sup> Sub-groups over-involved in speed-related crashes relative to involvement in all crashes

### *Fatigue-related Crashes*

Fatigue-related crashes were identified as those crashes in the database that were coded as having a fatigued controller as a factor contributing to the crash. Table 2.4 displays the number of drivers from each age/sex group involved in fatigue-related crashes. As illustrated, most drivers involved in fatigue-related crashes were male. Drivers from the younger age group were also more highly involved in fatigue-related crashes than older drivers, regardless of gender.

**Table 2.4.** Number of drivers from each age/sex group involved in fatigue-related crashes

<b>Age/sex group</b>	<b>No. of drivers in fatigue-related crashes</b>
Males 17-20	2075 (40.4)
Females 17-20	645 (12.5)
Males 21-25	1875 (36.4)
Females 21-25	549 (10.7)
<b>Total</b>	<b>5144 (100)</b>

Percentage of drivers in crashes in parentheses

Table 2.5 displays the number of drivers from each sub-group involved in fatigue-related crashes as a function of residential status. A greater number of males and females who resided in metropolitan areas, as opposed to rural areas, were involved in fatigue-related crashes. This pattern was consistent across age groups.

**Table 2.5.** Number of drivers from each age/sex group involved in fatigue-related crashes as a function of residential status

<b>Age/sex group</b>	<b>Residential Status</b>	
	<b>Metro</b>	<b>Rural</b>
Males 17-20	1681 (39.8) <sup>#</sup>	394 (42.9) <sup>#</sup>
Females 17-20	501 (11.9)	144 (15.7)
Males 21-25	1580 (37.4) <sup>#</sup>	292 (31.8) <sup>#</sup>
Females 21-25	460 (10.9)	89 (9.7)
<b>Total</b>	<b>4222 (100)</b>	<b>919 (100)</b>

Percentage of drivers in crashes in parentheses

<sup>#</sup> Sub-groups over-involved in fatigue-related crashes relative to involvement in all crashes

### *Non-use of seatbelts*

These crashes were identified as those in which the driver did not wear a seatbelt. The number of drivers from each sub-group involved in crashes where the seatbelt was not worn is displayed in Table 2.6. As illustrated, a higher number of males compared to females were involved in crashes where the seatbelt was not worn. Furthermore, the number of males involved in this type of crash increased with age, while the number of females decreased somewhat with age.

**Table 2.6.** Number of drivers from each age/sex group involved in crashes where the seatbelt was not worn

<b>Age/sex group</b>	<b>No. of drivers in crashes where belt not worn</b>
Males 17-20	260 (35.7)
Females 17-20	76 (10.4)
Males 21-25	324 (44.4)
Females 21-25	69 (9.5)
<b>Total</b>	<b>729 (100)</b>

Percentage of drivers in crashes in parentheses

Table 2.7 displays the number of drivers from each sub-group involved in crashes where the seatbelt was not worn, as a function of their residential status. Males from both age groups who resided in metropolitan areas were involved in a greater number of crashes where the seatbelt was not worn than males of the same age who resided in rural areas. Similarly, females in both age groups who resided in metropolitan as opposed to rural areas were involved in a greater number of these crashes.

**Table 2.7.** Number of drivers from each age/sex group involved in crashes where the seatbelt was not worn as a function of residential status

<b>Age/sex group</b>	<b>Residential Status</b>	
	<b>Metro</b>	<b>Rural</b>
Males 17 20	205 (33.8)	55 (45.1) <sup>#</sup>
Females 17-20	63 (10.4)	13 (10.7)
Males 21-25	282 (46.5) <sup>#</sup>	42 (34.4) <sup>#</sup>
Females 21-25	57 (9.4)	12 (9.8)
<b>Total</b>	<b>607 (100)</b>	<b>122 (100)</b>

Percentage of drivers in crashes in parentheses

<sup>#</sup> Sub-groups over-involved in crashes where seatbelt not worn relative to involvement in all crashes.

### *Distraction-related Crashes*

Distraction-related crashes were identified as those crashes for which the contributing factor was coded as “distracted inside the car” or “distracted outside the car”. The number of drivers from each sub-group who were involved in distraction-related crashes is displayed in Table 2.8. As shown, a greater number of distraction-related crashes resulted from the driver being

distracted by something outside the car, as opposed to inside the car. Also, a greater number of males than females were involved in crashes where distraction inside the car or distraction outside the car was the contributing factor. For both males and females, involvement in distraction-related crashes decreased with increasing age.

**Table 2.8.** Number of drivers from each age/sex group involved in distraction-related crashes

<b>Age/sex group</b>	<b>Distracted inside</b>	<b>Distracted outside</b>	<b>Total</b>
Males 17-20	616 (41.6)	870 (34.2)	1486
Females 17-20	273 (18.4)	486 (19.1)	759
Males 21-25	373 (25.2)	771 (30.3)	1144
Females 21-25	218 (14.7)	416 (16.4)	634

Percentage of drivers in crashes in parentheses

Table 2.9 displays the number of drivers from each sub-group who were involved in distraction-related crashes as a function of residential status. Between 80% and 86% of drivers involved in these crashes resided in metropolitan as opposed to rural areas. This was the case for all sub-groups.

**Table 2.9.** Number of drivers from each age/sex group involved in distraction-related crashes as a function of residential status

<b>Age/sex group</b>	<b>Distracted inside</b>	<b>Distracted outside</b>	<b>Total</b>
<b><i>Metro</i></b>			
Males 17-20	482 (40.8) <sup>#</sup>	736 (33.6)	1218
Females 17-20	205 (17.3) <sup>#</sup>	409 (18.7) <sup>#</sup>	614
Males 21-25	317 (26.8)	683 (31.2)	1000
Females 21-25	178 (15.1)	360 (16.5)	538
<b><i>Rural</i></b>			
Males 17-20	134 (45.0) <sup>#</sup>	134 (37.7)	268
Females 17-20	68 (22.8) <sup>#</sup>	77 (21.7) <sup>#</sup>	145
Males 21-25	56 (18.8)	88 (24.8)	144
Females 21-25	40 (13.4)	56 (15.8)	96

Percentage of drivers in crashes in parentheses

<sup>#</sup> Sub-groups over-involved in distraction-related crashes relative to involvement in all crashes

### ***Invalid Licence***

Crashes where the driver held an invalid licence (e.g., expired, disqualified or cancelled) or where the driver was unlicensed were included. Table 2.10 displays the number of drivers in each sub-group who were involved in crashes when their licence was invalid or when they were unlicensed. A greater number of drivers involved in these crashes were male compared to female. Furthermore, for both males and females, involvement in these crashes increased with age.

**Table 2.10.** Number of drivers from each age/sex group involved in crashes where their licence status was expired, unlicensed, disqualified or cancelled

<b>Age/sex group</b>	<b>Expired</b>	<b>Unlicensed</b>	<b>Disqualified</b>	<b>Cancelled</b>	<b>Total</b>
Males 17-20	63 (30.4)	779 (40.7)	149 (31.0)	217 (33.3)	1208
Females 17-20	18 (8.7)	189 (9.9)	8 (1.7)	22 (2.2)	237
Males 21-25	92 (44.4)	751 (39.3)	296 (61.5)	339(52.1)	1478
Females 21-25	34 (16.4)	193 (10.1)	28 (5.8)	73 (11.2)	328

Percentage of drivers in crashes in parentheses

The number of drivers in each sub-group who were involved in crashes when their licence was invalid or when they were unlicensed is shown in Table 2.11 as a function of residential status. More drivers who resided in metropolitan, as opposed to rural areas, were involved in these crashes. This was the case for all sub-groups.

**Table 2.11.** Number of drivers from each age/sex group involved in crashes where their licence status was expired, unlicensed, disqualified or cancelled as a function of residential status

<b>Age/sex group</b>	<b>Expired</b>	<b>Unlicensed</b>	<b>Disqualified</b>	<b>Cancelled</b>	<b>Total</b>
<b>Metro</b>					
Males 17-20	55 (31.8)	612 (38.8) <sup>#</sup>	110 (28.3)	184 (32.9)	961
Females 17-20	14 (8.1)	156 (9.9)	8 (2.1)	17 (3.0)	195
Males 21-25	78 (45.1) <sup>#</sup>	652 (41.3) <sup>#</sup>	249 (64.0) <sup>#</sup>	295 (52.7) <sup>#</sup>	1274
Females 21-25	26 (15.0)	159 (10.1)	22 (5.7)	64 (11.4)	271
<b>Rural</b>					
Males 17-20	8 (23.5)	167 (50.2) <sup>#</sup>	39 (42.4) <sup>#</sup>	33 (36.3)	247
Females 17-20	4 (11.8)	33 (9.9)	0 (0)	5 (5.5)	42
Males 21-25	14 (41.2) <sup>#</sup>	99 (29.7) <sup>#</sup>	47 (51.1) <sup>#</sup>	44 (48.4) <sup>#</sup>	204
Females 21-25	8 (23.5)	34 (10.2)	6 (6.5)	9 (9.9)	57

Percentage of drivers in crashes in parentheses

<sup>#</sup> Sub-groups over-involved in crashes where licence invalid relative to involvement in all crashes

### *Alcohol-related Crashes*

Alcohol-related crashes were identified as those crashes in which the driver had a Blood Alcohol Concentration (BAC) of over 0.05. The number of drivers from each sub-group who were involved in alcohol-related crashes is displayed in Table 2.12. As illustrated, males were involved in more than five times as many alcohol-related crashes as females. Furthermore, the number of males involved in these crashes was higher for the older as opposed to the younger age group. This pattern was also found (albeit to a lesser degree) for female drivers. The controllers' residential postcode was not available for alcohol-related crashes; therefore, the data could not be presented for metropolitan and rural drivers separately.

**Table 2.12.** Number of drivers from each sub-group involved in alcohol-related crashes

<b>Age/sex group</b>	<b>Under 0.05</b>	<b>Over 0.05</b>	<b>Unknown</b>
Males 17-20	35617 (33.9)*	1678 (35.8) <sup>#</sup>	7083 (32.1)
Females 17-20	16783 (16.0)	264 (5.6)	3139 (14.2)
Males 21-25	34745 (33.2)	2376 (50.7) <sup>#</sup>	7949 (36.0)
Females 21-25	17669 (16.9)	370 (7.9)	3889 (17.6)
Total	104814 (100)	4688 (100)	22060 (100)

Percentage of drivers in crashes in parentheses

<sup>#</sup> Sub-groups over-involved in alcohol-related crashes relative to involvement in all crashes

## 2.2.2 Sub-groups Over-involved in Crashes

To determine which young driver groups are over-involved in each crash type, the percentage of each sub-group's involvement in the different crash types was compared to the relative involvement of the other young driver sub-groups in these crashes. In addition, each sub-group's involvement in the different crash types was compared to that group's involvement in *all* crash types. This gave an indication of those young driver sub-groups that are over-involved in certain crash types relative to other young driver sub-groups and relative to their involvement in all crashes. The analyses were broken-down further in order to examine, within each sub-group, whether drivers who resided in metropolitan or rural areas are more over-involved in each crash type.

Table 2.13 displays those young driver sub-groups that are over-involved in each crash type relative to other young driver sub-groups.<sup>2</sup> Of interest, is that only the male young driver sub-groups are over-involved in crashes relative to the other sub-groups. For no crash types were females over-involved relative to other sub-groups. Males from both age groups and from both metropolitan and rural areas are over-involved in every crash type, with the degree to which they are over-involved relative to the other sub-groups varying across the different crash types.

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<sup>2</sup> As the drivers' residential postcode was not available for alcohol-related crashes, the extent to which the driver sub-groups from metropolitan and rural areas were over-involved in this crash type was assumed to be equal.

**Table 2.13.** Those young driver sub-groups that are over-involved in crashes relative to other young driver sub-groups

Sub-groups	Factor Involved						
	All crashes	Speed	Fatigue	Seatbelt	Distraction	Licence	Alcohol
<i>Metro</i>							
<b>Males 17-20</b>	X	XX	X	X	XX	X	X
<b>Males 21-25</b>	X	X	X	XX	X	X	XX
<b>Females 17-20</b>							
<b>Females 21-25</b>							
<i>Rural</i>							
<b>Males 17-20</b>	X	XX	XX	XX	X	XX	X
<b>Males 21-25</b>	X	X	X	X	X	X	XX
<b>Females 17-20</b>							
<b>Females 21-25</b>							

Note: X = over-involvement. XX = greater level of over-involvement.

While Table 2.13 displays the young driver sub-groups that are over-involved in crashes *relative to other young driver sub-groups*, Table 2.14 displays those young driver sub-groups that are over-involved in each crash type *relative to their involvement in all crashes*. The data in this table is a combination of the sub-group over-involvement data provided in Tables 2.3 to 2.12. Again, the male sub-groups from metropolitan and rural areas are over-involved in many of the crash types displayed. Of the female sub-groups, only the 17-20 year old drivers from metropolitan and rural areas are over-involved in distraction-related crashes.

**Table 2.14.** Those young driver sub-groups that are over-involved in crashes relative to their involvement in all crashes

Sub-groups	Factor Involved					
	Speed	Fatigue	Seatbelt	Distraction	Licence	Alcohol
<i>Metro</i>						
<b>Males 17-20</b>	X	X		X		X
<b>Males 21-25</b>		X	X		X	XX
<b>Females 17-20</b>				X		
<b>Females 21-25</b>						
<i>Rural</i>						
<b>Males 17-20</b>	X	X	X	X	X	X
<b>Males 21-25</b>		X	X		X	XX
<b>Females 17-20</b>				X		
<b>Females 21-25</b>						

Note: X = over-involvement. XX = greater level of over-involvement.

Based on these two tables, the young driver sub-groups that are over-involved in each crash type examined were identified. Table 2.15 displays the sub-groups identified.

**Table 2.15.** Those young driver sub-groups identified as being over-involved in each crash type

Sub-groups	Factor Involved					
	Speed	Fatigue	Seatbelt	Distraction	Licence	Alcohol
<i>Metro</i>						
<b>Males 17-20</b>	<b>XX</b>	<b>X</b>	<b>X</b>	<b>XX</b>	<b>X</b>	<b>X</b>
<b>Males 21-25</b>	<b>XX</b>	<b>X</b>	<b>XX</b>	<b>X</b>	<b>X</b>	<b>XX</b>
<b>Females 17-20</b>				<b>X</b>		
<b>Females 21-25</b>						
<i>Rural</i>						
<b>Males 17-20</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>X</b>	<b>XX</b>	<b>X</b>
<b>Males 21-25</b>	<b>XX</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>XX</b>
<b>Females 17-20</b>				<b>X</b>		
<b>Females 21-25</b>						

Note: X = over-involvement. XX = greater over-involvement.

As illustrated the sub-groups that are over-involved in crashes are as follows:

- Males aged 17-20 years from both metropolitan and rural areas are over-involved in speed- and fatigue-related crashes, crashes where the seatbelt was not worn, distraction-related crashes, alcohol-related crashes and crashes where the driver held an invalid licence or was unlicensed.
- Males aged 21-25 years from metropolitan areas are over-involved in speed- and fatigue-related crashes, crashes where the seatbelt was not worn, alcohol-related crashes and crashes where the driver held an invalid licence or was unlicensed.
- Males aged 21-25 years from rural areas are over-involved in speed- and fatigue-related crashes, crashes where the seatbelt was not worn, distraction-related crashes, alcohol-related crashes and crashes where the driver held an invalid licence or was unlicensed.
- Females aged 17-20 years from metropolitan and rural areas are over-involved in distraction-related crashes.
- Females aged 21-25 years from both metropolitan and rural areas are not over-involved in any of the crash types.

## 2.3 Selection of ITS Technologies

A number of ITS technologies were identified that would serve as the subject for the focus group discussions. The key criterion used for selecting the ITS technologies was that they had to be able to address the cause of the crashes (e.g., excessive speed), or the type of crashes (e.g., run off road) in which young novice drivers are over-involved or are injured in large numbers. As discussed in the previous section, the crash types in which young novice drivers are over-involved are speed-related crashes, fatigue-related crashes, crashes where the driver was distracted by something inside or outside the car, crashes where the seatbelt was not worn, alcohol-related crashes and crashes where the driver's licence was invalid. The primary causes of each of these crash types and the ITS technologies which were identified as being best able to address these crash causes are discussed in turn in the following sections.

### **2.3.1 Speed-related Crashes**

Speed-related crashes were coded in the crash database as those crashes in which the controller was speeding. These crashes were therefore assumed to be primarily caused by excessive speed. The ITS technology identified as having the greatest impact in reducing the incidence or severity of speed-related crashes was the ISA system. ISA, therefore, was chosen as one ITS technology to be discussed in the focus groups. Two variants of ISA were chosen for discussion: an ISA limiting system, which limits the speed of the vehicle to the local posted speed limit and an ISA alerting system, which warns the driver when he/she is exceeding the posted speed limit. These two variants of ISA were chosen for discussion as previous research (e.g., Regan, Mitsopoulos, Haworth et al. (2002)) suggests that the acceptability of these two variants varies dramatically and, therefore, examining only one variant would not provide an accurate indication of the acceptability of all ISA systems.

### **2.3.2 Fatigue-related Crashes**

Fatigue-related crashes were identified in the database as those crashes which had a fatigued controller as a contributing factor. These crashes were therefore assumed to be primarily caused by fatigue. Many fatigue-related crashes are run off road crashes and therefore the ITS technologies identified as having the greatest impact on reducing the incidence and severity of fatigue-related crashes are a Lane Departure Warning system, which warns the driver when their vehicle leaves the designated lane, and a Fatigue Monitoring system, which detects impairments resulting from fatigue. Both the Lane Departure Warning system and the Fatigue Monitoring system were discussed in the same focus group, however the focus was on the Lane Departure Warning system, with the Fatigue Monitoring system introduced as an alternative system to address fatigue-related crashes.

### **2.3.3 Crashes where the Seatbelt was not Worn**

While not wearing a seatbelt does not contribute to a crash occurring, it has an impact on the severity of the crash. It was assumed that a Seatbelt Reminder or Interlock system was the ITS technology likely to have the greatest impact on reducing the severity of crashes in which the driver does not wear his/her seatbelt. Seatbelt Reminder systems warn the driver when they or one of their occupants is unrestrained. The Seatbelt Interlock system prevents the car from accelerating if the driver or one of the occupants is unrestrained. These two systems were chosen for discussion, as the acceptability of each is likely to differ because the level of control they take from the driver differs.

### **2.3.4 Distraction Crashes**

Distraction-related crashes were identified as those crashes for which the contributing factor was identified as the driver being distracted by something inside or outside the car. As no ITS technologies have been designed specifically to address distraction inside and outside the vehicle, further analyses were undertaken to determine the types of crashes which result from the driver being distracted inside or outside the vehicle. The crash types identified were rear-end crashes and run off the road crashes when on a straight road. The ITS technologies which address these crash types are a Lane Departure Warning system (for run off road crashes) and Forward Collision Warning and Following Distance Warning systems (for rear-end crashes).

Forward Collision Warning systems warn the driver of an imminent collision with the vehicle in front, while Following Distance Warning systems warn the driver that he/she is travelling too close to the vehicle in front. All three technologies were chosen for discussion, with the Lane Departure Warning and Forward Collision Warning systems as the focus of the discussion and with the Following Distance Warning introduced as a variant of the Forward Collision Warning system.

### **2.3.5 Licence**

Similar to crashes in which the seatbelt is not worn, having a licence that is expired, cancelled, disqualified or where the driver is unlicensed, does not contribute directly to crash occurrence. However, some crashes may be avoided by not allowing unlicensed drivers to drive (e.g., these drivers may have crashes because they are inexperienced) or by not allowing drivers to drive outside the conditions of their licence. The ITS technology which would address these crashes is an Electronic Driver's Licence, which prevent drivers from driving while unlicensed or driving outside the conditions of their licence.

### **2.3.6 Alcohol-related Crashes**

Alcohol-related crashes were identified as those crashes in which the driver had a BAC of over 0.05. The cause of these crashes, therefore, is alcohol. The technologies that would address these crashes are Alcohol Interlock or Sniffer systems and a performance based test. Alcohol Interlocks require drivers to blow into a breathalyser and obtain a BAC reading below 0.05 before the vehicle will start. Sniffer systems detect the presence of alcohol in the cabin and required drivers to blow into the breathalyser if alcohol is detected. Performance-based tests require drivers to complete and pass a psychomotor driving task, which is designed to detect if they are impaired by alcohol, before the vehicle will start. All three systems were chosen for discussion in the focus groups, with the Alcohol Interlock and Sniffer systems discussed as two variants of the one system.

## **2.4 Summary of ITS**

A summary of the ITS technologies chosen for the focus group discussions is displayed in Table 2.16.

**Table 2.16.** Summary of ITS technologies selected for focus groups

<b>System Type</b>	<b>Functional Description</b>
Intelligent Speed Adaptation (limiting & alerting)	Limiting: Limits speed according to posted local speed limits. Alerting: Warns driver when vehicle speed has exceeded a certain threshold
Forward Collision Warning	Warns of an imminent collision with a vehicle ahead.
Following Distance Warning	Warns the driver when they are travelling too close to the vehicle ahead.
Lane Departure Warning	Warns when vehicle starts to leave the designated lane.
Fatigue Monitoring System	Detects impairment due to fatigue and warns the driver.
Alcohol Sniffer/Interlock	Prevent (interlock)/discourage (sniffer) drink driving.
Performance Test	Requires drivers to complete and pass a psychomotor driving task within the vehicle that is designed to detect if they are impaired by alcohol before the vehicle will start.
Seatbelt Reminder/Interlock	Warns the driver (reminder) or prevents the vehicle from starting (interlock) if one or more occupants are unrestrained.
Electronic Driver's Licence	Prevents unlicensed driving and driving outside conditions of driver's licence

## 2.5 Composition of Focus Groups

Several criteria were used to determine the composition of the focus groups. First, it was decided to run focus groups that involved both males and females in the same group. The vast literature on conducting focus groups generally states that mixed gender focus groups are acceptable as long as the topic under discussion is not gender specific (e.g., birth control) and the age of the participants is as close as possible (Greenbaum, 1988). It was felt that the topic under discussion in the current focus groups is not gender specific and in order to ensure that the participants are as close as possible in terms of age, if a focus group involves both genders, then only one age group is included (e.g., 17 to 20 year olds). On the other hand, if a focus group involves only one gender, then both age groups can be included. Second, no more than two major technologies were to be discussed in each focus group. In some focus groups, however, a variant of a major technology under discussion may be introduced for the purposes of comparing the acceptability of a slightly different or more controlling technology. Discussing no more than two main technologies within the one focus group ensured that more detailed information regarding the acceptability of these technologies could be obtained.

The main criterion used to select driver sub-groups for participation in a particular focus group was that the sub-groups were over-involved in those crashes for which the ITS technologies under discussion are designed to address. The driver sub-groups that were over-

involved in crashes relevant to each of the technologies, and hence were considered to be necessary for inclusion in the focus groups, are as follows.

- **Intelligent Speed Adaptation** – Male drivers aged 17-20 and 21-25 years from metropolitan and rural areas.
- **Forward Collision Warning/Following Distance Warning** – Male drivers aged 17-20 and 21-25 years from metropolitan and rural areas.
- **Lane Departure Warning** - Male drivers aged 17-20 and 21-25 years from metropolitan and rural areas.
- **Fatigue Monitoring System** - Male drivers aged 17-20 and 21-25 years from metropolitan and rural areas.
- **Alcohol Interlock/Sniffer System** - Male drivers aged 17-20 and 21-25 years from metropolitan and rural areas.
- **Performance Test** - Male drivers aged 17-20 and 21-25 years from metropolitan and rural areas.
- **Seatbelt Reminder Warning/Interlock System** - Male drivers aged 17-20 and 21-25 years from metropolitan and rural areas.
- **Electronic Licensing** - Male drivers aged 17-20 and 21-25 years from metropolitan and rural areas.

As discussed previously, only male drivers were over-involved in crashes relevant to each of the technologies. As females were also required to be involved in the focus group discussions in order to examine any gender differences in the acceptability of ITS that may emerge, those female drivers who were over-involved in crashes relative to their involvement in all crashes, or to the other female sub-group, were identified. These were as follows:

- **Fatigue-related Crashes (LDW and FCW/FDW)** – Female drivers aged 17-20 years from metropolitan and rural NSW.
- **Distraction-related Crashes (LDW and FCW/FDW)** - Female drivers aged 17-20 years from metropolitan and rural NSW.

No females aged 21 to 25 years were over-involved in any crash type relative to their overall crash involvement or that of the 17-20 year old females, and therefore their inclusion in any focus group could not be justified by the crash data. Therefore, only the 17-20 year old female sub-group was considered for involvement in the focus groups. Based on crash over-involvement, those driver sub-groups considered suitable for inclusion in a focus group for a particular technology are displayed in Table 2.17.

**Table 2.17.** Driver sub-groups considered suitable for inclusion in the focus groups

Type of Technology	Sub-group	
	Male (Metro & Rural)	Female (Metro & Rural)
Intelligent Speed Adaptation	17 to 20 21 to 25	
Forward Collision Warning	17 to 20 21 to 25	17 to 20
Following Distance Warning	17 to 20 21 to 25	17 to 20
Lane Departure Warning System	17 to 20 21 to 25	17 to 20
Fatigue Monitoring System	17 to 20 21 to 25	17 to 20
Alcohol Sniffer/ Interlock Systems	17 to 20 21 to 25	
Performance Test	17 to 20 21 to 25	
Seatbelt Reminder/Interlock	17 to 20 21 to 25	
Electronic Driver's Licence	17 to 20 21 to 25	

A total of eight focus groups was held, with some run in metropolitan NSW and some in rural NSW. In order to determine the composition of the focus groups, the ITS technologies which should be discussed within each focus group were determined. This involved identifying the number of crashes relevant to each technology that involved drivers from metropolitan and rural areas and using this information to determine how many focus groups would be run in metropolitan NSW and how many would be run in rural NSW and which technologies would be examined in each focus group. Then, those driver sub-groups that are over-involved in crashes relevant to each specific technology were included in the relevant focus groups. This resulted in eight focus groups, four in metropolitan NSW and four in rural NSW. In order to include the 17-20 year old female sub-group in the discussion group on lane departure warning and forward collision warning, the 20-25 year old male sub-group was excluded. This group was excluded as they were involved in fewer crashes relevant to these

technologies compared to males aged 17-20 years and also because the mixed gender focus group required that the participants were from the same age group. The final focus group composition is displayed in Table 2.18.

**Table 2.18.** Final Focus Group Composition

Focus Group	ITS	Sub-groups			
		Males (Metro)	Males (Rural)	Females (Metro)	Females (Rural)
1	Intelligent Speed Adaptation	17-20 21-25			
2	Intelligent Speed Adaptation		17-20 21-25		
3	Forward Collision Warning Following Distance Warning Lane Departure Warning Fatigue Monitoring System	17-20		17-20	
4	Forward Collision Warning Following Distance Warning Lane Departure Warning Fatigue Monitoring System		17-20		17-20
5	Alcohol Interlock Performance Test	17-20 21-25			
6	Alcohol Interlock Performance Test		17-20 21-25		
7	Seatbelt Reminder Warning/Interlock Electronic Licensing		17-20 21-25		
8	Seatbelt Reminder Warning/Interlock	17-20 21-25			

# Chapter 3. DESIGN, DEVELOPMENT AND ADMINISTRATION OF THE TELEPHONE SURVEY

## 3.1 Introduction

A telephone survey was utilised to recruit participants for the focus groups. This chapter outlines the design and development of the telephone survey and provides a detailed description of the administration procedure. Following this, the composition of the telephone survey respondents is discussed.

## 3.2 Design and Development of the Telephone Survey

The primary function of the telephone survey was to serve as a tool for recruiting eligible respondents for focus group participation. Two telephone surveys were developed for the study: one to recruit participants for the metropolitan focus groups and one to recruit participants for the rural focus groups. These surveys were identical apart from the section informing respondents where the focus groups would be held.

To be eligible for focus group participation, the respondents had to satisfy the following criteria:

- be aged between 17 and 25 years;
- hold a current full or probationary car driver's licence;
- currently drive a car; and
- not drive a motorcycle or heavy vehicle for more than 20 percent of the total time they spent driving.

The survey followed the same format as that used by Regan, Mitsopoulos, Haworth et al. (2002) in a similar study. The survey comprised five sections:

*Section A – Introduction.* In the first section of the survey, the interviewer introduced himself or herself to the respondent and asked the respondent whether he/she would be interested in completing a short survey on peoples' driving experience. If the respondent indicated that he/she did not wish to participate, the survey ended at this stage. Participants who indicated that they would be happy to complete the survey were then asked questions regarding their age, gender, whether they held a current car driver's licence and whether they currently drove a car. Respondents who did not hold a current driver's licence or who did not currently drive a car were informed that the interviewer was only looking to interview people who held a licence or currently drove a car. For these respondents, the survey ended at this stage.

*Section B – Driving Experience.* The second section comprised questions regarding respondents' driving experience, including whether they held a Learner's Permit, Probationary or Full car driver's licence. If respondents indicated that they held a Learner's Permit, the survey was discontinued. Respondents were also asked whether they drove a motorcycle or heavy vehicle for more than 20 percent of the total time they spent driving. The survey was discontinued for those respondents who indicated that they spent more than 20 percent of their driving time driving a motorcycle or heavy vehicle.

*Section C – Demographics.* In order to ensure that the telephone survey respondents represented a broad cross-section of the community, four questions regarding occupation, work type, education level and the suburb in which they live, were asked.

*Section D – Focus Group Recruitment.* In this section, the respondents were invited to attend a focus group discussion on technologies for cars that are designed to improve road safety. Respondents from the metropolitan areas were told that the groups would be held at a location in the Sydney CBD and respondents from Wagga Wagga were informed that the groups would be held in the township of Wagga Wagga. Given that the recruitment phase was expected to take over a month, the authors felt that it was not appropriate to book participants into focus groups at the time of the survey. This was because it was likely that the participants recruited at the beginning of the recruitment period might forget about the groups over the following weeks. Rather, the authors decided to ask participants for their contact details and told them that they would be contacted in a few weeks to be booked into a focus group. In order to determine the most suitable time to conduct the groups, participants were also asked whether they would prefer the groups to be held on the weekend or during the week, and at what time. The authors felt that this recruitment strategy would maximise focus group attendance.

*Section E – Result of Call.* In the final section, the survey administrators were instructed to specify the outcome of the call for each respondent - for example, if the respondent was recruited for a focus group, if they completed the interview but were not recruited for a focus group, if the respondent refused to participate in the survey, or if the phone line was engaged.

Appendix A contains copies of the two computerised telephone surveys.

### **3.2.1 Generation of Random Telephone Numbers**

Calls were made using telephone numbers that were randomly selected from the Telstra White Pages. The phone numbers were selected manually from the phone books, as privacy laws prohibit the generation of lists of random telephone numbers from the White Pages on-line or on CD-ROM.

## **3.3 Survey Administration**

The surveys were prepared and administered in Microsoft Access 2000. Six trained research assistants conducted the surveys over 20 nights. Calls were made from Monday through to Thursday from 5.30pm to 8.30pm in order to maximise the chance of contacting potential participants. Each survey took a maximum of 5 minutes to complete and interviewers entered the respondents' details and answers directly into the Access database.

After two weeks of recruitment, the researchers realised that the response rates (i.e., percent of participants recruited for a focus group) for the Sydney surveys were very low (less than 1% response rate) and that the recruitment of the 40 Sydney focus groups participants would not be completed within the time allocated for the telephone survey. Suggestions regarding the best course of action to take were sought from colleagues, both from within MUARC and from market research companies. The overwhelming majority of colleagues suggested contracting a sub-consultant to conduct the recruitment of Sydney participants and to moderate the four Sydney focus groups. Woolcott Research, a market research company

located in Sydney, was hired for this purpose. Woolcott Research recruited participants through their fortnightly omnibus survey, using the eligibility criteria developed by MUARC to screen potential participants.

The survey for the rural area was also revised in order to improve the response rate (i.e., percent of participants recruited for a focus group). These changes consisted of informing the respondents at the beginning of the survey that MUARC is not a market research company, but a research centre. Respondents were also informed that MUARC was conducting research to reduce the road toll in NSW, in order to emphasise that the research could benefit them directly. The response rates for the rural area subsequently improved.

### 3.3.1 Sampling Area

The metropolitan and rural areas from which to recruit focus group participants were selected using Year 2000 Estimated Resident Population Data for each statistical local area of NSW (Australian Bureau of Statistics, 2000). These data display the estimated population of each statistical division and sub-division of NSW by age (in 5-year cohorts) and sex based on results of the 1996 census of Housing and Population. The metropolitan and rural areas with the largest numbers of residents in the 15-19 and 20-24 year age groups were then selected in order to maximise the chance of contacting our target population. Based on this method, the metropolitan areas from which to recruit participants and run focus groups were the Inner, Eastern and Inner Western suburbs of Sydney. Three criteria guided the selection of these suburbs: they are all in close proximity to each other and to the focus group venue, thereby maximising the possibility that people would attend the focus groups; they offer a wide spread of socio-economic status; and they have a high population of 17 to 25 year olds. The rural area selected for the focus groups was Wagga Wagga. This area was chosen because it has the largest number of residents in the 17 to 25 year age group of all the rural towns in NSW.

### 3.3.2 Target Participant Sample

Ten participants were required for each focus group - 5 from each of the two sub-groups represented in each discussion group. As four focus groups were being conducted in Sydney and four in Wagga Wagga, the target sample size was 40 participants for the metropolitan focus groups and 40 participants for the rural groups. The desired sample size for each sub-group, across metropolitan and rural focus groups separately, is shown in Table 3.1.

**Table 3.1.** Target sample size to be recruited for each driver sub-group based on the number of focus groups they are involved in

<b>Driver sub-group</b>	<b>Number of focus groups</b>	<b>Sample size</b>
<i>Metro</i>		
<b>Males 17-20</b>	4	20
<b>Males 21-25</b>	3	15
<b>Females 17-20</b>	1	5
<i>Rural</i>		
<b>Males 17-20</b>	4	20
<b>Males 21-25</b>	3	15
<b>Females 17-20</b>	1	5

As it was likely that a number of participants would be unable to attend a focus group when they were contacted the second time, it was desirable to recruit several extra people than was actually required for each group. Once the quota for a particular driver sub-group had been filled, respondents from that sub-group were no longer required to undertake the telephone survey and the interviewer was instructed to request only those respondents in the remaining sub-groups to complete the survey.

### **3.3.3 Rural Survey Response Rates**

The metropolitan focus group participants were recruited through a recruitment company in Sydney via a fortnightly omnibus survey and the response rates were not available to the authors. Therefore, only the response rates for the rural, Wagga Wagga telephone survey conducted by MUARC will be reported here. The rural telephone survey administration was divided into three phases. During Phase 1, participants from all required sub-groups (i.e., males aged 17-25 and females aged 17-20 years) were recruited and the survey was revised after 1,000 calls in order to improve the response rate. After this revision the response rate for recruiting participants improved from 1.5% to 3.9%. In Phase 2, females were no longer recruited or surveyed as the quota for female drivers had been filled. Finally, during Phase 3, only males in the 21 to 25 year age group were recruited. It is important to report the response rates for each of the three recruitment phases separately as recruiting from only certain sub-groups can affect the response rates.

During Phase 1, 2042 calls were initiated of which 1169 resulted in contact with a potential respondent. Of the calls where contact was made, 38 (3.3%) resulted in a participant being recruited for a focus group; 19 calls (1.6%) resulted in a completed interview with a respondent; 119 (10.2%) were refusals; 965 (82.5%) were cases where the respondent was not in the required age group; 9 (0.8%) were instances where the respondent did not hold a current car driver's licence; 9 (0.8%) were cases where the respondent did not currently drive a car; 1 (0.08%) was a case where the respondent indicated that a motorcycle was their main form of transport; 1 (0.08%) was a case where the respondent indicated that a truck was their main mode of transport; 5 (0.4%) were cases where the respondent held a learner's permit; 1 call (0.08%) was from a respondent who indicated that they wanted to be called back at a later time; and 2 calls (0.2%) were terminated by the respondent during the survey. No contact with a respondent was made for the remaining 873 calls. Of these calls, 387 (44.3%) were unanswered; 138 (15.8%) were calls to an answering machine; 115 (13.1%) were to an engaged line; 212 (24.4%) were to a line that was disconnected; and 21 (2.4%) calls were to wrong numbers, such as fax machines.

In Phase 2, 1427 calls were made, 835 of which resulted in direct contact with a respondent. Of these, 19 (2.3%) resulted in the respondent being recruited for a focus group; 13 (1.6%) resulted in the respondent completing an interview, but not being recruited for a focus group; 107 (12.8%) were refusals; 682 (81.7%) calls were to respondents who were not in the required age group; 4 (0.5%) were instances where the respondent did not hold a current car driver's licence; 1 (0.1%) case was where the respondent did not currently drive a car; 8 (0.9%) calls were to respondents who wanted to be called back at a later time; and 1 call (0.1%) was terminated during the survey. The remainder of the 592 calls made did not result in contact with a respondent. Of these calls, 289 (48.8%) were unanswered; 97 (16.4%) were calls to an answering machine; 64 (10.8%) were to phones that were engaged; 128 (21.6%) were to a line that was disconnected; and 14 (2.4%) were calls to an incorrect number.

A total of 296 calls was initiated during Phase 3, with 172 of these resulting in contact with a potential respondent. Of the calls where contact was made, 3 (1.7%) resulted in the respondent being recruited for a focus group; 19 (11%) were refusals; 2 (1.2%) were cases where the respondent did not hold a current car driver's licence; 150 (87.2%) were to respondents who were not in the correct age group; and 1 call (0.6%) was to a respondent who wanted to be called back at a later time. The remaining 124 calls did not result in direct contact with a respondent. Of these calls, 48 (38.7%) were unanswered; 19 (15.3%) were to an answering machine; 16 (12.9%) were to a line that was engaged; 37 (29.8%) were to numbers that were disconnected; and 1 (0.8%) call was to a wrong number, such as a fax machine.

### **3.4 Results of the Rural Telephone Survey**

#### **3.4.1 Recruitment Outcomes**

A total of 60 telephone survey respondents indicated that they would be interested in attending a focus group. A couple of weeks before the focus groups, the participants were contacted again and asked if they were still interested in attending a focus group. If they were, they were booked into a focus group session that suited them. Of the 60 respondents who indicated that they were interested, a total of 32 participants were booked into focus groups. This number was smaller than expected and may have been due to the school holidays starting the week the focus groups were being held. Indeed, many of the original 60 respondents who indicated that they were unable to attend a group said it was because they were away for the holidays.

The participants who had been booked into a focus group were sent a confirmation letter detailing the location and time of their focus group session. Participants were also sent an explanatory statement and consent form and participants aged 17 years or under were sent a parental consent form to comply with the Monash University Standing Committee on Ethics in Research Involving Humans' requirement that participants aged under 18 years of age gain parental consent to attend the groups (see Appendix B for copies of the explanatory statement and consent form).

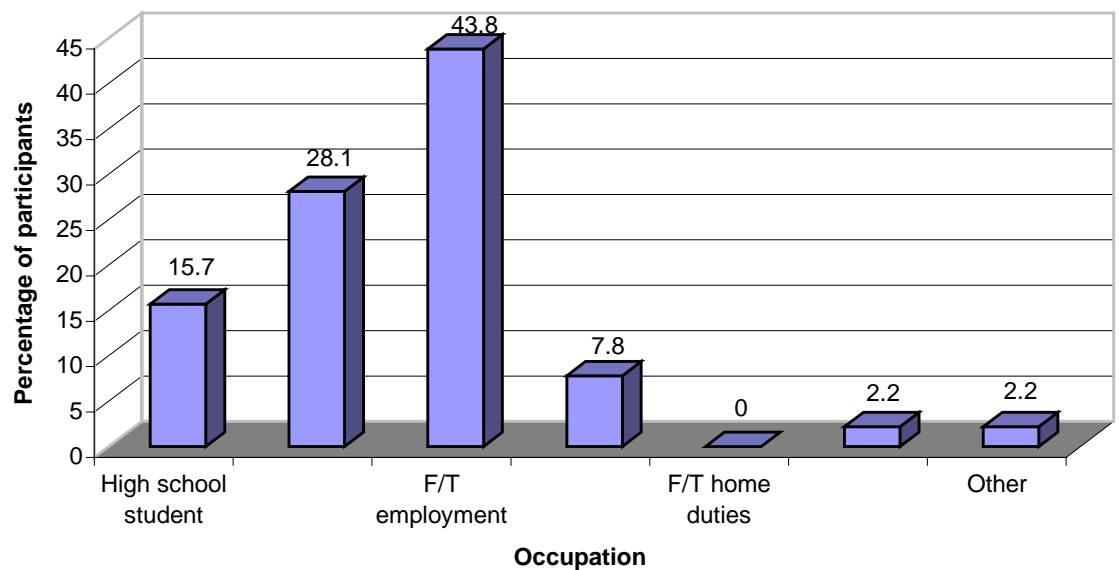
#### **3.4.2 Composition of Telephone Survey Respondents**

As well as serving as a tool for recruiting focus group participants, the telephone survey was also used to obtain information regarding respondents' demographic characteristics and driving experience. This information was used to ensure that the sample of survey respondents was representative of the young driver population in general. A total of 89 respondents completed the telephone survey. Of these respondents, 79% were male and 21% were female. A higher proportion of males were interviewed, as a higher number of males were required for the focus groups and females were therefore only required to complete the survey during the first phase of recruitment. The mean age of the sample was 20.3 years (SD 2.5 years).

With regard to respondents' driving experience, 61% of the respondents had a full car driver's licence, with 30% of respondents holding a probationary licence. The mean age at which respondents obtained their probationary licence was 16.8 years (SD 2.1 years) and, on average, respondents had been driving a car for 3.5 years (SD 3.1 years). As the legal age for obtaining a licence in NSW is 17 years, it is assumed that the respondents who indicated that

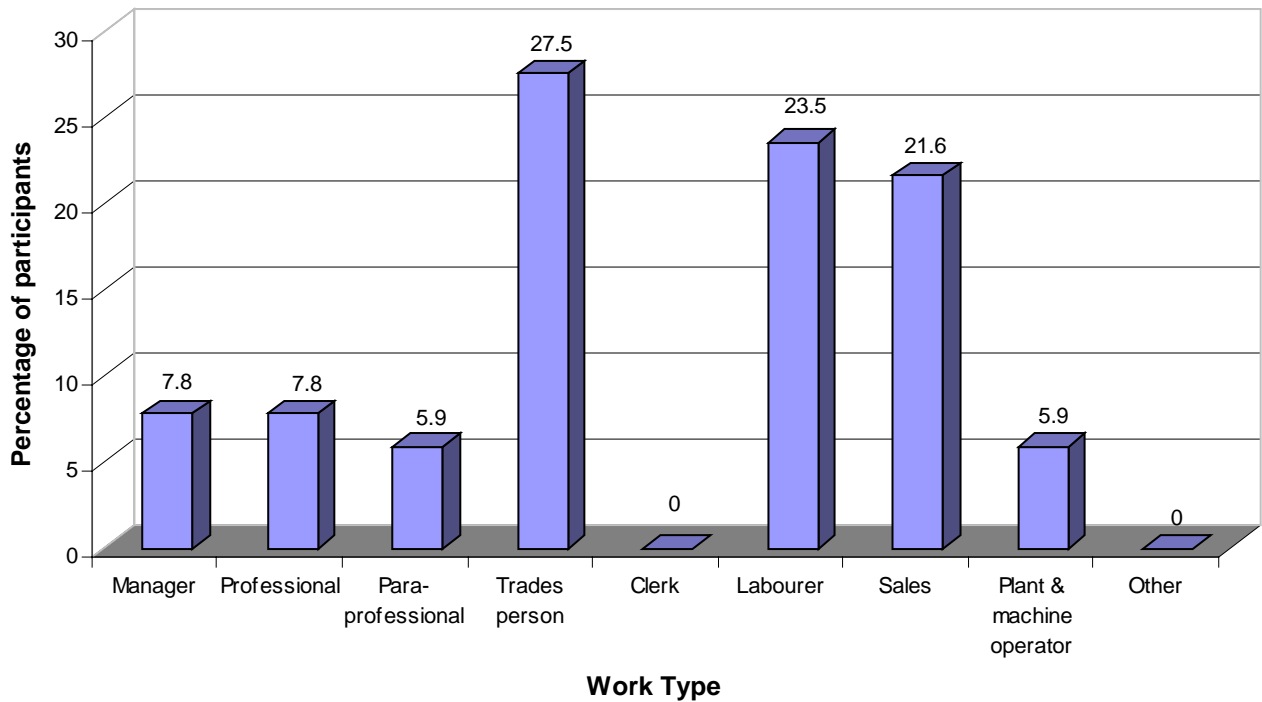
they received their licence before this age had obtained their licence in another state, or gave the age that they obtained their learner's permit.

The respondents were also asked questions regarding their occupation. Figure 3.1 displays the percentage of participants in each occupation type. As illustrated, almost half (43.8%) of the respondents were in full time employment and 7.8% were in part time employment. Just over 28% of respondents were in tertiary education and 15.7% were high school students. Of the two respondents whose occupation fell into the "other" category, one indicated that he/she was completing an apprenticeship and the other stated that he/she was undertaking "other study".



**Figure 3.1.** Percentage of participants as a function of occupation.

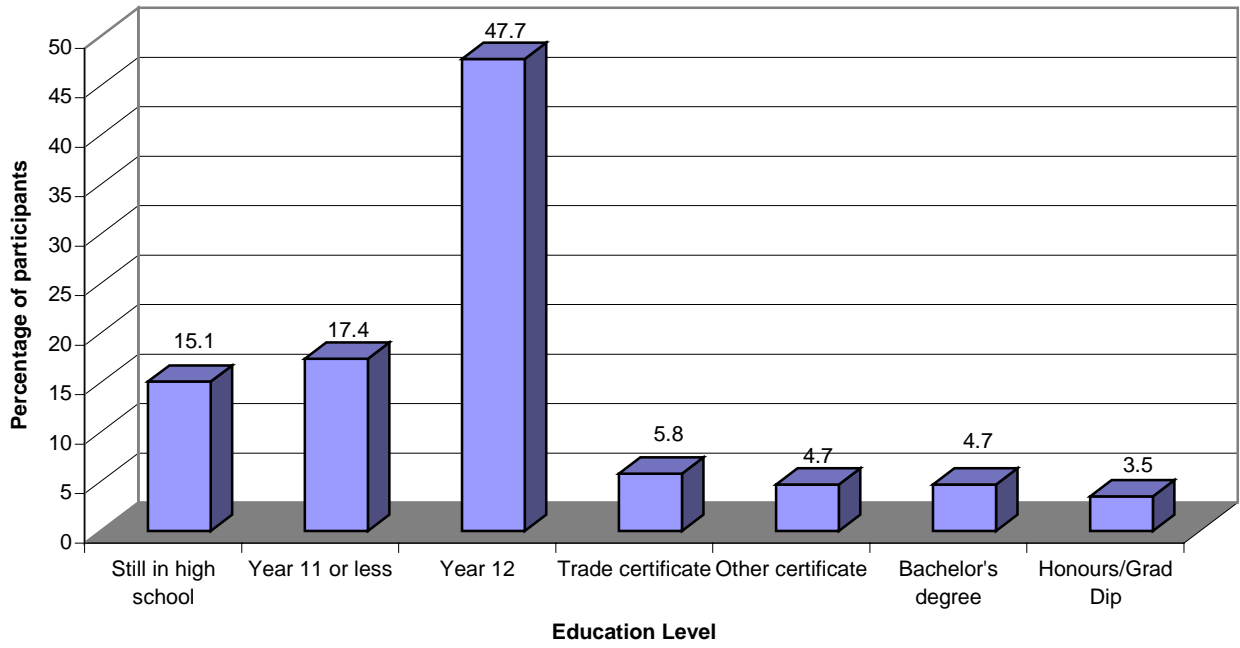
Those participants who indicated that they were in full or part time employment were asked to further specify their type of work. As can be seen in Figure 3.2, respondents represented a wide range of work types. Over one quarter of the participants (27.5%) indicated that they were trades people, while 23.5% were labourers and 21.6% stated that they were in sales. A similar number of respondents were in managerial (7.8%), professional (7.8%) and paraprofessional positions (5.9%), or were plant or machine operators (5.9%).



**Figure 3.2.** Percentage of those respondents in full or part time work as a function of work type.

Finally, participants were asked to specify the highest level of education they had completed. As illustrated in Figure 3.3, almost half of the respondents (47.7%) had completed year 12, 17.4% had completed year 11 or less and 15.1% were still completing high school. A similar number of respondents had completed a trade certificate (5.8%), other certificate type (4.7%), a bachelor's degree (4.7%), or an honours degree or graduate diploma (3.5%).

Overall, the telephone survey provided important information on the demographic characteristics of the survey respondents. In particular, it showed that just over half of the respondents were "blue collar" workers (e.g., tradespersons/labourers) and just over 80% had completed year 12 or less as their highest level of education. These figures, particularly for the highest education level achieved, are not surprising given the young age of the survey respondents.



**Figure 3.3.** Percentage of participants as a function of education level completed.

# Chapter 4. FOCUS GROUP DISCUSSION ON YOUNG DRIVER ACCEPTABILITY OF ITS - METHOD

## 4.1 Introduction

A total of eight focus groups, four in Sydney and four in Wagga Wagga, were conducted to obtain information on the acceptability of the various in-vehicle ITS technologies chosen for discussion. As several of the technologies under discussion have not yet been developed as prototypes, the focus groups provided the opportunity to assess the acceptability of the ITS technologies to young drivers without the drivers actually having to experience or interact with the technologies. Rather, all that was required was to provide a clear description of each technology and for the participants to view a short video segment demonstrating the operation of each technology.

This chapter describes the focus group methodology. It includes details of the final composition of the focus group sample, a description of the materials used and outlines the procedure followed when conducting the focus groups. Many of the materials used as well as the general procedure followed, were similar to those used by Regan, Mitsopoulos, Haworth et al. (2002) in their study on ITS Acceptability to Victorian car drivers. The results of the focus groups are presented and discussed in Chapter 5.

## 4.2 Participants

A total of 58 drivers, 9 females and 49 males, participated in the 8 focus groups. The composition of the participant sample will be described separately for Sydney and Wagga Wagga in the following sections.

### Sydney Participants

Thirty-eight participants, 6 females and 32 males, participated in the four focus groups conducted in Sydney. Each participant attended one focus group only. Participants ranged in age from 17 to 25 years, with a mean age of 20.55 years ( $SD = 2.46$  years). The final composition of each of the four Sydney focus groups is illustrated in the top half of Table 4.1. As displayed, each of the Sydney focus groups comprised between 8 and 11 participants. For the male 17 to 20 year sub-group the mean age across the groups was 18.9 years ( $SD = 0.9$ ). For the male 21 to 25 year sub-group the mean age across focus groups was 22.9 years ( $SD = 0.9$ ). For the female 17 to 20 year sub-group the mean age was 18.8 ( $SD = 1.2$ ).

### Wagga Wagga Participants

A total of 20 drivers, 3 females and 17 males, participated in the four focus groups held in Wagga Wagga. The participants ranged in age from 17 to 25 years, with an overall mean age of 19.8 years ( $SD = 2.4$ ). The final composition of the Wagga Wagga focus group sample is displayed in the bottom half of table 4.1. As illustrated, a smaller number of participants attended the Wagga Wagga focus groups compared to Sydney. One explanation for the lower attendance rates in Wagga Wagga is that these groups were run at the beginning of the school holidays and many participants indicated that they could not attend the groups as they were going away over the holiday period. The Wagga Wagga focus group participants were similar in age to the Sydney participants. For the male 17 to 20 year sub-group, the mean age across focus groups was 18.3 years ( $SD = 0.9$ ). For the male 21 to 25 sub-group the mean age across

focus groups was 22.6 years (SD = 0.5). For the female 17 to 20 year sub-group the mean age was 18.0 (SD = 1.0).

**Table 4.1.** Focus group composition

Focus Group	ITS	Sub-groups	n	Mean age*
<i>Sydney</i>				
1	FDW, FCW, LDW, FWS	M 17 to 20	5	19.0 (1.3)
		F 17 to 20	6	18.8 (1.2)
2	ALC, sniffer, PT	M 17 to 20	3	18.7 (0.6)
		M 21 to 25	5	23.6 (1.3)
3	ISA	M 17 to 20	3	20
		M 21 to 25	6	23.3 (1.6)
4	SBR	M 17 to 20	5	17.8 (0.8)
		M 21 to 25	5	22.0 (1.0)
<i>Wagga Wagga</i>				
1	ALC, sniffer, PT	M 17 to 20	3	19.0 (1.7)
		M 21 to 25	4	22.5 (1.7)
2	SBR, LIC	M 17 to 20	4	18.3 (0.9)
		M 21 to 25	0	-
3	FDW, FCW, LDW, FWS	M 17 to 20	2	18.0
		F 17 to 20	3	18.0 (1.0)
4	ISA	M 17 to 20	1	20
		M 21 to 25	3	22.7 (0.6)

\* Standard deviation in parentheses

Note: ISA = Intelligent Speed Adaptation; LDW = Lane Departure Warning; FWS = Fatigue Warning System; FCW = Forward Collision Warning; FDW = Following Distance Warning; ALC = Alcohol Interlock; Sniffer = Alcohol Sniffer System; PT = Driving Performance Test; SBR = Seat Belt Reminder; LIC = Electronic Licensing.

Participants were recruited through a telephone survey (refer Chapter 3 for a detailed description of the recruitment method). In order to ensure that the participants did have experience as a driver, but did not drive alternative transport to a car for a substantial amount of their driving time, the following inclusionary criteria were applied to screen potential participants:

- the participants had to currently drive a car;
- they had to hold a current probationary or full car driver's license; and,
- of the total time the participants spent driving, not more than 20% of this time is spent driving a heavy vehicle or a motorcycle.

In addition, none of the participants had ever interacted with any of the technologies under discussion.

## 4.3 Materials

### 4.3.1 Discussion Guide

A list of open-ended questions was developed to guide the focus group discussions (see Appendix C for an example of the moderator's discussion guide). The definition of acceptability used in this study was encapsulated in the range of questions. It will be recalled that, to be acceptable, an ITS must be: effective, useful, usable, affordable and socially acceptable. These factors, among others, will influence a potential user's willingness to buy and use the technology (Regan, Mitsopoulos, Haworth et al. (2002).

The key issues covered in the guide were:

- what do drivers like and dislike about the technologies;
- do drivers believe that these technologies will make them safer drivers, and if so, under what conditions;
- do drivers feel that these technologies serve a purpose, and if so, under what conditions;
- what, if any, potential problems or concerns do drivers have about the technologies and how do drivers think these systems can be better designed to overcome such problems;
- what factors would encourage or discourage drivers from purchasing the technologies;
- how much would drivers be willing to pay for the technologies; and
- how would drivers react if it were compulsory to equip vehicles with these technologies?

### 4.3.2 Questionnaire

A questionnaire was also developed and administered as part of the focus group activity (see Appendix D). The purpose of the questionnaire was to obtain information regarding the composition of the focus groups in terms of participants' experience as a driver, experiences with everyday driving situations, preferences regarding factors that might be taken into account when purchasing a vehicle, and experiences with in-vehicle and other (e.g. mobile phone) technologies. The questionnaire comprised four parts.

- a) The first section consisted of questions for gathering information on participants' demographic characteristics, including age, education level, and occupation.
- b) The second part comprised questions for gathering information about participants' driving experience, travel patterns, and history of traffic infringements (e.g. speeding fines) and crash history. This section of the questionnaire also included the 32 items comprising the Driver Behaviour Questionnaire (DBQ; Åberg & Rimmö, 1998). The DBQ is a well-researched instrument designed to assess driver experiences with, and reactions to, a range of situations encountered in everyday driving. Factor analysis of the DBQ by Åberg & Rimmö (1998) revealed a four-factor structure. The four factors were labeled: violations, mistakes, lapses due to inattention and lapses due to inexperience (Åberg & Rimmö, 1998). The violations factor refers to deliberate behaviours such as speeding, tailgating and risky overtaking maneuvers. The mistakes factor concerns misjudgments while

driving and includes behaviours such as misjudging distance and speed, and misreading road signs. The inattention factor refers to behaviours such as failing to notice road signs and traffic signals. The inexperience factor refers to behaviours such as shifting into the wrong gear and forgetting to remove the parking brake. For each of the 32 items, respondents were required to indicate on a six-point scale (0 = never, 1 = very seldom, 2 = rather seldom, 3 = sometimes, 4 = often, 5 = very often) how often they engage in the behaviour. Driving experience, travel patterns, history of traffic infringements and crashes, and driver behaviour/style are all factors that are likely to influence an individual's acceptability of a given technology. It was imperative, therefore, to collect information on these factors to determine whether there were differences on any of these factors across the focus groups that might affect the outcomes of the discussions.

- c) The third section of the questionnaire consisted of questions for gathering information on the level of importance assigned to factors that might influence an individual's decision to purchase a particular car over another (e.g. price, engine capacity, safety features). Preferences towards factors affecting vehicle purchase are interesting to gauge, since a similar range of factors is likely to influence an individual's willingness to purchase and install an ITS.
- d) The final section of the questionnaire comprised questions for gathering information regarding participants' exposure to various technologies, including in-vehicle technologies such as cruise control and manual speed alert, and other technologies that are available in the community, such as mobile phones and the Internet. This is important to ascertain since people who are more likely to purchase and use currently available technologies might be more positive towards in-vehicle ITS technologies in general. Differences between groups on this factor might influence the outcomes of the discussions.

### **4.3.3 Video Presentations**

Brief video segments demonstrating each of the ITS technologies were also developed and shown to participants during the focus groups. These were implemented as Microsoft PowerPoint presentations and ran for approximately one to two minutes each. The purpose of these videos was to provide participants with some information regarding the functional operation of each of the technologies, the visual and auditory warnings that they issue and to demonstrate how the vehicle would have to be driven to initiate these warnings. For those technologies (Intelligent Speed Adaptation, Alcohol Interlock, Following Distance Warning and Seatbelt Reminder Warning) that are fitted to real vehicles (e.g., TAC SafeCars), the video segments comprised footage of functional systems in real cars. For the remaining technologies, the video segments showed footage of simulated systems in vehicles not equipped with ITS, in which the system warnings were superimposed on the original video footage. Participants in both the Sydney and Wagga Wagga focus groups were shown identical video presentations for each technology, in order to ensure that the information participants received regarding the technologies was consistent. A description of each of the video segments is provided in the following sections.

#### **Forward Collision Warning**

The video footage for the Forward Collision Warning (FCW) system shows a vehicle rapidly approaching a braking vehicle in front. A display, superimposed on the video footage, depicts an icon flashing once the vehicle is in danger of colliding with the car in front. An auditory

warning can also be heard at this time. An image taken from the FCW video depicting the vehicle approaching a braking vehicle is provided in Figure 4.1.



**Figure 4.1:** Forward Collision Warning video segment.

### **Following Distance Warning**

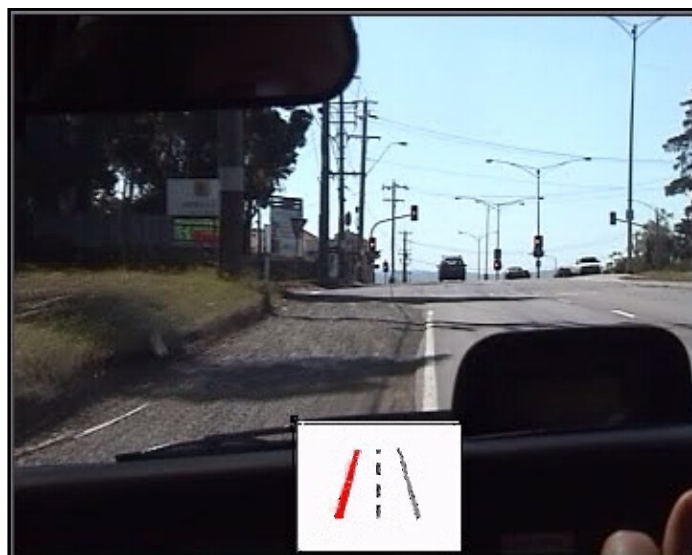
The Forward Collision Warning video segment depicts a car driving along a freeway. After 5 seconds of driving the car begins to ‘close in’ on the car in front. As the distance between the approaching car and the car in front drops to 2 seconds, a visual warning depicting a “following distance ladder” is superimposed on the video footage. The top three bars of the ladder begin to fill with yellow as the following gap closes. As the car gets even closer to the car ahead, the bottom three bars of the ladder fill with red and the entire ladder begins to flash. When the bottom bar of the ladder fills with red an auditory warning is heard in conjunction with the video footage. After several seconds, the following car slows down, increasing the following distance from the car in front and the warnings cease. Figure 4.2 shows an image taken from the Following Distance Warning system video depicting the visual warning ladder that is displayed.



**Figure 4.2.** Forward Collision Warning video segment.

### **Lane Departure Warning**

The video footage for the Lane Departure Warning system depicts a car driving along a straight road. After 5 seconds of driving the car veers off the road to the left. At this time, superimposed on the video footage, is a visual warning depicting the left line marking of the lane flashing. This is accompanied by an audio warning of the sound made when a vehicle drives over a rumble strip. After 3 seconds, the car veers back onto the road and the warnings cease. Figure 4.3 shows an image taken from the Lane Departure Warning system video of a car veering off the road and of the visual warning that is issued.



**Figure 4.3.** Lane Departure Warning video segment.

### **Fatigue Warning System**

The video footage for the Fatigue Warning system depicts a car driving along a country road. The car begins moving from side to side giving the impression that it is a little out of control.

The camera zooms in on the driver, who is yawning, has her hand up to her mouth and is beginning to close her eyes. At this point, the fatigue monitoring display superimposed on the video flashes the words “FATIGUE WARNING” and at the same time a voice message says “FATIGUE WARNING”. This message is repeated several times. Figure 4.4 displays a segment taken from the Fatigue Warning system video. It depicts a car being driven along a country road and the superimposed image of the fatigue warning icon being issued to the driver.



**Figure 4.4.** Fatigue Warning video segment.

### **Intelligent Speed Adaptation**

The video footage for the Intelligent Speed Adaptation systems first focuses on a speed limit sign situated on the side of the road and then on the speedometer, which is on 55 km/h and rising. At the point when the speedometer reaches 63 km/h, the camera zooms in on the ITS display and shows footage of the ISA visual (flashing sign of the posted speed limit) and auditory warnings until the driver reduces speed to below the limit. The ISA visual warning, as it appeared in the video footage, is shown in Figure 4.5.



**Figure 4.5.** Intelligent Speed Adaptation video segment.

### **Alcohol Interlock**

The Alcohol Interlock video footage shows the driver getting into a car and attempting to start it. When the car fails to start, the driver blows into the breathalyser unit and once a BAC reading of 0% is shown, the driver is able to successfully start the car. Figure 4.6 shows an image taken from the Alcohol Interlock video footage of a driver blowing into the breathalyser unit. From this video segment, the additional features of the Alcohol Sniffer system were then described and explained to the participants.



**Figure 4.6.** Alcohol Interlock video segment.

## Drink Driving Performance Test

The video footage of the Drink Driving Performance Test depicts a driver getting into a car. Before the driver starts the car an alcohol sniffer detects alcohol on her breath and issues the following auditory message: “Alcohol detected, please press the accelerator pedal to start the driving test”. The driver then presses the accelerator pedal and the visual display of the driving test is superimposed on the video footage. For approximately 20 seconds, the driver is filmed as she takes the driving test and at the end she is issued the following auditory warning: “You have failed the driving test – for your safety you should not drive the car.” The visual display of the Performance Test, as it appeared in the video footage, is shown in Figure 4.7.



**Figure 4.7.** Drink Driving Performance Test video segment.

## Seat Belt Reminder

The Seat Belt Reminder video segment depicts a driver getting into a car and starting it without fastening her seat belt. The Seat Belt Reminder flashing visual warning icon appears on the video footage as the driver starts the car. The driver then proceeds to drive off and once she exceeds 10 km/h, the driver hears an auditory warning. After hearing the auditory warning, the driver realises she is not wearing her seat belt. She then fastens her seat belt and the warnings cease. Figure 4.8 shows an image taken from the Seat Belt Reminder video footage of the driver driving without her seat belt fastened.



**Figure 4.8.** Seat Belt Reminder video segment

### **Electronic Driver's Licence**

The video footage for the Electronic Driver's Licence system depicts the driver getting into a car and inserting her licence into the licence card reader slot. This scene is shown in Figure 4.9. A voice is then heard informing the driver that she is not authorised to drive the vehicle.



**Figure 4.9.** Electronic Driver's Licence video segment.

#### 4.3.4 Data collection

Finally, in order to facilitate the accuracy of the data collection and transcription process, a digital video camera was used to record each of the focus groups.

### 4.4 Procedure

Three of the metropolitan focus groups were held at an inner city location and the fourth group was held at a location in Parramatta. The rural focus groups were all held at the Country Comfort Wagga Wagga Motel Boardroom.

The Sydney participants were informed of the time and location of the focus groups at the time of recruitment. The Wagga Wagga participants were contacted on the morning of their focus group to remind them of their engagement and to confirm that they had received the information about the focus groups sent to them at the time of recruitment. Each focus group was approximately 1.5 to two hours in duration and proceeded in the following manner:

- *Introduction:* The focus group facilitator introduced him or her self and provided a brief description of the project, including the funding body, the researchers involved in the project and the aims of the focus group discussions.
- *Ethical requirements:* Prior to attending the focus groups, participants had read the explanatory statement sent to them through the mail and signed the consent form, which they returned to the facilitator upon arrival at the focus groups. Participants were reminded of the ethical issues raised in the explanatory statement, such as the purpose of the consent form and the need to maintain confidentiality by not discussing the views of individual participants outside of the focus group. All participants wore nametags with their first name and participant code. Participants were informed that the purpose of the codes was to ensure that none of the participants could be identified by name in the report and that, as such, they should not hesitate in expressing their honest opinions during the discussion. The need to videotape the sessions for data collection purposes was also explained and participants were informed that all tapes would be destroyed at the end of the project.
- *Project description:* Participants in each focus group were read an identical description of the project to ensure that the information provided about the purpose of the project was standard across all groups.
- *Questionnaire:* Participants were asked to complete the demographic and driving experience questionnaire.
- *Functional descriptions and video footage:* A functional description outlining the purpose and operation of the technology (or technologies) to be discussed in the session was read out to participants (see Appendix E for the functional descriptions). This was followed by a short video segment demonstrating the functions of the technology and the warnings issued (described previously; see section 4.3.3). This footage was played several times if necessary in order for the participants to fully understand the function of the technology.
- *Guided discussion:* The discussion followed the format set out in the moderator's discussion guide, however due the different issues raised during each group there was some variation across focus groups with regard to the order in which the issues were discussed and the formation of additional questions.

A transcription of each focus group discussion was prepared from the videotapes. The aim of this process was to preserve the content of any comments made, rather than provide a verbatim transcription of each focus group. These transcriptions were used to categorise the focus groups discussions into several constructs that underlie acceptability. The results of the focus groups discussions are presented and discussed in Chapter 5.

# **Chapter 5. FOCUS GROUP DISCUSSION ON YOUNG DRIVER ACCEPTABILITY OF ITS – RESULTS AND DISCUSSION.**

## **5.1 Introduction**

In this chapter, the results of the eight focus groups are presented and discussed. The first section of the chapter presents a summary of the results of the questionnaire completed by participants during the focus groups. In the last section of the chapter, the findings from the focus groups are documented.

## **5.2 Focus Group Questionnaire – Summary of Results**

The purpose of the focus group questionnaire was to obtain information regarding the participants' demographic details, including details about their occupation and level of education, their driving experience and their experience with, and use of, in-vehicle ITS and other technologies (e.g., DVD's). This information was also used to identify any differences on these variables between the Sydney and Wagga Wagga participants. This section provides a brief summary of the questionnaire results. A more detailed discussion of the questionnaire results can be found in Appendix F.

The questionnaire results revealed that the participants from both the Sydney and Wagga Wagga groups were employed in a range of occupations. The Sydney participants, however, were employed in a wider range of occupations compared to the Wagga Wagga participants and in particular, a greater proportion of the Sydney participants were employed in professional positions, such as accountants or teachers. In terms of highest education level completed, more than twice as many Wagga Wagga participants than Sydney participants were still completing years 11 or 12. The proportion of participants who had completed some form of post-secondary education, however, was similar across groups. In terms of the factors influencing their decision to purchase a car, the participants from both groups indicated that cost and reliability were the most important factors influencing their decision and that ABS brakes was the safety feature they would most likely seek when purchasing a vehicle.

In regard to their use of in-vehicle technologies, the majority of both Sydney and Wagga Wagga participants indicated that they had driven a car equipped with Cruise Control, while very few participants had used in-vehicle Route Navigation or Adaptive Cruise Control. The most commonly used technology based facilities were email and the internet and this was similar across groups.

The Sydney and Wagga Wagga focus group samples were similar in terms of their driving experience and exposure, however the Sydney participants were more likely to have obtained their full driver's licence than Wagga Wagga participants. The Sydney participants were also more likely to have been booked for speeding and were involved in a greater number of crashes than the Wagga Wagga participants. In terms of driving styles, which were measured by the DBQ, the Sydney participants committed a greater number of violations (e.g., exceeding the speed limit) and lapses due to inattention (e.g., failing to notice signal changes) compared to the Wagga Wagga participants.

## 5.3 Results of the Focus Group Discussions

As discussed earlier, several constructs are believed to underlie ‘acceptability’. The key constructs underlying acceptability, as defined by Regan, Mitsopoulos, Haworth et al. (2002) for the purposes of their study, are: Effectiveness, Usefulness, Usability (ease of use), Willingness to Buy (affordability) and Social Acceptability. In line with Regan, Mitsopoulos, Haworth et al., for the current study, the themes arising from the discussions of each technology are discussed under these headings. Changes to the design of the technologies suggested by the participants are also discussed.

### 5.3.1 Intelligent Speed Adaptation

Two focus groups were held to discuss ISA, one in the Sydney suburb of Parramatta and one in Wagga Wagga. Both of these focus groups comprised males aged 17 to 25 years. ISA is designed to discourage or prevent drivers from exceeding the speed limit. The focus group participants discussed and compared two variants of ISA: a speed alerting system, in which drivers are warned when they are travelling above the local speed limit; and a speed limiting system, which prevents the driver from accelerating over the speed limit by restricting fuel flow to the engine or applying the brakes. As the speed limiting system is more controlling than the alerting system, it was believed that drivers may deem this system as less acceptable. Indeed, this has been demonstrated previously (e.g., Regan, Mitsopoulos, Haworth et al., 2002; Varhelyi, 1996). It was therefore important to obtain information on the acceptability of both systems as this may differ considerably.

#### Effectiveness

The majority of participants from both Sydney and Wagga Wagga viewed the ISA technology in a negative light. Although many of the participants stated that they could see the safety benefits of the technology, they all agreed that it would become annoying very quickly. For example:

*“You can see the safety benefits of it, but after a while I think most males would apply the fist to it.” – Wagga Wagga*

Participants in both Sydney and Wagga Wagga were concerned that the technology, particularly the limiting system, would not allow them to travel along with the rest of the traffic, which often travels 5 to 10 km/h above the speed limit. Here the participants felt that they would be in a ‘catch 22 situation’: if they tried to travel with the rest of the traffic flow, the system would constantly issue them with warnings, but on the other hand, if they travelled at or below the speed limit, they would hold up the rest of the traffic.

*“Even though you can see the safety aspects of it, it is going to annoy the hell out of you, because traffic flow is usually faster than the speed limit by about 5 km/h or so. So if you sit on the limit, you will hold up traffic and annoy people.” – Wagga Wagga*

*“The traffic often travels 5 or 10 km/h above the speed limit, so if you have this thing beeping in your head the whole time you are just going to lose it.” – Sydney*

Both the Sydney and Wagga Wagga participants also raised several questions regarding the operation of the system, particularly whether it could be turned on or off. Both groups agreed that if the system could be turned off, it would be a more attractive option. When questioned

about whether they would actually turn the system on if given the option, all but one of the Sydney participants said that they would not turn it on and if they did turn it on, it would just be for a short time until the novelty had worn off. The one Sydney participant who agreed that he would turn it on said that for everyday driving he would turn it on, but would turn it off in emergency situations. The Wagga Wagga participants felt that it would depend on the driver whether you would turn the system on. Several participants agreed that they would turn the system on if they had children and one of them was going to drive the car, or if they were down to their last demerit point of their licence.

Despite their overall negative feelings towards the systems, the Sydney participants did agree that the systems would have some advantages. One participant stated that the system would be helpful for him, as he drives all day and he would not have to worry about the speed he was doing. Other Sydney participants mentioned that the systems would be useful when driving in unfamiliar areas where the speed limit was unknown, or to prevent you from receiving a speeding fine. For example:

*“It would be handy for me because I drive all day and I would not have to worry about the speed that I am doing.” - Sydney*

*“I think it could help because you would not get picked up for a speeding ticket by the radar.” - Sydney*

*“...heaps of times when I am driving, I think what is the limit here? So that would be the advantage of it. “ – Sydney*

In contrast, the Wagga Wagga participants mentioned fewer advantages of the systems. Indeed, the only advantage they did mention was that the systems could be beneficial if they had children and they loaned their car to one of them.

When asked whether driving with these systems would make them drive any differently, both the Sydney and Wagga Wagga participants stated that it would, because they would drive at the correct speed. The participants agreed that it would also make them safer drivers, as they would be travelling at slower speeds and would have more time to react to potential hazards. One Sydney participant also mentioned that the system would make drivers safer around school zones. The participants did mention, however, that some people will speed regardless of the system and they will just have it disconnected.

The participants from both Sydney and Wagga Wagga also raised the concern that they would become too dependent or over-reliant on the system and they would pay less attention to speed zones and no longer monitor their speed. The participants saw such dependence on the system as being a particular problem if the system malfunctioned.

*“You could definitely become complacent with this system – you would be used to putting your foot down and having it slow you down.” – Wagga Wagga*

*“You could get too dependent on it and if it does malfunction, you are not even going to be paying attention.” – Sydney*

*“You could depend on it and if they put in a new school zone that the system does not know about, you could go through at 80 km/h because you are not paying attention.” - Sydney*

*“You would not pay attention to any signs.” – Sydney*

One Sydney participant also mentioned that with these systems, you might drive around with a false sense of security that everyone has these systems and they are safer, or that the car is almost driving itself, so you may not take as many precautions as usual.

When asked whether they could think of any potential problems they might have with the technology, the participants from both Sydney and Wagga Wagga raised a number of issues. First, participants were concerned about being restricted by the system in an emergency situation, where you may need to speed to get to hospital. All of the participants agreed that you would have to be able to override the system in such cases.

*“Can you disable the system in an emergency and you need to speed?” – Wagga Wagga*

*“What if your wife is in labour and you have to get her to hospital and you have to go 50 km/h the whole way?” – Sydney*

Both groups of participants were also concerned with the speed limiting system and the fact that it will not let you accelerate beyond the speed limit. In particular, participants believed that this could be dangerous as there are sometimes situations where you need to accelerate out of danger. One Wagga Wagga participant also raised the concern that it would be extremely dangerous if you pulled out to overtake a vehicle and the limiting system suddenly kicks in and you are stuck in the overtaking lane with no acceleration. The following quotes illustrate these concerns.

*“Not every obstacle on the road is stationary and sometimes you need to accelerate around them.” –Wagga Wagga*

*“What happens if you anticipate that the car will accelerate, and you move into the right hand lane and put your foot down and all of a sudden the car goes beep and slows down and you have someone stuck behind you?” – Wagga Wagga*

*“There is a need for you to keep to the speed limit, but sometimes it could be dangerous if you need to accelerate out of danger.” – Sydney*

The participants also raised the concern that the system, and in particular the beeping, may be distracting, especially to younger drivers such as learners.

*“It would be a huge distraction with the beeping because you would be concentrating on getting the speed limit down and you are not looking where you are going.” – Sydney*

*“If you are a learner driver and it beeps, it might scare you and make you have a crash.” – Wagga Wagga*

Finally, the Sydney participants were concerned with the limiting system applying the brakes as the car enters a lower speed zone. They felt that this could be dangerous, particularly if the road is wet. For example:

*“It could make you less safe if it braked in the wrong situation and sent you into a spin.” – Sydney*

*“The braking scares me because if you go from an 80 km/h to 60 km/h zone, there is a different way of braking from the dry to the wet, and the car is not going to know what situation you are in. I don’t want to rely on a box in my bonnet to do it for me.” – Sydney*

Concerns over the reliability of the systems were also raised by the participants in both groups. In particular, the Wagga Wagga participants felt that the system would not be very reliable because it has not been around for long. They were also concerned with the system’s speed data not being updated when the vehicle moves into a new speed zone. Participants suggested that this could be annoying if the car moved into a higher speed zone, but the system still limited the car to the lower speed. In the case of moving into a lower speed zone, the participants were concerned about the legal implications if you were speeding, but the system did not recognise this. The Sydney participants, on the other hand, were concerned with the system malfunctioning and issuing false alarms, such as applying the brakes when they are not speeding. They suggested that the system would have to be tested thoroughly before it is installed.

Both the Sydney and Wagga Wagga participants strongly agreed that they would not put up with the systems if the systems were not 100% reliable. The Wagga Wagga participants were particularly adamant about this, saying they would not drive if the systems were unreliable.

In both groups it was thought that passengers would find the system annoying and would potentially feel less safe if the system was constantly beeping. One participant also mentioned that passengers trust the driver to get them where they are going, but they may be less inclined to trust the system.

There were mixed reactions among the participants, both between and within the two groups, regarding whether driving a car with ISA would make them drive other cars without ISA any differently. One participant in the Wagga Wagga group stated that it would not make him drive other cars any differently as you would be used to the speeding regulations. Others believed that they would drive faster in a car without the system, as they would suddenly have the freedom to do so. Others, still, felt that they would be more complacent because they would expect the car to still regulate their speed. For example:

*“No, you would be accustomed to driving at the regulations.”- Wagga Wagga*

*“If you got into a car without it, you might go: “I can speed again”, and you would not be used to the higher speeds. You would get that rebellious streak and do what you can’t do in your car.” – Wagga Wagga*

*“If you found a car that didn’t have the system, you would just go fast in it.” – Sydney*

*“You could definitely become complacent – you would be used to putting your foot down and having it slow you down.” – Wagga Wagga*

*“You would drive more complacently because you would be used to having a car which is half automated, which could be quite dangerous.” - Sydney*

## **Usefulness**

There was a consensus among the participants in both groups that they would *personally* not find the ISA technology useful. Some participants stated that this was because they did not

speed and so the system would be of no benefit to them. Others mentioned that you can still drive dangerously even if you are travelling at or below the speed limit, so they saw little benefit in the system. The participants did, however, claim that the technology may be useful for other groups of road users, such as for those drivers who intentionally speed or tailgate other vehicles; learner drivers and P-plates; and recidivist speeders. Some of the Wagga Wagga participants also mentioned that they would find the system useful if they had children, who were beginning to drive. Finally, several Sydney participants said that the systems would be useful around school zones and to prevent you from receiving speeding fines. One Sydney participant, however, believed that the systems would be less useful in city areas. These issues are illustrated in the following quotes.

*“If I could install it into my kids’ car I would.” – Wagga Wagga*

*“Maybe it could be used as a restriction for people who have been caught previously, but for the average driver it would not be very useful.” – Wagga Wagga*

*“I tend to stick to the speed limit anyway so it would not affect me. But it may be useful for those who go over the speed limit or tailgate.” – Sydney*

*“It can stop you speeding, but you can still drive like a psychopath doing the speed limit.” – Sydney*

*“I think it would be more beneficial for learner drivers and p-plates, and disqualified drivers as well.” – Sydney*

*“I don’t think you can classify it as a city thing.” – Sydney*

## **Usability**

Concern was raised by participants in both groups over the visual and auditory warnings issued by the ISA systems. In particular, some participants felt that there is no need for the auditory warning when there is the visual icon and a decrease in speed. One Sydney participant stated that the audio would be a major distraction, as you would end up concentrating on reducing your speed, rather than on the road ahead. However, others felt that they would prefer only the auditory warning rather than the visual flashing icon. For example:

*“Is there a need for it to beep if it is flashing on the screen and limiting your speed? I think having no acceleration is a message enough. Somebody is just out to annoy people.” – Wagga Wagga*

*“I would be more inclined to agree to one that just beeps” – Sydney*

*“It would be a huge distraction with the beeping, because you would be concentrating on getting your speed down and not looking where you are going.” – Sydney*

For participants from both groups, the CD ROM map of the road network raised many ongoing concerns. The major concern was whether the CD ROMs would have to be changed or updated as the speed zones change or as one moves into another jurisdiction. One participant also raised the issue of how drivers would update the CD ROM and was concerned that if he

had to update it over the internet, that other people may be able to gain access to his vehicle details.

*“You would have to constantly update the CD if the speeds changed or you were changing areas.” – Wagga Wagga*

*“Sydney’s roads are constantly being updated, so the map would have to be constantly updated somehow. My concern is that if you have to update through a modem then someone could gain access to your details and start messing with the system.” – Sydney*

Participants also questioned where they would purchase the updated or new CD ROMs and whether they would have to do this themselves or have the CDs sent to them. Another participant was concerned with the cost of repairing the system if it malfunctioned. Finally, one Wagga Wagga participant was concerned with the time it would take for the system to warm up and register the satellites. He suggested that the warm up time would need to be fairly quick, around one minute, or it would become an inconvenience.

When asked whether they would want to cheat the systems, participants from both groups said that they would. They also believed that many other road user groups, such as truck drivers, would also want to cheat the systems. Some of the ways suggested by participants to cheat the system were: rip out the cable that applies the brakes on the limiting system; take out the CD ROM; or dismantle the entire system and remove it from the car. Several participants suggested that if a person did not want the system and was going to dismantle it, then he/she most likely would not buy a car equipped with the system in the first place.

### **Willingness to Buy**

Both the Sydney and the Wagga Wagga groups only expressed an interest in purchasing the alerting variant of the ISA technology and were adamant that they would not purchase the speed limiting system.

Several of the Wagga Wagga participants stated that they would not have either system in their car, even if the systems were free. Others said that they would buy the alerting system, but only under the following conditions: if they could disable it, if the system did not restrict their car in any way, or if they could set the limit on the system so that it did not issue warnings until they were travelling 5 to 10 km/h above the speed limit. All Wagga Wagga participants agreed that if one of the systems were a standard feature, it would not make the car more appealing and all agreed that if the systems were not standard, they would definitely not purchase them as an extra.

*“I personally would not buy a vehicle that had that on it. If I could not disable it I wouldn’t bother” - Wagga Wagga*

*“I wouldn’t pay money for it in the first place. If it was an option on my car I wouldn’t purchase the car or I would disable it” – Wagga Wagga*

*“I would buy it if you could set the limit that it would go off at 5 or 10 km/h above the limit.” – Wagga Wagga*

The Sydney participants felt that poor reliability, cost and difficulties in updating the CD ROM were factors that would stop them from purchasing the ISA systems. When asked what would encourage them to purchase the systems, several of the participants said that they

would buy the systems if the systems prevented them from receiving speeding fines, or if they received substantial reductions on their insurance premiums. Others stated that they would not purchase the system because it would be worth more than their car. In addition, the Sydney participants stated that if one of the systems were a standard feature, it would only make a car more appealing if the system could be turned on or off; if they actually wanted the system; or if they got substantial reductions on their insurance premiums. All agreed that if the systems were not standard features, they would definitely not purchase them as extras.

*“Whether you bought it depends on if you can turn it on and off.” - Sydney*

*“Given an option you would not put it in there, unless you got massive reductions on your insurance premiums.” – Sydney*

*“For some people the system would be worth more than their car.” - Sydney*

Both the Sydney and Wagga Wagga participants stated that males under 25 years do not purchase cars for their safety features, and authorities would have a hard time convincing them to install an ISA system. Indeed, several of the participants suggested that when they get a new car they want to see how fast it can go, and they would not want to be restricted by such systems.

In terms of how much the participants were willing to pay for the systems, the Wagga Wagga participants stated that they thought the systems would cost around \$1,000 to install. However, all agreed that they would not be willing to pay this amount and this decision did not depend on the type of car the system would be equipped to. The Sydney participants said that the system would cost around \$2,000 to install. Several participants said that whether they would pay this much for the system would depend on how much they would save on their insurance, while others mentioned that the government should subsidise the costs associated with installing the system.

## **Social Acceptability**

Three issues pertaining to social acceptability were raised by the participants in both groups. These were whether the systems should take control away from the driver, the legal implications arising from use of the systems and whether the systems should be compulsory.

Both groups of participants were not in favour of the ISA technology taking control away from them as a driver. The Sydney participants stated that they felt the alerting system was the “lesser of two evils” and that they would prefer the alerting system to a limiting system, which takes control of the car. Many participants mentioned that they like to be fully in control of their car at all times, but they would be willing to accept a system which only warns them to slow down in the first instance and then, if they continued to speed after repeated warnings, slows the vehicle down automatically. The Wagga Wagga participants all agreed that the limiting system, which takes control of the car could be dangerous, particularly if drivers are used to their car having power and they all of a sudden find that their car does not have the power to perform a manoeuvre.

Participants from both Sydney and Wagga Wagga were concerned with the legal implications of the systems, particularly if the systems malfunctioned. More specifically, participants from both groups were concerned about who would have to pay a speeding fine, if the system

provided the driver with an incorrect speed limit for an area, or who would be liable if use of the system resulted in an accident.

With regard to whether the systems should be compulsory, the Wagga Wagga participants felt that they should not be compulsory for the average driver, unless the systems were tax free or subsidised. Participants did, however, believe that the systems should be compulsory for recidivist speeders and for novice drivers, such as learner's or P-plate drivers. Similarly the Sydney drivers did not think the systems should be compulsory - and if they were made compulsory, it should only be for new vehicles.

### **Suggested Design Changes to Enhance System Acceptability**

The participants from both groups offered a number of suggested changes to the ISA systems that could make them more appealing, such as the systems to be overridden or switched off, having a higher tolerance level before warnings are issued and alerting the type of warnings issued by the systems. For example:

*“Have an on/off switch that you control by another key.” – Wagga Wagga*

*“Not having restricted at the limit, having a say 10 km/h leeway.” – Wagga Wagga*

*“Getting rid of the beep. It is annoying, but that is what it is there for, so maybe you should have it. “ – Wagga Wagga*

*“You could have vibrating seats or the seat belt constricts.” – Wagga Wagga*

*“It could beep once when you enter a new speed zone, just to let you know the speed has changed.” – Sydney*

*“It would be all right if it let you go up to 45 km/h over the limit because after that you automatically lose your licence. People would accept it more if it let them go a bit over the limit - say 20 km/h or 10% over the limit.” – Sydney*

### **Summary of Main Issues**

The participants in both groups were not in favour of the ISA technology, particularly the speed limiting system. While the participants felt that they may become safer drivers with the system, they raised the concern that people could become too reliant on the system and no longer monitor their own speed. The systems, particularly the limiting system, were also viewed by the participants as being potentially dangerous if the driver needed to accelerate out of danger or if the system applied the brakes in the wet, sending the car out of control. The reliability of the system was also a concern raised by participants, particularly in relation to the system's speed information not matching the actual speed limits.

In relation to the usefulness of the technology, both groups of participants stated that the systems would not be useful for them, but that the systems may be useful for recidivist speeders or learner or P-plate drivers. Both groups of participants felt that the auditory warning could be distracting and having to constantly update the CD ROM as they drive from one jurisdiction to the next was a concern.

The participants were generally not willing to buy the limiting system, but stated that they would consider buying the speed alerting system if they could disable it or if they received reductions on their insurance premiums and the system was subsidised. In addition, both groups of participants were not in favour of the technology taking control away from them as a driver and claimed that they would not buy the limiting system for this reason. Concern was also raised about the legal implications of the system, such as who would be liable if the system malfunctioned or “caused” an accident. The participants felt that the systems should not be compulsory, but if they were made compulsory this should only be for new vehicles, or for particular groups of drivers such as recidivist speeders or novice drivers, and the systems should be subsidised. Finally, to make the systems more appealing to them, the participants suggested using different warnings, such as vibrating seats, giving drivers the option of turning the system on or off, and designing the system with a certain leeway, so that it does not issue warnings as soon as the speed limit has been exceeded.

Overall, the Wagga Wagga and Sydney participants held similar attitudes towards the ISA technology and raised many of the same issues regarding the acceptability of the system. It therefore appears that the acceptability of this technology may not differ considerably across male metropolitan and rural drivers in the 17 to 25 year old age group.

### **5.3.2 Forward Collision Warning**

The Forward Collision Warning and its related variant, the Following Distance Warning system (discussed in Section 5.3.3) were discussed in two focus groups, one in Sydney and one in Wagga Wagga. Both groups comprised male and female participants aged 17 to 20 years. The Forward Collision Warning system is designed to reduce the number and severity of rear-end crashes by providing visual and auditory warnings to the driver when a collision is imminent.

#### **Effectiveness**

The participants in both groups raised many questions about the design and technical operation of the Forward Collision Warning system, such as whether it can be turned on or off by the driver, if it will initiate warnings if the driver trying to park next to another car, whether the radars will only detect objects in front of the car or objects to the side of the car as well, and where the system is mounted. The Sydney, but not the Wagga Wagga, participants also questioned whether the system would go off in heavy traffic and mentioned that if the auditory warning went off frequently in such situations, it would become very annoying. Despite these concerns, the Sydney participants agreed that the system would help them establish if any vehicles in front were braking suddenly if they were travelling behind a truck or a large vehicle and their visibility was reduced. They also suggested that the system would help them to avoid an accident if they were momentarily distracted and were not concentrating on the vehicles ahead. For example:

*“It would be good when you are in traffic and you have a Jeep or Land cruiser in front of you and you don’t know what is going on in front of them or to what extent they are braking. So the advantage of it is that it takes away the doubt of how quickly they are slowing down.” – Sydney*

*“A lot of the rear enders happen because people are distracted, so I think it would help with that, but you would want to know more about it.” - Sydney*

The Wagga Wagga participants on the other hand, felt that for the system to be effective, it must be installed in every vehicle on the road, including trucks.

When asked whether driving a car equipped with Forward Collision Warning would make them drive any differently, participants from both groups agreed that it would if they paid for the system themselves and used the system properly. The participants were unsure, however, whether the system would make them safer drivers. The Wagga Wagga participants stated that this would depend on the driver, while the Sydney participants believed that, while driving with the system may decrease rear-end accidents in certain situations, it would be unlikely to make drivers safer in general.

The participants from both groups also raised the concern that drivers may become too dependent or over-reliant on the system, making them become complacent about monitoring the actions of vehicles ahead. For example:

*“People might start relying on it “ – Wagga Wagga*

*“I think these systems would make you have a really relaxed approach as a driver, because you would think I have all of these systems here to do it all for me. “ – Sydney*

*“You could become reliant on it.” Sydney*

*“You might become complacent, as you do with other technologies.” Sydney*

*“I am very concerned about relying on it too much, I think people should focus on driving better.” – Sydney*

One Wagga Wagga participant, however, felt that the system would make people adopt larger following distances in an attempt to prevent the system from issuing warnings.

The participants from both groups also raised several concerns about the potential dangers or problems associated with the system. In particular, the participants were concerned with the system that automatically braked the car if a collision were imminent. The participants’ main fear was if the system had to brake in wet conditions and it did not take into consideration the extra stopping time that would be required in the wet, or if braking in the wet caused the car to lose its grip on the wet road and start skidding out of control. The participants were also concerned that the auditory warning issued by the system may distract or shock the driver and cause more accidents. The following quotes demonstrate some of the participants’ concerns:

*“A sudden noise like that could shock the driver. If they have got their foot on the accelerator couldn’t that sudden shock make them speed up?” – Wagga Wagga*

*“I don’t like the idea of the system having control of your brakes.” – Wagga Wagga*

*“The noise could freak you out and cause more accidents.” – Sydney*

*“I can’t imagine the Forward Collision Warning system would work in the wet. I don’t think it would give you enough time and you couldn’t really adjust it to say it is a bit wet, or it is really wet, so you would turn it off.” – Sydney*

The participants from both groups were also concerned about maintaining the system and how much this might cost. For example:

*“The number of services it needs could be a problem.” – Wagga Wagga*

*“It might be hard to fix.” – Sydney*

*“How is your average mechanic going to fix the systems?” – Sydney*

Issues regarding the reliability of the system were also raised by participants. Participants were concerned that the system could malfunction by either issuing warnings when a collision is not imminent or by failing to issue a warning when the car is about to collide with the vehicle in front. Participants were also concerned that the system would have to be precisely calibrated so that the warnings were issued at the correct time, allowing the driver enough time to react and avoid a collision. All participants agreed that the system would have to be 100% reliable, particularly given the view that drivers would rely on the Forward Collision Warning system to prevent accidents. However, one Wagga Wagga participant mentioned that the system could only be relied upon up to a point, as it is ultimately up to the driver to do the right thing with the system.

*“Failure of the system if you are relying on it would be a problem.” – Wagga Wagga*

*“It would have to be 100% reliable before it went into cars.” – Wagga Wagga*

*“What is 100% reliable in your car anyway?” – Wagga Wagga*

*“You are still relying on the driver to do the right thing with the system. No one can tell what is going on in someone’s head.” – Wagga Wagga*

*“They could malfunction – they could go off all the time or they could do the opposite and not go off at all and you are relying on it.” - Sydney*

*“No, you would just have to disconnect it if it wasn’t 100% reliable.” - Sydney*

When asked how they think their passengers would react to the system, the Sydney participants felt that their passengers would find the Forward Collision Warning system annoying. The Wagga Wagga participants believed that their passengers would feel safer with the system in their driver’s vehicle, but that some may wonder if the system was court imposed. The Sydney participants felt that their passengers might feel less safe and might worry about the competence of the driver at first, but after a while would become used to the system and accept it. One Sydney participant also mentioned that as a driver he/she would become annoyed with his/her passengers if they constantly pointed out that the system was issuing warnings to slow down.

## **Usefulness**

Both the Wagga Wagga and Sydney participants said that they would find the system useful. The participants from both groups mentioned that it would be useful in situations where cars cut suddenly in front of them. The Sydney participants also mentioned that the system would be useful for predicting accidents that, as drivers, they may not be able to predict and avoid. The participants from Sydney and Wagga Wagga, however, differed in where they thought

the technology would benefit them most: the Wagga Wagga participants felt that the system would be most useful when driving around town, while the Sydney participants felt that the system would be most useful on freeways and country roads and would be less useful in heavy traffic around town.

*“I would want to use the FCW one, because I don’t drive too closely, but so many cars jump out in front of you, sometimes you don’t notice.” – Wagga Wagga*

*“It depends what sort of driver you are and what sort of driving you do. Driving around town the Forward Collision Warning is going to be better.” – Wagga Wagga*

*“It would also help if it sense when cars cut in on you.” – Sydney*

*“The FCW system can predict something that you might not be able to predict, It would be important to be able to disengage it in heavy traffic.” - Sydney*

*“Would use it on freeways, country roads etc.” – Sydney*

## **Usability**

The Sydney participants raised numerous concerns regarding the usability of the system. Their main concern was with the location of the visual display, which was located on the top of dashboard to the left of the driver in the video presentation. They felt that it should be mounted higher on the dashboard, above the steering wheel, so that drivers do not have to look down or to the left to see the warnings. The loudness of the auditory warning was also a concern and the participants questioned whether the system would turn the radio off when the warnings are initiated so that the warnings can be heard clearly. Finally, the Sydney participants felt that the system should give the drivers greater warning of a collision and therefore, giving drivers more time to react.

*“It should be mounted on the dashboard above the steering wheel so you don’t have to look down to see it.” – Sydney*

*“How loud is it? Would it turn the radio off?” – Sydney*

*“I think that the system needs to give the driver more time to stop.” – Sydney*

The only usability concern raised by the Wagga Wagga participants was whether the system could be turned on and off as desired. Being able to turn the system on and off was seen by the participants as an advantage and as something that would make the system more attractive to them.

When asked whether they would want to cheat the system, the participants from both groups stated that some drivers would definitely want to cheat the system. Many Sydney participants said that they would attempt to cheat the system by disconnecting it. Some participants also mentioned that they could envision young drivers trying to test how close they could get to a vehicle ahead before the system issued warnings by approaching the vehicle ahead at high speeds. The Wagga Wagga participants commented that while it could be hard to tamper with the system’s wiring, drivers would eventually find a way to disconnect the system. The

Wagga Wagga participants also mentioned that interfering with the radar on the front of the car by covering it with something would be another way to cheat the system. For example:

*“I think I would be tempted to disconnect it, or take it to a service place to disconnect it. I can see a lot of young drivers trying to test it and having competitions seeing how close they can get and how loud they can make it beep.” – Sydney*

*“People might drive a bit fast and try and make the FCW system go off a few times, but that would be less fun and a lot more dangerous.” – Sydney*

*“It would be like in the trucking industry where they are supposed to have regulators so they don’t go over 100 km/h, but those are gone, people just take them out, so it could be the same with these.” – Wagga Wagga*

*“Put something over to cover the radar on the front of the car.” – Wagga Wagga*

*“Put aluminium foil over the radar or cut a few wires.” - Wagga Wagga*

*“It could be easily tampered with and there would be a commercial incentive to design a way to tamper with the technology.” – Wagga Wagga*

*“Give it time, once the technology has been out for a while, people will find ways to cheat it.” – Wagga Wagga*

## **Willingness to Buy**

Cost, reliability and proven effectiveness were the factors identified by participants in both groups as the most critical in influencing their decision to purchase the Forward Collision Warning system. For the Wagga Wagga participants, proven effectiveness was the overriding factor found to influence their decision to purchase the system. The following quotes highlight the reasons given by the Wagga Wagga participants for buying or not buying the system.

*“The reliability of the system.”*

*“What experts in that field are going to be saying about it. What you get told about it.”*

*“Cost is a big one.”*

*“If the system is effective and reliable.”*

*“If you knew it was going to work.”*

*“If you had some facts on if it was going to work or not.”*

*“Even if it saves you once that is going to be effective.”*

For the Sydney participants, the overriding factor influencing their purchase decision was the cost, however, they also mentioned that they would be encouraged to buy the system if it could be adjusted for wet conditions or could be turned on and off. Generally, the Sydney

participants believed that rear-end crashes are not serious crashes, so, contrary to the Wagga Wagga participants, the Sydney participants expressed less of a desire to purchase the system on the basis of proven effectiveness. One Sydney participant mentioned that if drivers were given more information on the incidence of rear-end crashes then they might be more inclined to buy the system. The following quotes highlight the reasons given by the Sydney participants for buying or not buying the system.

*“Price definitely.”*

*“Reports of failure – it would have to have extensive research done on it before people would buy it.”*

*“It would need to change in different conditions if it was wet.”*

*“If you can disengage it.”*

*“If people were more informed about the rate of rear-end crashes then they would be more inclined to purchase the system.”*

Both groups also mentioned that they would like to hear feedback from users on the benefits of the system before they purchased it.

The Sydney participants stated that if the system were a standard feature, it would make a car more appealing to purchase. The Wagga Wagga participants on the other hand, said that whether a car that came standard with the system were more appealing than one that did not, would depend how effective the system was and what type of car it was equipped to. If the system was not a standard feature, Sydney participants said that whether they purchased the system as an extra would depend on the cost and whether they had proof that the system worked. The Wagga Wagga participants said that they would, depending on cost, purchase the alerting system as an extra, but stated that they would not purchase the system that automatically braked under any circumstances.

In terms of how much the participants would pay for the system, the Sydney participants stated that they would not pay much for the system and stated that they thought even \$500 was too much. Several participants did state that the price they would be willing to pay for the system would depend on how much their car was worth – if their car was worth more they would be willing to pay more for the system. The Wagga Wagga participants also stated that the price they would be willing to pay for the system depends on the type of car it would be equipped to, but overall, they were willing to pay more for the system than the Sydney participants – around \$1,000. One Wagga Wagga participant raised the important point that if the system were too expensive, young drivers would not be able to afford the system, even if they wanted to.

## **Social Acceptability**

Four issues pertaining to social acceptability were raised by participants. These were: whether the system should take control away from the driver, the legal implications arising from use of the system, privacy issues and whether the system should be compulsory.

Both groups of participants were not in favour of the Forward Collision System taking control away from them as a driver. They felt that the system which automatically braked for the driver could be dangerous under certain conditions, such as in the wet, and the automatic braking could shock some drivers, causing them to panic. The following examples demonstrate the participants' concerns.

*"If you are totally oblivious to what is going on, just driving along and it takes control of your car you could get jolted and do something spontaneous."* – Wagga Wagga

*"I think it would shock you too much if it braked automatically."* – Wagga Wagga

*"Weather as well could be a problem if it braked – what if the person did not have proper control of the steering wheel? If it was wet and it braked, you could lose it in the wet when you didn't really need to."* – Wagga Wagga

*"I think that would be dangerous."* – Sydney

*"On a country road if you close in on the car ahead to overtake and you pull out and it brakes, you would be stuck on the other side of the road."* – Sydney

The legal implications associated with the system also caused concern for the Sydney and Wagga Wagga participants. The Sydney participants were concerned about who would be liable if they had a rear-end crash and the system did not warn them. The Wagga Wagga participants in contrast, were concerned with the legal problems that could arise if drivers were caught with a tampered system, even if this system had been installed voluntarily. Wagga Wagga participants were also concerned about privacy issues with the system and, in particular, whether the system would act like a black box recorder and record their driving, to which the authorities would later be able to gain access.

With regard to whether the system should be compulsory, the Wagga Wagga participants said that there would have to be financial assistance or benefits offered if the system was made compulsory. They also mentioned that the system would have to be reliable and tamper proof before it was made compulsory. The Sydney participants stated that they would not like to have to pay for the system if the system was made compulsory - but if it was free of charge and reliable, then they agreed that making it compulsory could be beneficial.

### **Suggested Design Changes to Enhance System Acceptability**

The participants from both groups offered a number of suggested changes to the Forward Collision Warning system to make it more appealing. While the Wagga Wagga participants suggested ways in which the system could be deployed and advertised to make it more appealing to potential users, the Sydney participants focused on changes to the design of the actual system. For example:

*"You would have it installed in every other car, and preferably through the trucking industry as well."* – Wagga Wagga

*"You would need some shock type advertisement to advertise it."* – Wagga Wagga

*"Make them cost less."* – Sydney

*“Have lights along the steering wheel.” – Sydney*

*“Have people who have been involved in accidents inform people about the dangers of tailgating.” – Sydney*

## **Summary of Main Issues**

While participants from both Sydney and Wagga Wagga raised questions regarding how the system operated under certain driving conditions, both groups agreed that the system would be effective in helping them avoid accidents if the visibility of the traffic ahead was reduced or if they were momentarily distracted. Nevertheless, the participants did raise concerns over the reliability of the system, the impact of potential over-reliance on the system, and the potential dangers associated with the automatic braking system under certain conditions, such as in the wet. Nevertheless, the participants thought that the system would be useful, although the conditions under which it was believed to be most useful differed for the two groups. The Wagga Wagga participants felt that the system would be most useful around town, while the Sydney participants felt that the system would be more useful on freeways and country roads. In terms of usability, the Sydney participants were concerned about the location of the visual display and the loudness of the auditory warning, while the Wagga Wagga participants were concerned about whether they could voluntarily engage and disengage the system. For the Sydney participants, cost was the key factor influencing their willingness to purchase the system, while for Wagga Wagga participants proven effectiveness was the most critical factor. Wagga Wagga participants indicated that they would be willing to pay twice as much for the system than the Sydney participants. In terms of social acceptability, participants from both groups were not in favour of the system taking control away from them and they indicated that the system should only be compulsory if it was subsidised or free of charge and it had been proven effective.

Overall, while the Wagga Wagga and Sydney participants appeared to hold similar attitudes towards the Forward Collision Warning system and raised many of the same issues regarding the system’s acceptability, they did have differing attitudes regarding several aspects of the system, such as its potential benefits, under what conditions it would be most useful, and the factors that would be most influential in their decision to purchase the system. This suggests that while the overall acceptability of the Forward Collision Warning system may not differ considerably across metropolitan and rural drivers in the 17 to 20 year age group, the specific aspects of the system that influence acceptability may indeed differ across these driving populations.

### **5.3.3 Following Distance Warning**

The Following Distance Warning system was discussed in two focus groups, one in Sydney and one in Wagga Wagga. Both groups comprised male and female participants aged 17 to 20 years. The Following Distance Warning system is designed to reduce the number and severity of rear-end crashes by issuing graded warnings which increase in intensity as the driver gets closer to the vehicle ahead.

## Effectiveness

There were mixed reactions among Sydney and Wagga Wagga participants to the Following Distance Warning system. The Wagga Wagga participants all agreed that the system would be effective in preventing people from tailgating and that this system would be more feasible and effective than the Forward Collision Warning system in preventing rear-end crashes. These participants did, however, feel that combining the Following Distance Warning system with the Forward Collision Warning systems would result in the most effective system.

*“I think it is good because I get annoyed when people sit right on my bumper.” – Wagga Wagga*

*“The concept of the following distance warning system seems more feasible than the other system to me and I see it as something that could be more effective than what the other one seemed to be. The incorporation of both of the systems would also maybe be good, but this system definitely seems more effective than the other system.” – Wagga Wagga*

*“I like the idea of the two systems being incorporated. It would be good not to have two things beeping at you and having to say which one is that, what’s beeping at me.” – Wagga Wagga*

The Sydney participants in contrast, held negative attitudes towards the system, particularly as they felt that the system would become very annoying if it issued constant warnings in heavy traffic. The participants also felt that the chance of being involved in a rear-end crash is quite small, so they did not feel that the system would be particularly effective. They did, however, think that the system would be more effective than the Forward Collision Warning system and that it would be useful as a guideline for drivers, particularly young drivers, to help them establish a safe following distance.

*“I think it is not a great idea because it would go off too frequently.” – Sydney*

*“You would need to use it in a place where there is not much traffic, because in the city you are so close to other cars all the time.” – Sydney*

*“I think as a young driver this system would be really good as a guideline to let you know when you are too close, because often you get too close and you don’t even know it.” – Sydney*

Participants from Sydney and Wagga Wagga felt that the Following Distance Warning system would make them drive differently. The Sydney participants felt that the system would make them safer drivers in terms of reducing how much they tailgate, but it would not make them safer drivers in general. One participant, however, mentioned that all drivers know that they should keep a safe distance behind the vehicle ahead and if drivers are not willing to keep a safe distance for their own safety, then they probably would not do this just because a system warns them they are too close. The participants from Wagga Wagga indicated that they felt the system would make drivers safer, particularly those who do not pay attention to the road or who inadvertently tailgate.

The potential for drivers to become over-reliant on the system was raised by participants in both groups. For example:

*“People might start relying on it, or it might go off without you realising it. After you have driven with it a couple of times and it has gone off a couple of times, you are going to start waiting for that noise before you do anything or realise you are tailgating. To start off with, I think it would make you a more conscious driver, but after a few uses, I think you would start to relax with it.” – Wagga Wagga*

*“There is the issue of becoming too reliant on it, because you need to learn how to judge these things for yourself. It also doesn’t help when you go to your parent’s car that doesn’t have it.” – Sydney*

Participants from both groups were also concerned that the system could be dangerous. In particular, the participants felt that young drivers would try to test the system to see how close they could get behind vehicles and how loud they could make the system beep, which could result in accidents. The Sydney participants also felt that some drivers could panic when the auditory warning sounds and brake hard, causing the vehicle behind to crash into them.

*“People would play with it and see how far they could push it before things start to happen. The initial novelty of it all could result in a few bad experiences for some people.” – Wagga Wagga*

*“I can see a lot young drivers trying to test it and having competitions seeing how close they can get and how loud they can make it beep.” – Sydney*

*“It could be dangerous because you could hear the warning and slam on your brakes and the car behind you runs into you.” – Sydney*

The Sydney participants felt that the Following Distance Warning system would be more reliable than the Forward Collision Warning system, but agreed that this system could malfunction by either giving false alarms or by not issuing warnings when it should. Neither of the groups would put up with the system if it were not 100% reliable, stating that they would either not purchase the system or disconnect the one they had.

Participants in both groups thought that their passengers would find the system annoying and may feel unsafe if the system was constantly issuing the driver warnings. However, the participants felt that this system would give passengers more confidence to tell the driver to pull back or slow down.

## **Usefulness**

Participants from Sydney and Wagga Wagga agreed that the Following Distance Warning system would be useful in stopping drivers from tailgating, particularly on freeways and when travelling long distances.

*“Would use it on freeways, country roads etc.” – Sydney*

*“For long distance driving, the FDW one would be better.” – Wagga Wagga*

The Sydney participants felt that the graded warnings issued by the system were very useful as they give the driver enough time to react, with the increase in warning intensity creating a sense of urgency in the driver. Despite indicating that as a stand alone system the Following

Distance Warning system would be useful, the Wagga Wagga participants all agreed that combining the Following Distance Warning and Forward Collision Warning systems would be more useful and potentially less confusing because drivers would not have to work out which of the systems was beeping at them.

*“I think the FDW system is useful because it gives you graded warnings, the visual warnings and then the beep which gives you a sense of urgency.” – Sydney*

*“The most useful thing would be for both systems to be incorporated into the one system.” – Wagga Wagga*

## **Usability**

The Sydney participants indicated that they liked the graded warnings issued by the system, as the warnings provided the driver with sufficient time to react. One participant, however, felt that the auditory warning needs to be more aggressive, while others felt that the warning was aggressive enough and believed that a more aggressive warning could startle the driver. The Sydney participants also felt that the location of the visual display would make it difficult for drivers to see warnings properly and suggested that the display be placed on the dashboard above the steering wheel.

*“I think the Following Distance Warning system is good – it gives you a few leading up warnings and it is not as intimidating.” – Sydney*

*“It needs to give you an aggressive warning, it didn’t sound very aggressive.” – Sydney*

*“I thought it was aggressive enough. You would not want something screaming at you or it could startle you.” – Sydney*

*“It should be mounted on the dashboard above the steering wheel, so you don’t have to look down to see it.” – Sydney*

The Wagga Wagga participants indicated that the visual warning should flash from the beginning of the warning sequence, in order to catch the driver’s attention. Participants stated that simply having the warning ladder fill with colour may not be sufficient to catch drivers’ attention, or if drivers did see the warning, it might not be aggressive enough to make many drivers act. The participants also mentioned that while the yellow ladder fill was easy to see, the red was not. Since many lights on the dashboard are red, the bars on the ladder that fill with red may not be noticed. Participants suggested that a bright purple would stand out and would be more easily seen by drivers. The fact that the system did not issue warnings when the car was travelling below 25 km/h was liked by all the Wagga Wagga participants, as the system would not issue warnings in peak hour traffic and around car parks.

*“You would need some type of visual flash instead of just a bar that moves up because otherwise you would just sit there and think the bar’s going up, big whoop. You need some kind of flash to get your attention just before it beeps at you.” – Wagga Wagga*

*“Also, the yellow is good, but with the red, a lot of the lights are red on the dash, maybe a different colour, like bright purple would be good to make it stand out.” – Wagga Wagga*

*“I like the idea that the system cuts out when the car slows to a certain distance so it does not go off in car parks or in peak hour traffic.” – Wagga Wagga*

Participants from both groups thought of several ways in which drivers could cheat the Following Distance Warning system, such as disconnecting it, or blocking the radar on the front of the car. The Wagga Wagga participants also mentioned that drivers could cheat the system by resetting the following distance at which the system issues warnings to one second instead of two, so that vehicles can get extremely close before the warnings are given. The following quotes highlight some of the ways to cheat the system that were suggested by the participants.

*“I think I would be tempted to disconnect it.” – Sydney*

*“Put something over to cover the radar on the front of the car.” – Wagga Wagga*

*“If you could find a way to put an excessive limit on it, say a 1 second gap rather than a 2 second gap to activate the warning, then people could tailgate without the system going off.” – Wagga Wagga*

## **Willingness to Buy**

Consistent with the Forward Collision Warning system, cost, reliability and proven effectiveness were the factors identified by participants in both groups as most critical in influencing their decision to purchase the Following Distance Warning system. Again, for the Wagga Wagga participants, proven effectiveness was the overriding factor that would influence their decision to purchase the system. For the Sydney participants, the overriding factor influencing their purchase decision was the system’s cost.

The Sydney participants stated that if the system were a standard feature, it would make a car more appealing. The Wagga Wagga participants, on the other hand, said that whether the system as a standard feature would make a car more appealing would depend on the effectiveness of the system and the type of car it was being equipped to. If the system was not a standard feature, Sydney participants said that whether they purchased the system would depend on the cost and whether they had proof that it worked. The Wagga Wagga participants said that they would, depending on cost, purchase the alerting system as an extra, but stated that they would not purchase the system that automatically braked for them under any circumstances.

In terms of how much participants would pay for the system, the Sydney participants stated that, in line with the Forward Collision Warning system, \$500 was too much to pay. Several participants did state, however, that if their insurance premiums were reduced they would consider paying more for the system. The Wagga Wagga participants stated that the price they would pay for the system would depend on the type of car it was going to be equipped to but, overall, they were willing to pay around \$1,000.

## **Social Acceptability**

Two issues that pertained to the social acceptability of the Following Distance Warning system were discussed. These were the legal implications associated with the system and whether the system should be compulsory.

In terms of the legal implications associated with the system, the Wagga Wagga participants were concerned about the repercussions of being caught with a system that had been disconnected or tampered with. The Sydney participants, in contrast, raised the issue of who would be liable in the event of a crash if the system did not issue any warnings – the driver or the manufacturer?

If the system were to become compulsory, the Wagga Wagga participants indicated that there would need to be some financial assistance and that the system would have to be 100% reliable. The Wagga Wagga participants also mentioned that, if it were to be made compulsory, the Following Distance Warning system should be combined with the Forward Collision Warning system. The Sydney participants stated that they would not like to have to pay for the system if it was made compulsory but, if it was free of charge and was reliable, they agreed that making the system compulsory may be beneficial.

### **Suggested Design Changes to Enhance System Acceptability**

The participants from both groups offered a number of suggested changes to the Following Distance Warning system that could make it more appealing. Participants suggested changing the colour of the visual display, reducing the cost of the system, and holding education seminars to inform drivers about the dangers of following a lead vehicle too closely. For example:

*“Change the colour of the visual warning and maybe the sound.” – Wagga Wagga*

*“The option of what skin (design) you have on the display, something that is approved by the RTA.” – Wagga Wagga*

*“Make the system cost less.” – Sydney*

*“Have lights along the steering wheel.” – Sydney*

*“Have people who have been involved in accidents inform people about the dangers of tailgating.” – Sydney*

### **Summary of Main Issues**

There were mixed reactions between the Wagga Wagga and Sydney participants to the Following Distance Warning system. The Wagga Wagga participants indicated that the system would be effective in preventing people from tailgating, but suggested that the system would be even more effective if it was integrated with the Forward Collision Warning system. In contrast, the Sydney participants held negative attitudes towards the system, as they felt it would be annoying in heavy traffic. Both groups raised concern over the potential for over-reliance on the system and the fact that many young drivers may try to test the system in competitions with others. Overall, however, the participants felt that this system would be more reliable than the Forward Collision Warning system. Participants in both groups felt that the system would be useful, particularly on long trips or on freeways. In terms of usability, the Sydney participants liked the graded warnings issued by the system, but thought that the visual display could be better located so drivers did not have to look away to see it. The Wagga Wagga participants were concerned that the visual warning would not attract the driver’s attention and suggested that the warning should flash from the beginning of the

warning sequence and be purple, or some other bright colour, instead of red. For the Sydney participants cost was the key factor influencing willingness to purchase the system while, for Wagga Wagga participants, proven effectiveness was the most critical factor. In addition, the Wagga Wagga participants indicated that they would be willing to pay twice as much to purchase the system than the Sydney participants. In terms of social acceptability, participants from both groups indicated that the system should only be compulsory if it was free of charge or if financial assistance was given to purchase the system and it had been proven effective.

Overall, while the Sydney participants agreed that the Following Distance Warning system has some advantages, they generally thought that the system would be less effective and were less willing to purchase it than the Wagga Wagga participants. The more negative attitude of the metropolitan participants may result from their opinion that the system would be more useful and effective in areas where there is less traffic or on long distance trips.

### 5.3.4 Lane Departure Warning

The Lane Departure Warning system and its variant, the Fatigue Warning system (discussed on section 5.3.5) were discussed in two focus groups, one in Sydney and one in Wagga Wagga. Both groups comprised male and female participants aged 17 to 20 years. The Lane Departure Warning system is designed to warn the driver when his/her vehicle leaves the designated lane. This system was discussed as a fatigue warning device, as many run off the road crashes are believed to be due to fatigue.

#### Effectiveness

There were mixed reactions towards the Lane Departure warning system both within and between the Sydney and Wagga Wagga groups. The Wagga Wagga participants held negative attitudes towards the system and all agreed that they did not think that this system would be effective in reducing fatigue related accidents. They gave several reasons for this. First, participants felt that the system would be annoying if it issued warnings when they were changing lanes or turning corners. Second, on many roads there is not a clear distinction between the road and the edge of the road, therefore the system may not be reliable on such roads. Finally, the participants felt that veering from your lane is not necessarily a sign of fatigue. However, the participants indicated that if the system could reliably distinguish the road from the edge of the road, it would be useful for long trips or driving on country roads.

*“Going off the side of the road is not definitely a sign of fatigue.” – Wagga Wagga*

Many Sydney participants agreed that they did not think the Lane Departure Warning system would be effective, because many roads are thin and thus there may not always be sufficient time for the system to warn drivers before a crash.

*“I did not like the LDW one at all.” – Sydney*

*“But some roads are really thin, so you would have crashed before the thing goes off – I don’t see the point.” – Sydney*

Other Sydney participants, however, believed that the system would be effective, as it would make them more conscious of changing lanes carefully and would also warn drivers when

they drift out of their lane for a reason other than fatigue, such as when they take their eyes off the road to change radio stations.

*“I think the LDW is cool, it might go off when you change lanes, say if you go over a bridge and you change lanes, but it would not be that annoying and it might even make you think about when you change lanes more.” – Sydney*

*“I think the LDW system doesn’t just have to deal with fatigue, it could warn you if you drift because you are changing the radio.” – Sydney*

Participants in both groups did not think that the system would necessarily make them drive any differently. They generally thought that this would depend on the individual person and whether they ignored or adhered to the warnings. Both groups also agreed that the system would not make them safer drivers. The participants from Wagga Wagga felt that the system was very technical and suggested that simpler things, such as the rumble strips, may be more effective.

Concern was raised by both groups that the more controlling variant of the system, which steers the car back into the correct lane, might be dangerous if the driver swerved to avoid an object and the car steered the driver back into the path of the object. The same concern was also raised about turning corners: the car may try to steer the car straight ahead. In addition, the Sydney participants felt that the system was too reliant on the white lines on the edge of the road and were concerned about how the system would deal with roads that do not have a white line.

The issue of the reliability of the system was a major concern for both groups. In particular, the participants were concerned that the system would issue many false alarms, especially when changing lanes or turning corners.

There were mixed reactions between the Sydney and Wagga Wagga participants regarding how they thought their passengers would react to the system. The Sydney participants felt that their passengers would feel safer and more relaxed with the system, as it would provide an “extra pair of eyes”. They also felt that the system warnings would give passengers more confidence for telling the driver to pull over and let someone else drive. The Wagga Wagga participants in contrast, felt that passengers would be cautious of the system and would feel less safe, particularly if the system kept on issuing warnings. For example:

*“I think passengers would be more inclined to say something if there was also a system there saying you are fatigued.” – Sydney*

*“They will be more at ease.” – Sydney*

*“It will give the passenger support to say I’ll take over you are tired.” – Sydney*

*“More relaxed because there is an extra pair of eyes.” – Sydney*

*“If I was in a car and the driver had all this stuff in the front, I would be a little cautious thinking that he was a bad driver because he needs all this technology just to get him to the corner store.” – Wagga Wagga*

*“You would be a bit hesitant to step into the car; you would say, ‘do you want me to drive mate?’” – Wagga Wagga*

*“You would be a bit scared at any noises that the driver was falling asleep.” – Wagga Wagga*

## **Usefulness**

Both the Sydney and Wagga Wagga participants were hesitant when asked if they thought that the Lane Departure Warning would be useful. Participants in both groups suggested that the Lane Departure Warning system may be useful for drivers who drive long distances on country roads, or who often drive at night. However, participants felt that this system would be less useful than other fatigue systems that are specifically designed to detect signs of fatigue (this type of system is discussed in the following section). Participants also argued that there are already rumble strips on the road that are designed to warn drivers that they are veering out of their lane, so the need for the system would not be great.

*“I can see people getting it who drive long distances.” – Sydney*

*“I think for people who are travelling in the country and they don’t have the lights on the roads, or the regular traffic flow going past, something like this would be good just to keep them awake. A lot of times you can’t rely on the radio because there is no radio.” – Wagga Wagga*

*“I don’t think the LDW one is that useful because you have the rumble strip on the highway anyway, so I don’t think you need a second warning.” – Wagga Wagga*

## **Usability**

The only issue pertaining to the usability of the Lane Departure Warning system that was raised by the participants was whether they would want to cheat the system, and if they did, how they would go about cheating the system. The Sydney participants indicated that they would definitely want to cheat the system and they would do this by swerving off the road to “test the system out”. The Wagga Wagga participants indicated that they would cheat the system by tampering with the system’s wiring to disconnect it or paint white lines on the road to confuse the system.

*“If you had the first one you would definitely want to cheat it, you would swerve and test it out.” - Sydney*

*“The wiring is so easy to play around with, so you could play around with the wiring.” – Wagga Wagga*

*“Everyone would go around painting white lines on the road to confuse the system.” – Wagga Wagga*

## Willingness to Buy

Cost, reliability and the system being too controlling were the main factors influencing participants' decision not to purchase the system. Both groups indicated that nothing would encourage them to purchase the system, regardless of whether the system was or was not a standard feature. Both groups also mentioned that they would not be willing to purchase the system at any cost.

*"If it was going to take control away." – Wagga Wagga*

*"Unreliability." – Wagga Wagga*

*"Insurance being too high and cost." – Wagga Wagga*

*"Cost, because it is so advanced it would cost a lot." – Sydney*

*"Reliability – if it does not work." – Sydney*

## Social Acceptability

Two issues were raised by the Sydney and Wagga Wagga participants in relation to the social acceptability of the Lane Departure Warning system. These were whether the system should take control away from the driver and whether the system should be made compulsory.

The Sydney and Wagga Wagga participants were not in favour of the system taking control of their car by steering it back into the correct lane. Specifically, they felt that it would be dangerous if the driver had intentionally pulled off the road or had swerved to miss an object and the car steered them back onto the road or into the path of an object or hazard. One Sydney participant, however, indicated that he/she was in favour of the system automatically steering the car back onto the road in the event that the car did unintentionally veer out of the correct lane or off the road.

*"If you are changing lanes it could put you back in your lane, or if you are swerving to miss something it could steer you back into its path." – Sydney*

*"You can't take control away from the driver because the car cannot think for itself." – Sydney*

*"What if you were swerving to miss something? You get off the road to get away from it and it puts you back on the road." – Wagga Wagga*

*"If it wasn't reliable and you were turning a corner and it put you back on the road - that would be dangerous." – Wagga Wagga*

With regard to whether the system should be compulsory, the Wagga Wagga participants were adamant that the system should not be made compulsory under any circumstances. Despite their negative attitudes towards the system, the Sydney participants on the other hand, indicated that the system should be compulsory for young drivers and for people who spend a lot of time driving, such as taxi drivers, truck drivers and couriers.

*“For younger people it would be good.” – Sydney*

*“Taxi drivers, couriers, truck drivers – people who drive a lot.” – Sydney*

*“No, it definitely should not be compulsory.” – Wagga Wagga*

*“Not in its current state, and even then it should be an additional feature, and not have it required by anyone.” – Wagga Wagga*

## **Suggested Design Changes to Enhance System Acceptability**

Both the Wagga Wagga and Sydney participants felt that there was no way to improve the design of the Lane Departure Warning system. They also suggested that it should not be developed any further, as they felt it was a primitive and inferior version of other fatigue detection systems.

## **Summary of Main Issues**

There were mixed reactions to the Lane Departure Warning system among the Wagga Wagga and Sydney participants. The Wagga Wagga participants did not think that the system would be effective due to its perceived unreliability in detecting changes in the road surface and signs of driver fatigue. Many Sydney participants also thought that the system would not be useful because there are already measures in place (e.g., rumble strips) to warn drivers that they are veering out of their lane. However, several Sydney participants felt that the system would be effective, not just for fatigue, but also for warning drivers who have drifted from their lane because their attention has been diverted elsewhere.

Both groups of participants felt that the more controlling variant of the system would be dangerous if it steered drivers back into the path of a hazard. The system was thought to be useful for drivers who travel long distances, particularly at night. None of the participants were willing to buy the system and indicated that they would not pay anything for it. Finally, the participants from Wagga Wagga thought that the system should not be compulsory under any circumstances, while the Sydney participants felt that it should be compulsory for certain road user groups such as young drivers and drivers who spend a lot of time on the road.

Overall, the Sydney participants appeared to hold a marginally more positive attitude towards the Lane Departure Warning system compared to the Wagga Wagga participants. Generally, the Sydney participants thought that the system would be more effective and that it should be compulsory for certain road user groups.

### **5.3.5 Fatigue Warning System**

The Fatigue Warning system was discussed in the same two groups that discussed the Lane Departure Warning system. Both groups comprised male and female participants aged 17 to 20 years. The Fatigue Warning system is designed to detect signs of impairment due to fatigue and, if fatigue is detected, issue warning to the driver to pull over and stop the vehicle and rest.

## Effectiveness

The Wagga Wagga participants were sceptical about the Fatigue Warning system. In particular, all agreed that many people would not want a camera in their car and may find it disconcerting. They also thought that the cost of the system could be enormous and that the people who would most benefit from the system may not be able to afford it, reducing its overall effectiveness. For example:

*“The cost of the fatigue system is going to be enormous with the video cameras and everything and it is not going to be suited to everyone. The people who have got the fancy cars with these technologies in it probably won’t get the full use out of it. Like they are probably not the type of people who fall asleep, they are probably very conscious. So the idea is good, but it probably won’t be effective for people who would need it the most.” – Wagga Wagga*

The Wagga Wagga participants also felt that there are more accurate signs of fatigue than blinking, such as steering wheel movements and body posture, and suggested that the system should focus more on detecting these aspects of fatigue.

*“The blinking and video camera part is the thing that I am a bit sceptical about, but the idea of your steering wheel movements becoming more erratic or having a sensor in your seat to detect changing body posture is better than the idea of somebody (or camera) watching you, which could be disconcerting for a lot of people.” – Wagga Wagga*

Overall, the Wagga Wagga participants thought that the Fatigue Monitoring system is very technical and, as such, is less feasible than some of the other systems that have been fitted to vehicles (i.e., Forward Collision Warning and Following Distance Warning systems). They also indicated that this system does not appear accurate enough to be implemented on cars at present and perhaps a more simple system such as a timer, which driver’s are required to press after particular time intervals, would be more effective in the long term.

*“In theory this system seems good, but it seems a lot less feasible than the Forward Collision and Following Distance Warning systems.” – Wagga Wagga*

*“I don’t think both these technologies are up to being implemented yet.” – Wagga Wagga*

*“Surely there is a better way to detect fatigue than all these high tech things. Like having a timer in the car, which tells you have been in the car for two hours, have a break. That would be the logical thing to do. Besides its cheap too.” – Wagga Wagga*

The Sydney participants held more positive attitudes towards the system. They thought that it would be effective in reducing fatigue-related crashes, but were concerned that the auditory warning was too quiet to wake people up and keep them awake. Some participants suggested that having a blast of cold air in addition to the auditory warning may be more useful. In addition, like the Wagga Wagga participants, the participants from Sydney indicated that blinking may not be an accurate sign of fatigue and that the system would need to focus on other signs of fatigue in order to be effective.

*“I think the Fatigue Warning system one is good because it is focusing on fatigue, but it would be better if it did something more to wake you up. I don’t think that noise would wake you up.” – Sydney*

*“With the Fatigue Warning system you would think a machine has picked up that I am tired, but the noise would not be that beneficial - it might wake you up for a second. If you are that tired a blast of air is not going to help.” – Sydney*

*“It should be based on solid evidence of what happens when you are just about to fall asleep, not just go off if you blink a few times.” – Sydney*

When asked whether the system would make them drive any differently, the Sydney participants indicated that the system would make them more inclined to pull over if they felt tired. The Wagga Wagga participants on the other hand indicated that they would test the system to see if it woke them up. The Wagga Wagga participants were also sceptical that the system would make them safer drivers and suggested that it would depend on the individual. However, the Sydney participants thought that the system would make them safer, because fatigue is such a big problem and this system may prevent them and other drivers from falling asleep.

*“I would be tempted to see whether it actually woke me up or not.” – Wagga Wagga*

*“If you are tired you would normally go to your limit but with this, you would think okay I’ll pull over.” – Sydney*

*“The fatigue warning system would make me safer because fatigue is a big problem.” – Sydney*

*“I think currently it is a good warning. It would prevent you from falling asleep.” – Sydney*

The Wagga Wagga participants were concerned that drivers may become over-reliant on the system, which could be dangerous. For example:

*“With the fatigue warning one, you could wait until it goes off. You would think I am obviously not fatigued yet, the car is not telling me I am fatigued, so I won’t stop.” – Wagga Wagga*

In addition, both groups thought that there could be potential problems with the system if people wore sunglasses and the system could not detect their blinking patterns. The reliability of the system was also of concern to participants in both groups, particularly with regard to whether the system would issue false alarms if a driver happened to blink a lot naturally, or if the system did not issue warnings because it had not detected that a driver had become fatigued. While participants agreed that it may become annoying if the system constantly issued false alarms, one Sydney participant mentioned that it is more important that the system picks up signs of fatigue and, as a consequence, some false alarms might reassure the driver that the system is working. Overall, however, the participants agreed that the system would have to be 100% reliable or very close to it to be effective.

*“How would it work if you were wearing sunglasses or had the sun reflecting in your eyes?” Sydney*

*“What if you had a blinking problem?” – Sydney*

*“What if it does not detect that you are fatigued because you don’t blink a lot?” – Sydney*

*“I don’t think false alarms are such an issue with these systems compared to the others, because you want it to pick up any signs to know it is working. It is more important that it actually picks up fatigue when it is supposed to.” – Sydney*

*“Sun in your eyes, or wearing sunglasses could be a problem.” – Wagga Wagga*

The Wagga Wagga participants were unsure whether driving a car equipped with this system would make them drive other cars without the system any differently. The Sydney participants in contrast, indicated that they would be more aware of what their tiredness threshold was and would be more aware when they had to pull over and rest. In terms of how their passengers would feel about the system, the Wagga Wagga group thought that the system may make them more hesitant to get in the car and may make them feel less safe, particularly if the system was issuing warnings frequently. However, the Sydney participants felt that their passengers would feel safer in the car and would feel more confident about telling the driver to pull over and offer to share the driving load.

*“You would be a bit hesitant to step into the car; you would say ‘do you want me to drive mate?’” – Wagga Wagga*

*“You would be a bit scared at any noises that they were falling asleep.” – Wagga Wagga*

*“I think they would also be more inclined to say something if there is something there saying you are fatigued.” – Sydney*

*“They will be more at ease.” – Sydney*

*“It will give the passenger support to say I’ll take over you are tired.” – Sydney*

## **Usefulness**

The participants from both groups identified several uses for the Fatigue Warning system, including reducing the incidence of fatigue-related crashes among those groups of road users who do a lot of driving, such as truck drivers and couriers. The participants also felt that the system would be useful for drivers who drive long distances or drive in country areas, but they felt that the system would have little use around urban areas where there is more traffic and street lights to keep drivers awake. One Sydney participant also mentioned that the system might be useful for families as an additional safety measure.

*“The fatigue warning system might be good for people who travel a lot and for those people who think I am all right I’ll keep going.” – Wagga Wagga*

*“I think for people who are travelling in the country and they don’t have the lights on the roads, or the regular traffic flow going past you, something like this would be good just to keep you awake. A lot of times you can’t rely on the radio because there is no radio.” – Wagga Wagga*

*“Country driving, I can’t really seeing it working in the city because you are stopping and starting and that keeps you awake.” – Sydney*

*“It would be good for truck drivers.” – Sydney*

*“I can see people getting it who drive long distances.” - Sydney*

## **Usability**

The participants raised several issues pertaining to the usability of the Fatigue Warnings system. The Sydney participants were concerned that the auditory warning would not be loud enough to wake drivers if they were falling asleep and suggested that a blast of cold air may be more effective. In addition, the Wagga Wagga participants were concerned that drivers would not like having a camera in their car recording their movements. The location of the visual warning display screen also concerned the Wagga Wagga participants and they suggested that it could be moved to a higher location, such as under the rear vision mirror, out of the way of the other controls on the dashboard.

When asked whether they would want to cheat the system, the Sydney participants were adamant that they would not cheat the system as they take fatigue much more seriously than some other issues such as speed. The Wagga Wagga participants on the other hand, mentioned several ways that they would try to cheat the system, including tampering with the wiring or wearing sunglasses so that the system cannot see them blinking.

## **Willingness to Buy**

Cost and reliability were the two factors identified as being the most influential in participants' decision to buy the Fatigue Warning system. Both groups mentioned that being expensive and unreliable would stop them from buying the system. However, having evidence that the system did actually save lives was mentioned by both groups as something that would encourage them to buy the system.

The Sydney participants felt that if the system were a standard feature it would make a car more appealing. However, the Wagga Wagga participants felt that it would not make a car more appealing, as the system is too technical and they were concerned that cars are becoming too computerised. In addition, the Sydney participants indicated that if the system were not a standard feature they would purchase it as an extra, as long as they could afford the system and it was of use to them. The Wagga Wagga participants, on the other hand, indicated that they would not buy the system because they felt that, at present, it is still in its “primitive stages of development” and could not feasibly be implemented. Not surprisingly, the Wagga Wagga participants indicated that they would not be willing to pay any amount to purchase the system. The Sydney participants on the hand stated that they would be willing to pay \$1,000 for the system, but mentioned that they would only purchase the system if it were installed in a new car.

## **Social Acceptability**

The Sydney and Wagga Wagga participants raised two issues regarding the social acceptability of the Fatigue Warning system. These included whether the system should take control away from the driver and whether the system should be made compulsory.

The Sydney and Wagga Wagga participants were not in favour of the system taking control of their car by automatically steering it to the side of the road and parking it if it detected that the driver was becoming fatigued. In particular, they felt that automatically parking the car could be hazardous if the car was driving up a mountain or on a country road where there is not always sufficient room on the edge of the road to park a car. One Wagga Wagga participant also mentioned that thinking about this variant of the system made them have visions of a horror movie where the car tried to get revenge on the driver by steering the driver off the road.

With regard to whether the Fatigue Warning system should be compulsory, the Wagga Wagga participants were adamant that the system should not be made compulsory under any circumstances. The Sydney participants, on the other hand, indicated that the system should be compulsory for young drivers and for people who spend a lot of time driving, such as taxi and truck drivers.

### **Suggested Design Changes to Enhance System Acceptability**

A number of design changes were suggested by the participants to enhance the acceptability of the Fatigue Monitoring system. These included removing the camera, altering the warning, or replacing the system with a simple timer, which drivers press at certain time intervals.

*“Get rid of the camera.” – Wagga Wagga*

*“Put a timer in the car.” – Wagga Wagga*

*“Make it more of an obnoxious noise.” – Sydney*

*“Link it to air con.” – Sydney*

### **Summary of Main Issues**

There were mixed reactions to the Fatigue Warning system from the Wagga Wagga and Sydney participants. The Wagga Wagga participants were sceptical that the system would be effective due to the enormous costs associated with the system and its unreliability in detecting signs of fatigue. The Sydney participants, however, thought that the system would be effective in reducing fatigue-related crashes, but felt that a more aggressive warning was required to wake up drivers. The system was thought to be useful for drivers who travel long distances, particularly at night. The cost and reliability of the system were the two critical factors influencing the participants’ willingness to buy the system. Finally, the participants from Wagga Wagga thought that the system should not be compulsory under any circumstances, while the Sydney participants felt that it should be compulsory for certain road user groups such as young drivers and drivers who spend a lot of time on the road.

The Sydney participants generally appeared to hold a slightly more positive attitude towards the Fatigue Warning system compared to the Wagga Wagga participants. Overall, the Sydney participants thought that the system would be more effective, should be compulsory for certain road user groups and were more willing to purchase the system than the Wagga Wagga participants.

### 5.3.6 Alcohol Interlock and Sniffer Systems and the Drink Driving Performance Test

Two focus groups were held to discuss the Alcohol Interlock and Sniffer systems and the Drink Driving Performance Test, one in Sydney and one in Wagga Wagga. Both of these focus groups comprised males aged 17 to 25 years. The Alcohol Interlock system is designed to prevent people from driving if they have a BAC over the legal limit, by requiring them to blow into a breathalyser unit before the car can be started. If the driver blows over the legal limit, the car will not start. The Sniffer system allows the car to be started and driven as normal. As the person is driving, the Sniffer system analyses the driver's breath for traces of alcohol. If alcohol is detected, a voice message is issued instructing the driver to blow into the breathalyser unit located in the car. If the alcohol reading is over the legal limit, the voice message informs the driver that he/she has 2 minutes to pull over and park the car before the engine stops. Finally, the Drink Driving Performance Test requires drivers to complete and pass a psychomotor driving task within the stationary vehicle before the vehicle will start. The test is designed to detect if the driver is impaired by alcohol.

#### Effectiveness

The Wagga Wagga participants raised several issues over the effectiveness of each of the alcohol detection systems. In particular, the participants indicated that they would find the Interlock system annoying if they had to blow into the system each time they wanted to start their car. They were also concerned that the breathalyser used as part of this system may not be as accurate as the breathalysers used by the police. For example:

*“Sounds pretty annoying” – Wagga Wagga*

*“It is probably not as accurate as a normal breathalyser.” – Wagga Wagga*

*“It would be annoying if you had to blow into the system every time you start the car, especially if you are in a hurry.” – Wagga Wagga*

In terms of the Sniffer system, the participants were concerned that, if drunk, drivers could easily have a crash in the two minutes it takes for the system to detect alcohol on the driver's breath. Participants suggested that, to be effective, the Sniffer system would have to detect alcohol a lot quicker. The participants indicated that it may be more effective if the Alcohol Interlock and Sniffer systems were integrated so that drivers would not have to take the test each time they start the car and the combined system could detect alcohol faster than the Sniffer system.

*“In that two minutes you could have an accident.” – Wagga Wagga*

*“I think it would be good if it stopped you straight away.” – Wagga Wagga*

*“If you integrated the two systems, so you have the Sniffer and if it detects alcohol, then you do the breathalyser test.” – Wagga Wagga*

With regard to the Drink Driving Performance Test, the Wagga Wagga participants were concerned that the system merely focuses on driving skill and not whether the driver is actually over the limit. They suggested that a driver could in theory pass the test, but still have

a BAC over the legal limit. Overall, the Wagga Wagga participants felt that the Alcohol Interlock and Sniffer systems would be more effective than the Drink Driving Performance Test.

*“If you pass the Driving Performance test, you could still be over the limit.” – Wagga Wagga*

Similar to the Wagga Wagga participants, the Sydney participants were concerned that having to blow into the Interlock system each time they got into the car would be annoying, particularly if they were in a hurry. Several of the participants suggested that it would be useful if the system gave drivers the option of whether they want to check their BAC reading and not force them into taking the test each time they start the car. Some participants also suggested that the system should prevent drivers who are over the legal limit from driving at all times. Others disagreed, stating that if the system stopped drivers from driving when they are over the legal limit, they would be more likely to try and find ways around the system.

*“Do you have to blow every time you start the car?” – Sydney*

*“If you are in a rush that would be annoying.” – Sydney*

*“I think it should be something that gives you the option of whether or not you want to check whether you are over the limit, but not something that forces you to take the test. The more you try and force people into it, the more they will resist it.” – Sydney*

*“It should stop you from driving full stop, it should not just tell you are over the limit.” – Sydney*

*“But if it does stop you then you are going to try and find ways around it.” – Sydney*

In terms of the Sniffer system, the Sydney participants felt that this system would not be effective, because a drunk driver could easily have an a crash within the time it takes for the system to detect alcohol. They suggested that the system would have to detect the alcohol and stop the driver before they begin to drive the car. For example:

*“What if you take off and kill someone within a minute, it has got to stop you before you take off.” – Sydney*

The Sydney participants also felt that the Drink Driving Performance Test would not be effective in preventing drink driving, as the test does not realistically simulate real driving conditions and a drunken person could pass the test with relative ease. The participants also felt that many drivers would continue to drive even if the system told them they had failed the test. The participants suggested that the system would need to actually stop drivers from driving if they failed the test.

*“That computer test would not be accurate enough anyway, because no game would be the same as driving on the road. Anyone can control a car, but it is about being aware of people crossing the street and stuff and I don’t think this test tests for that.” – Sydney*

*“If you are drunk and the system does not try and stop you from driving, you are going to think I will drive anyway. You will drive regardless of whether it tells you are drunk.” – Sydney*

Overall, if the system were affordable, around half of the Sydney participants indicated that they would purchase one of the systems for safety reasons and also to prevent them from getting caught for drink driving.

Both the Wagga Wagga and Sydney participants indicated that these systems would make them drive differently. The Sydney participants felt that the systems would make them safer if they prevented them from driving while drunk, but would make them less safe if the systems passed them when they were actually over the legal limit. The Sydney participants were also concerned that some drivers could speed in order to make up for the time it takes to take the breathalyser test. The Wagga Wagga participants, on the other hand, felt that while the systems would not make them less safe drivers, the systems would not change drivers' attitudes, because people who are irresponsible enough to attempt to drink and drive will probably find a way around the system and drive regardless of whether the system is warning them not to drive. The participants also felt that the systems would simply prevent people from driving if over the legal limit, but would not affect peoples' driving skills in general.

*"They will make you safer if you are drunk and they take you off the road." – Sydney*

*"They could make you less safe if you have been drinking but they pass you." – Sydney*

*"You could try and make up the time you spent blowing in the breathalyser out on the road, driving faster." – Sydney*

*"They will only stop you from driving, they won't change your attitude." – Wagga Wagga*

*"I don't think the systems would affect your driving skill at all, you can either drive or not." – Wagga Wagga*

Participants from Wagga Wagga were concerned that drivers may begin to rely on the systems after a while and, as a consequence, may not monitor their own ability to drive. In addition, the participants were concerned with keeping the mouthpiece for the breathalyser unit clean and whether it could potentially give drivers the same reading as a previous occasion if the mouthpiece is not cleaned thoroughly after each use. False alarms were also a concern with the Interlock system, particularly if false alarms prevented drivers from starting their car in an emergency.

*"If you fail the test one night and then blow into it the next morning, will it be clean or will it come up with the same reading?" – Wagga Wagga*

*"May issue false alarms –would be a pain if you can't start your car and you have an emergency and it won't let you go anywhere because it thinks you are drunk." – Wagga Wagga*

The Wagga Wagga participants also felt that the Sniffer system could be dangerous if it required the driver to park the car on the side of a major road or on a road where there is not enough room for a car to park safely. The participants also mentioned that the system could detect alcohol from passengers who have been drinking and attempt to stop the car, even if the driver has not had any alcohol. For example:

*"If you have the Sniffer and you have not had anything to drink, but your four mates in the car have, it will make you pull over." – Wagga Wagga*

*“I would worry if I was driving on a major road and you could not pull over.” – Wagga Wagga*

In relation to the Drink Driving Performance Test, the Wagga Wagga participants were concerned that the system does not actually tell drivers whether they are over the legal BAC limit. The participants felt that it is more important that drivers know if they are over the limit, rather than whether they can drive in a straight line.

The Sydney participants were concerned with the accuracy of all three systems and whether they could accurately detect driver’s BAC. False alarms were also of concern to the Sydney participants, particularly in relation to the Interlock system, as this system would prevent drivers from starting their car. The cost of maintaining the systems and finding a qualified person to fix them was also raised by the Sydney participants as a potential problem.

When asked whether they would be able to accept the systems if they were not 100% reliable, the Sydney participants indicated that they would not accept the systems due to the inconvenience they would cause. The Wagga Wagga participants on the other hand said that whether they could put up with the systems would depend on whether they could turn the systems off.

There were mixed reactions among the Wagga Wagga participants regarding whether driving a car equipped with one of these systems would make them drive other cars not fitted with the systems any differently. Some participants felt that they would be more vigilant about whether they were over the legal limit, while others indicated that many drivers may be complacent because they will become used to having the systems warn them when they are not fit to drive. The Sydney participants indicated that they may be more inclined to take one of the breathalyser tests at the pub if their car is not equipped with one of the systems.

In terms of how their passengers would feel about the systems, participants from both groups felt that their passengers would probably feel safer getting into a car equipped with an alcohol detection system because they would know that their driver was not over the legal limit. The Sydney participants also felt that the systems would make passengers more confident in telling their driver not to drive.

## **Usefulness**

The Wagga Wagga participants identified a number of uses for the Alcohol Interlock and Sniffer systems and the Drink Driving Performance Test. They felt that these systems would be useful if drivers were just over or below the legal limit and are not sure if they are in a position to drive. Participants also expressed that the systems would be particularly useful for recidivist drink drivers.

*“If you have had a few drinks and you have a couple of hours off and you are not quite sure whether you’re over or not, it is useful in that way.” – Wagga Wagga*

*“They had the breathalysers in the pubs, so it would be good if this was in your car to save you the hassle.” – Wagga Wagga*

*“These systems would be more useful for groups like repeat offenders.” – Wagga Wagga*

The Sydney participants felt that the Alcohol Interlock system would be the most useful of all three systems. Participants felt that the Drink Driving Performance Test would not be useful, as it would be treated as a game. Participants also felt that their passengers would “egg them on” when taking the test and as such, drivers would not take the test seriously. With regard to the Sniffer system, the Sydney participants felt that it could be dangerous for the system to stop the car two minutes into the drive. For example:

*“The useful one is the interlock.” – Sydney*

*“It could be dangerous if you are in the middle of a freeway and the Sniffer system tells you to pull over or it will stop the engine. Once you have stated driving it is too late to stop you.” – Sydney*

*“The Performance Test is not very useful, I would find it more amusing.” – Sydney*

*“If you have passengers they would egg you on when you take the test.” – Sydney*

*“The test is just a game, it does not simulate actual driving. - Sydney*

## **Usability**

Participants from both groups raised a number of concerns with the physical appearance of the breathalyser unit. Several participants commented that the unit was too big and chunky and would get in the way of the other controls or holders in the vehicle such as mobile phone chargers. Other participants felt that the unit could be dangerous in the event of a crash as it could fly around the cabin. Both groups of participants felt that the system would need to be made more compact to enhance its usability.

The participants made several suggestions about how to cheat the three systems. For the Interlock system, the participants suggested that a passenger could blow into the breathalyser unit or even blow alcohol into the breathalyser unit so that it does not work. For the Sniffer system, participants suggested that drivers could cover the sniffer sensor with a wet cloth, a piece of cardboard or tape, they could use an air freshener or cologne in the car, open a window, or drink coffee or something strong to try to disguise the alcohol on their breath. Finally, for the Drink Driving Performance Test, the participants suggested that a passenger could take the test or drive badly in the baseline performance condition so that the system has less chance of detecting an inebriated driver who is unfit to drive.

*“Get your friend to blow into the interlock who hasn’t had a drink.” – Wagga Wagga*

*“You could have a drink of something strong like coffee or a cigarette and this might disguise it on your breath.” – Wagga Wagga*

*“You could cheat right from the beginning and drive really badly in the baseline performance, so when you are drunk it doesn’t matter.” – Wagga Wagga*

*“You could cover the sniffer with a wet cloth. Or stick some cardboard on it.” – Sydney*

*“You can practice the test drunk.” – Sydney*

*“Get someone else to breath into it.” – Sydney*

## **Willingness to Buy**

Participants from both groups stated that the cost of the system and its perceived reliability were the critical determinants of whether they would purchase any of the three systems. The Wagga Wagga participants also mentioned that they would not buy the systems if they issued false alarms or took more than a few seconds to detect the presence of alcohol.

When asked what would encourage them to buy the systems, the Wagga Wagga participants mentioned that if they had a family they would buy an alcohol detection system to lower the chance of their children having a crash while inebriated. The Sydney participants commented that they would be encouraged to buy the systems if they were cheap and there was a good advertising campaign highlighting that the systems could save lives.

The Sydney participants agreed that a car would be more appealing if it was equipped with an alcohol detection unit as standard; but only if it was the Interlock system, not the Sniffer or the Drink Driving Performance Test. The Wagga Wagga participants felt that many people would not know what the systems were or what they did and so they might not find a car that has one of these systems as standard any more appealing than a car that does not. They also felt that they would only make a family car more appealing, not a personal car. If the systems were not a standard feature, participants from both groups indicated that they would not purchase any of the systems as extras.

When asked how much they would be willing to pay for each system, the Wagga Wagga participants said they would pay \$100 to \$200 for the Interlock and Sniffer systems, but would not pay anything for the Drink Driving Performance Test. The Sydney participants also indicated that they would not pay anything for the Drink Driving Performance Test, but were willing to pay more than the Wagga Wagga participants for the other two systems. For the Interlock, the Sydney participants said they would be willing to pay up to \$500 and for the Sniffer system, they would pay up to \$200. However, they added that both the Sniffer and Interlock systems should come standard on new vehicles or be subsidised by the government.

## **Social Acceptability**

Three issues pertaining to the social acceptability of the alcohol detection systems were raised by the participants. These were the legal implications of the systems, whether the systems should take control away from the driver and whether the systems should be compulsory.

The Wagga Wagga participants were concerned about the legal issues that may arise out of use of the systems. Specifically, they were unsure if they would have recourse against the manufacturer if there were a discrepancy between the system’s breathalyser unit and a police breathalyser unit and they were fined for driving under the influence. For example:

*“That could also have legal implications, if it read 0.02 and you think I am fine, and you get pulled up and told you are over the limit, you could say, but I blew into mine and it said I was fine. How can you say which one is correct, the cops or yours?” – Wagga Wagga*

*“If the system was brought in under law, you would be able to sue them if it said you were OK to drive when you were not, but if it was just an optional extra, you would probably not have as much of a case.” – Wagga Wagga*

Both groups of participants agreed that they would be happy for the Interlock system to stop them from starting their car if they were over the legal limit as the implications of leaving people to decide whether they are fit to drive are too great. The Sydney participants, however, felt that the Sniffer system should not take control of the car, as this may be dangerous if it was not safe to pull over.

With regard to whether the systems should be compulsory, the participants from both groups felt that the Interlock should be made compulsory for all drivers, and that they would purchase this system even if it was not subsidised. Several Wagga Wagga participants suggested that road authorities should implement the Interlock system to new cars and make it mandatory for old cars to have the device fitted when they are sold (e.g., make its installation part of the Roadworthy Certificate). The participants were very concerned that if the Interlock system were too expensive young drivers, who may benefit from it the most, would not be able to afford it.

*“I would put the interlock in even if it wasn’t subsidised.” – Wagga Wagga*

*“It should be compulsory for all repeat offenders, regardless of their car and they should have to pay the full cost of it as part of the punishment.” – Wagga Wagga*

*“They should probably introduce this system the way they introduced unleaded fuel, just faze the old cars without the systems out. Or if the cars are sold, it is compulsory to have an alcohol system installed. Make it part of the RWC or vehicle transfer).” – Wagga Wagga*

*“Young drivers will have less chance of having access to the technology, if they are only on higher priced cars.” – Wagga Wagga*

*“The interlock only should be compulsory.” – Sydney*

*“I think it should be for people who are unlicensed or have a history of drink driving.” – Sydney*

## **Suggested Design Changes to Enhance System Acceptability**

With regard to the Drink Driving Performance Test, the Wagga Wagga participants indicated that they were not interested in it at all and would not attempt to improve its design. The Sydney participants said that it should be designed to be a more realistic depiction of actual driving conditions and that it should also test driver’s reaction times to hazards, such as pedestrians.

*“They would have to make the Performance Test more accurate and realistic to driving. Test you reaction time as well.” - Sydney*

For the Interlock and Sniffer systems, the Wagga Wagga participants suggested that these two systems should be combined and redesigned to be capable of detecting alcohol within 30

seconds of the driver entering the car. The Sydney participants, on the other hand, suggested that the Interlock should be more compact and positioned directly in front of the driver, so that the driver cannot pass it to one of their passengers. They also suggested that, for the Sniffer system, the windows and doors should be locked so the system can detect alcohol in the cabin quickly.

*“Combine the interlock and sniffer system into one. Make it detect alcohol within 30 seconds.” – Wagga Wagga*

*“Have the Interlock positioned differently; right in front of driver and make it more compact.” – Sydney*

*“Make the Sniffer system so that the windows and doors cannot be open after getting in the car.” - Sydney*

## **Summary of Main Issues**

Both the Sydney and Wagga Wagga participants felt that the Alcohol Interlock system would be the most effective of the three systems in preventing drink driving. Both groups felt that the Sniffer system could be potentially dangerous if it disengaged a car’s engine two or more minutes into a trip. Participants also felt that the Drink Driving Performance Test was unrealistic and resembled a game more than a test. The participants agreed that the systems would be useful for repeat drink driving offenders and those drivers who are sometimes unsure whether they are over the legal limit. However, the participants were concerned that the systems could be easily circumvented or could issue false warnings, leaving drivers unable to start their car. Both groups were willing to purchase the Interlock and Sniffer systems and suggested that they would be comfortable for the Interlock system to be made compulsory.

Overall, the Sydney and Wagga Wagga participants held similar attitudes towards the three alcohol detection systems. They were positive towards the Alcohol Interlock system and raised many of the same issues regarding its acceptability. Both groups were happy for the Interlock system to become compulsory and were willing to purchase it. However, the Sydney participants were willing to pay more than twice as much for the Interlock system than the Wagga Wagga participants.

### **5.3.7 Seat Belt Reminder**

Two focus groups, one in Sydney and one in Wagga Wagga, were held to discuss the Seat Belt Reminder and Seat Belt Interlock systems. Both of these focus groups comprised males aged 17 to 25 years. The Seat Belt Reminder system issues warnings if a vehicle occupant, including the driver, is unrestrained. The Seat Belt Interlock system prevents the car from starting if the system detects that at least one vehicle occupant is unrestrained. Both the Seatbelt Reminder and Interlock systems contain seatbelt buckle and weight sensors in the vehicle seats. These sensors detect whether there is an occupant in the seat and can determine whether the occupant has his/her seatbelt buckled. If the system detects that a vehicle occupant is unrestrained, the system issues reminder warnings or, in the case of the Interlock, sends a message to the ignition preventing it from starting until every occupant has put his/her seat belt on.

## Effectiveness

The participants from both Sydney and Wagga Wagga held positive attitudes towards the Seat Belt Reminder system, but not the Seat Belt Interlock system. In particular, the participants felt that the reminder system would be effective in getting those vehicle occupants who sometimes forget to put their seat belts on to buckle up. However, the vast majority of the participants indicated that they nearly always wear their seat belts and thus the system would only serve as a reminder on the rare occasion that they forget to put their seatbelt on. The participants also felt that the system could become annoying in situations where they believe that they do not need to wear a seat belt, including reversing the car out of the driveway, driving around the farm, or warming up their car in the morning.

*“I think the system is all right. The downside I see is if you are out on the farm and you don’t need your seatbelt – that would get a bit annoying.” – Wagga Wagga*

*“It would be a problem if you need to let your car warm up and you don’t necessarily sit in it.” – Wagga Wagga*

*“The one with the warning light is all right, but the one that immobilises the ignition is a bit rough.” – Sydney*

*“There are also times when you want to start your car but not sit in it, when you are jump starting someone, or you want to use the headlights, it would be a pain just to have to put your seat belt on to do something like that.” - Sydney*

Both groups indicated that they were quite concerned that the potential effectiveness of the system may be jeopardised due to the cost of maintaining and repairing the system if it became faulty. Several participants commented that some people might have the system disconnected rather than fixed if it cost too much to repair or maintain. For example:

*“Some people might find it cheaper to get it disconnected if it breaks, than to get it fixed.” – Wagga Wagga*

*“It could be quite expensive to fix or maintain.” – Sydney*

In addition, Wagga Wagga participants thought that the auditory warning could be distracting, however the Sydney participants felt that it would be more annoying than distracting. Both groups also felt that the sensors in the seats may be too sensitive and issue warnings if there is a bag or case on the seat. In contrast, the sensors may not be sensitive enough to detect small children. Participants stated that these problems and other false alarms would become very annoying after time. Both groups stated that they would not put up with the systems if the systems were unreliable and kept issuing false warnings. This was of particular concern for the Interlock system, as false warnings would prevent the car from starting unnecessarily.

*“I think that the noise could startle some people and they could get distracted and something could happen, so it would have to be pleasant.” – Wagga Wagga*

*“What happens if something goes wrong with it, if you have your seat belt on but the system is telling you it is off and it won’t start your car?” – Sydney*

*“If it starts playing up, giving warnings because of a case of beer on seat, that would be a problem.” - Sydney*

In terms of how their passengers would react to the systems, the Wagga Wagga participants felt that their passengers would be more relaxed in the car and would put their seat belts on to stop the auditory sound issued by the system. The Sydney participants commented that their passengers almost always wear their seat belts and so, their passengers would not react to the warnings. However, participants felt that some passengers might try to test the system by not belting up.

*“They wouldn’t react, because if they have their seatbelt on, they hear nothing and if they don’t it beeps and they put it on and then it’s just like any other car.” – Wagga Wagga*

*“I don’t have a problem with my passengers not belting up, so I wouldn’t really need it.” – Sydney*

## **Usefulness**

Participants from Sydney and Wagga Wagga indicated that the Seat Belt reminder and Interlock systems would not be personally useful for them, as they very rarely forget to put their seat belt on. However, participants did mention that the system would be useful for people with children and for people who carry a lot of passengers to ensure they are correctly buckled. For example:

*“It would be useful if you had little kids and you would not have to strain your neck turning around to see if they have their seatbelt on.” – Wagga Wagga*

*“It would be good to know that your passengers are buckled up because you can’t always see if they are.” – Wagga Wagga*

*“It would be good if you have passengers who you don’t really trust or if they forget, because it is you who gets into trouble.” – Sydney*

*“The reminder one is not a bad idea if you have a couple of kids and it just slips your mind to put their belts on. “ – Sydney*

## **Usability**

Several of the Sydney participants raised concern over the auditory warning given by the system, stating that there are so many warnings in some cars that it will become difficult to decipher what warning is being issued.

The participants from both groups were also concerned with the ease with which these systems could be circumvented or cheated. Some of the possible ways to cheat the systems suggested by participants were cutting the seat belt strap or inserting another object into the buckle holder.

*“You could cut your seatbelt and put the buckle in the holder permanently.” – Wagga Wagga*

*“Put something into the buckle holder or cut the switch out.” – Wagga Wagga*

*“Cut the belt, get a mechanic to disconnect it, pull a wire, and dismantle it.” – Sydney*

The participants commented, however, that drivers would only try to cheat the system if they had been made to install the system in their cars in the first place.

## **Willingness to Buy**

There was a general reluctance among the participants to buy the systems unless they were compulsory, primarily because participants viewed the systems as unnecessary given that they almost always wear their seatbelt. The Wagga Wagga participants did, however, think that they would be encouraged to buy the system if they had a family, while the Sydney participants indicated that they would be encouraged to buy the system if they could turn it on and off as required and if cars equipped with the system were cheaper.

The Sydney participants indicated that, if standard, neither the Interlock nor the Reminder system would make a car more appealing. The Wagga Wagga participants however, indicated that it would make a car more appealing if they had a family, but at this stage of their life they just want a car that will get them from one place to another. If the systems were not standard, the Sydney participants indicated that they would not purchase either variant as an extra. The participants from Wagga Wagga on the other hand stated that whether they purchased the systems as extras would depend on the cost to install and maintain them.

When asked how much they would be willing to pay for the systems, the Sydney participants said they would pay only \$50 for the systems. The Wagga Wagga participants indicated that they thought the system would cost between \$200 and \$300, but they would also be willing to pay only \$50 for the systems.

## **Social Acceptability**

Two issues pertaining to the social acceptability of the Seat Belt systems were raised by the participants. These were whether the systems should take control away from the driver and whether the systems should be compulsory.

The Sydney participants were against the idea of the Seat Belt Interlock system, saying that it is too extreme for a system to prevent a car from starting if an occupant is not wearing his/her seat belt. The Wagga Wagga participants in contrast, all indicated that they would not have a problem with the systems taking control away from them.

*“People like to be in control of their cars and not have their cars tell them what to do.” – Sydney*

*“It is just so trivial. Why turn off the car if you don’t have your seatbelt on?” – Sydney*

*“I don’t have a problem with it.” – Wagga Wagga*

In terms of whether the system should be compulsory, the Sydney participants indicated that the Interlock system should not be compulsory, but that they would not mind if the Reminder system were compulsory as long as it was fully subsidised and was only compulsory on new

cars. The Wagga Wagga participants also suggested that the systems should be compulsory only for new cars; however, they suggested that if a person has been caught without wearing a seat belt on numerous occasions then it should be mandatory for them to install one of these systems to their cars.

### **Suggested Design Changes to Enhance System Acceptability**

Several design changes were suggested by the participants to enhance the acceptability of the Seat Belt Reminder and Interlock systems. These ranged from making the auditory warning as discrete as possible to making the auditory warning override the stereo.

*“Most cars have a little seatbelt light that flashes on their dash, perhaps they could just a couple of beeps to these.” – Wagga Wagga*

*“I think it is pretty good how it is; it would be annoying so it would work.” – Wagga Wagga*

*“Maybe they should make it as discrete as possible – it should not be too obvious.” – Sydney*

*“It should be a reminder, not something that prevents you from driving.” – Sydney*

*“Have electric shocks.” – Sydney*

*“Have it connected to the stereo so it cuts it out or puts it to another station.” – Sydney*

### **Summary of Main Issues**

In general, both the Wagga Wagga and Sydney participants deemed the Seat Belt Reminder system, but not the Seat Belt Interlock system as acceptable. However, they indicated that the Seat Belt Reminder system would not be useful for them as they almost always wear their seat belts, but that would be useful for people with children. Participants were reluctant to purchase either of the systems, indicating that they would only pay \$50 for the systems. The Sydney participants felt that the interlock system was too extreme a measure and were not in favour of the system taking control away from them. The Wagga Wagga participants, on the other hand, did not have an issue with the Interlock taking control away from them. Both groups of participants were in favour of the Seat Belt Reminder system being compulsory, but only in new vehicles.

Overall, the Sydney and Wagga Wagga participants held similar attitudes towards the Seat Belt Reminder and Interlock systems. They were positive towards the Seat Belt Reminder system and raised many of the same issues regarding its acceptability. The main difference between the two groups was that the Sydney participants were more concerned about the systems taking control away from them than were the Wagga Wagga participants.

### 5.3.8 Electronic Licence

One focus group held in Wagga Wagga discussed the Electronic Licensing system. Males aged 17 to 25 participated in this group. The Electronic Licensing system works by getting the driver to insert a card into a card reader located on the dashboard in order to start the car. This card replaces the ignition key and contains information about the driver such as his/her name, licence type, any licence restrictions, demerit point status and outstanding fines. The electronic card is also coupled with a PIN or fingerprint system, so that the vehicle will only start if the driver is acknowledged as the authorised driver.

#### Effectiveness

The participants raised several concerns regarding the operation of the system and whether it can be cheated by some users. Participants were concerned about whether the card would work on all cars or whether it would be car specific. Participants mentioned that it would be a hassle if the card only worked on one car because often a car is driven by more than one driver and one driver often drives more than one car. For example, one participant indicated that he was a mechanic and was required to move cars around the yard all day. He commented that if he had to carry around multiple cards all day it would get very annoying. In order to overcome this potential problem, the participants suggested that the cards should be made to work on all cars, but drivers should have the option of restricting their card to only one or a few cars.

Participants were also worried that cards could easily be stolen and used to start cars. In order to prevent this from happening, participants suggested that there would need to be a fingerprinting system put in place that linked cards to specific drivers.

*“You could just steal your dad’s licence and use it.”*

*“It’s very advanced, but it would have to be very reliable so that someone could not steal your car just by having a special or stolen card. You could set into it a thing where only you or some other people can use your card.”*

*“You need a little figure print pack to link you with your licence.”*

The participants felt that the system would not make them drive any differently, but if it also restricted their speed or the type of car they were allowed to drive, then the system could make them safer drivers.

The participants also mentioned numerous problems with the Electronic Licensing system that may reduce its effectiveness, including losing their card just like keys, the card cracking or breaking and the card being chewed by the holder just like in an ATM machine. Participants were also concerned that the database containing driver information would have to be constantly updated and would be expensive to repair. Finally, participants suggested that the system would have to be secure so people could not tamper with the wiring.

*“Your card could also get chewed like inside an ATM machine.”*

*“It would be a hassle and costly to get the system up and running, but once they have it working it probably would not be as bigger hassle as people think it is.”*

*“To work for all cars, they would have to continually re-program or update a database because new kids are getting their licence all the time.”*

*“It would need a few safety mechanisms so that people just can’t go and mess with the wires because it doesn’t need a key anymore.”*

The participants commented that they would not put up with the system if it was not 100% reliable and stated that they would rather use keys if the card was prone to not working. With regard to passengers, the participants felt that their passengers would not react to the system unless it took a while for the driver to insert his/her PIN and for the system to register this PIN.

## **Usefulness**

The participants identified a range of uses for the Electronic Licensing system including:

*“It could be used as a security system to prevent theft if it is just programmed to your car.”*

*“It would also be good to keep some people like P-platers to a certain speed limit.”*

*“It would make people more aware of losing points, and would make them think twice about speeding around if they only had a couple of points left.”*

Generally, the participants thought the system would be useful as a security system to prevent the theft of their car, as well as a system that could impose restrictions on speed limits and the type of vehicle certain drivers can drive.

## **Usability**

How the card would be linked to its owner in order to prevent other people from using it was one of the biggest usability issues raised by the participants. Participants felt that it was essential for some sort of security system to be in place, whether this is a fingerprint system or a PIN system, in order to make the system more secure. For example:

*“Maybe you could have a PIN code that goes with your licence, you have to put in your PIN before the car will start.”*

*“That would be like a bank systems which are pretty secure.”*

*“You need a little finger print pack to link you with your licence.”*

Participants were also concerned that the system could easily be circumvented by some users:

*“You could just steal your dad’s licence and use it.”*

*“If I was home alone and I didn’t have my car, I would be pretty keen to cheat it to use one of my brother’s cars if I had to go somewhere.”*

*“There are always ways to beat something that is electronic.”*

*“Someone could take the system apart or develop a different card that they could slot in.”*

*“They could try and develop a universal chip for cards that works every car.”*

## **Willingness to Buy**

The cost of the system and the work that would be required to install the system were the main reasons why participants would not buy the Electronic Licensing System. In addition, all participants also agreed that they would not want to purchase the system for older cars, despite mentioning that the advantage of installing the system in old cars would be added security, because these cars are more vulnerable to being stolen. Nevertheless, participants mentioned that the safety and security benefits offered by the system provided sufficient encouragement for purchasing the system.

The participants stated that they would not purchase the system, regardless of whether it was a standard feature, because they would rather use their keys to start their car and because the system would be too expensive to maintain. The participants also commented that the system would probably cost around \$1,000 to purchase, but stated that they would be willing to pay only \$100 if they had to buy it.

## **Social Acceptability**

Three issues regarding the social acceptability of the system were raised by the participants. These were whether the system would invade the privacy of individuals, whether the system should take control away from the driver, and whether the system should be compulsory.

The participants were concerned that the system may invade their privacy if the authorities could use it to track their car. They were particularly concerned that their speed could be monitored and that they could be fined as a result. However, the participants were not concerned about their details being stored on the card, because this information is readily available. In fact, some participants felt that having their details stored on the card would make drivers more accountable for their actions when driving.

*“Privacy could be an issue, because they could know where you are all the time and what you have been doing.”*

*“What would stop them from fining you if they knew you had been speeding?”*

*“It would also make you more accountable, because instead of just using your keys to drive, you have to use your name, address, etc.”*

Participants were not concerned about the system taking control away from them, in terms of restricting them to a certain speed limit or restricting the type of vehicle they can drive. In fact participants were in favour of this idea and felt that it would have great safety benefits. For example:

*“It would be good if the card restricted you to driving cars with certain sized engines and if you tried to drive one with a bigger engine it just wouldn’t start up.”*

*“It would also be good to keep some people like P-platers to a certain speed limit.”*

When asked whether they thought the system should be compulsory, the participants stated that they were in favour of the system being compulsory as long as it was reliable and the government fully subsidised it. Participants also mentioned that even if the system were not compulsory for the average driver, it should definitely be compulsory for recidivist unlicensed drivers and drivers who have committed other driving offences.

### **Suggested Design Change to Enhance System Acceptability**

The participants suggested the following design changes to the Electronic Licensing system:

*“I like the thumb print idea, so you don’t have to take anything with you and no one can steal your thumb.”*

*“It would be better if it wasn’t a swipe card – you could just have your card in your wallet and the card reader could read it. Like a SIM card.”*

*“It would be good if the cards could be used in any car, but people who want to pay a bit extra to the RTA could restrict their car to only 3 or so licences, so they pay for the extra security.”*

### **Summary of Main Issues**

The participants raised many concerns over the use of the Electronic Licensing system, including how the technology would work, the potential for the system to be circumvented or cheated by some users, and privacy issues that might arise from use of the system. The participants did, however, agree that the system would be useful as a security system to prevent theft and would also be useful for imposing restrictions on certain driver groups. There was a general consensus among participants that they would not be willing to purchase the system regardless of whether it was a standard feature or not, but felt that it would be beneficial if it were compulsory, particularly for repeat unlicensed drivers.

## Chapter 6. GENERAL DISCUSSION

The current report describes the outcomes of a study, which constituted the first stage of a proposed multi-stage project. Stage 1 was funded by the Motor Accidents Authority (MAA) of NSW. This stage of the project aimed to examine the acceptability, to a sample of young novice drivers from metropolitan and rural NSW, of several in-vehicle ITS technologies from which they are likely to derive significant safety benefit. This was achieved by conducting eight focus groups: four in metropolitan Sydney and four in Wagga Wagga, involving a total of 58 young novice drivers aged 17 to 25 years.

While it is acknowledged that a failure of drivers to accept a technology can result in them not using it properly or not using it at all, only a very limited number of studies to date have examined the acceptability of ITS technologies to young drivers and of these, none have focused *specifically* on young novice drivers (Gray, 2001; Regan, Mitsopoulos, Haworth et al., 2002). Moreover, none of these studies have examined whether and how the acceptability of ITS technologies differs across drivers from metropolitan and rural areas. In order for the full safety potential of in-vehicle ITS technologies for young drivers to be realised, it is essential that young drivers' acceptability of these devices be established and those barriers that may prevent them from purchasing the technologies and using them in the intended manner be identified. It is also important that the perceived acceptability of ITS technologies to drivers from diverse geographical locations be compared and contrasted, as this may differ considerably as a result of the different driving and traffic conditions experienced.

In this chapter, the findings of the present study are discussed. In the first part of the chapter, the barriers to the acceptance of the selected technologies to young drivers that emerged from the focus group discussions are identified. Following this, the attributes of the discussed technologies that would make them acceptable to young novice drivers in NSW are described. The findings of the current study are then discussed in the context of previous research into ITS acceptability and several methodological issues relating to the current study are described. Finally, suggestions for future research are made.

### 6.1 Acceptability of the ITS technologies

#### 6.1.1 Barriers to the Acceptance of In-vehicle ITS by Young Novice Drivers

Based on the focus group findings discussed in the previous chapter, the general barriers to the acceptance of in-vehicle ITS technologies by young novice drivers in NSW can be determined. These barriers, along with suggestions about how these barriers may be overcome, are summarised as follows:

- Young drivers are less likely to accept a technology if they are unsure of how it operates or its full capabilities. It is therefore important that technology manufacturers widely disseminate detailed information about the technologies and advertise the technologies along with their benefits through a number of media.
- Young drivers are more accepting of technologies if they can see that they can serve more than one purpose. For example, the participants appeared to be more accepting of the Electronic Licensing system because they could see that it would be useful as a security device, as well as a system that would prevent unlicensed driving.

- Young drivers are cautious of technologies on which they may become over-reliant. In particular, they are concerned that young drivers may no longer monitor their own driving or ability to drive, which could be dangerous in the event of a system malfunction.
- Young drivers are unlikely to embrace a technology unless they have evidence that the infrastructure exists to support the proper functioning of the system. For example, there was concern among the participants that the speed limit data contained in the ISA system digital map would not be consistent with the speed limits in the actual road network, or that this information would not be updated regularly. There was also concern that the database required to store driver information for the Electronic Licensing system was not feasible given the enormous amount of storage space that would be required.
- Young drivers are unlikely to accept a technology if the technology is not 100% reliable or very close to it. It is important that the limitations of the system are conveyed to consumers through operating or user manuals.
- Young drivers are reluctant to accept a technology if it has a high rate of false alarms. Although many of the participants agreed that false alarms are less of an issue than the system not issuing warnings when it is supposed to, they felt that false alarms would annoy them and would reduce their confidence in the system. It is important, therefore, that manufacturers make users aware, through system user manuals, the conditions under which the system is likely to issue false alarms.
- Young drivers are unlikely to embrace a technology if they perceive that the system could be potentially dangerous. For instance, the participants felt that, by not allowing them to exceed a certain speed, the ISA limiting system could be potentially dangerous in the event that they needed to accelerate out of a hazardous situation. Participants were also concerned that the auditory warnings given by some systems could startle drivers.
- Young drivers are aware of how their passengers may react to different technologies and are generally more willing to accept systems that provide passengers with added support when telling the driver that they are not driving safely.
- Young drivers are less likely to purchase a technology unless they feel that it will help save their passengers lives as well as their own.
- Young drivers will more readily accept a technology if they perceive that it will be personally useful for them. However, the findings from this study suggest that drivers may underestimate the usefulness of some technologies due to their lack of knowledge regarding the crash types that the technologies address. This was particularly evident for the Following Distance Warning and Forward Collision Warning systems, as the participants were of the impression that rear-end crashes are uncommon and are generally not severe and, thus, felt that these systems would not be particularly useful. This is important information for manufacturers, as providing users with information on crash rates and how the technologies can address these, may enhance the acceptability of the technologies substantially.
- Young drivers are more likely to accept a technology if they can turn it on or off, or at least over-ride it temporarily. They are also more likely to accept a technology if it is compact and does not take up too much room in their car or interfere with any other controls. The systems that the participants appeared to have particular concerns with regarding their physical design were the Alcohol Interlock and Sniffer systems and the Electronic Licensing system. In order to enhance acceptability, it is therefore important that system manufacturers design their systems to be as small, unobtrusive, user friendly and attractive as possible.
- Young drivers are unlikely to accept a technology if they feel that it could be easily tampered with or circumvented. This was a particular concern for the Seat Belt Reminder

and Electronic Licensing systems. In order to minimize tampering, manufacturers should develop ways to make their systems tamper proof and/or regulatory authorities would need to introduce strict penalties for drivers who tamper with the technologies.

- Young drivers are unlikely to accept a technology if they feel that it may provide access for authorities to monitor their driving or that may record their driving offences. These concerns make it clear that suppliers need to inform users that the technologies are not designed to record users' driving activities or invade their privacy.
- Young drivers are unlikely to embrace systems that take away control from them, particularly if they feel that it may be dangerous if the systems do take control of the vehicle. The participants generally stated that they want systems that will help them gain control of their car, not take their control away. The participants were willing to allow the Seat Belt Interlock and Electronic Licensing systems to take control away from them as they felt that, by doing so, these systems would be enhancing their safety, not endangering it.
- Young drivers are willing to accept making some technologies compulsory, but usually only if they are subsidised, have been proven effective and reliable, and are only compulsory for certain sub-groups of drivers, namely recidivist offenders.
- Young drivers are unlikely to accept those systems that they view are too expensive to purchase, install and maintain. Generally, young drivers are willing to pay only a couple of hundred dollars at the most to purchase technologies, even if they deem these technologies as acceptable.
- Young drivers generally want more detailed information on the safety benefits of the technologies and evidence that the technologies are reliable and effective in saving lives before they are willing to purchase them.

Given the small number of participants in the current study, the findings may not be representative of the entire young driver population in NSW. Nonetheless, the findings do highlight some important issues that should be brought to the attention of the relevant road authorities and manufacturers who can influence the design of ITS technologies.

### **6.1.2 Acceptable Attributes of ITS Technologies**

Based on the focus group findings, it is also possible to determine for the selected ITS technologies, those attributes that are deemed acceptable to young novice drivers. Table 6.1 lists the technologies discussed, the authors' judgements of the perceived acceptability of each technology (judged as Low, Medium or High acceptability)<sup>3</sup>, and attributes of the technologies that would be deemed acceptable by the participants.

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<sup>3</sup> The acceptability ratings were subjective judgements made by the authors based on the findings of the focus groups, as the focus group participants were unable to provide a relative judgment of their perceived level of acceptability of each technology, given that they were only exposed to a sub-set of the technologies under discussion.

**Table 6.1.** Acceptable attributes and the perceived level of acceptability of each ITS technology.

ITS	Acceptability Rating	More acceptable if:
ISA	Low	<ul style="list-style-type: none"> <li>• not limiting;</li> <li>• can be enabled/disabled at will;</li> <li>• speed limit data in digital map corresponds to speed limits in the road network;</li> <li>• speed limit data can be easily updated;</li> <li>• have a 5 to 10 km/h leeway above the limit before system issues warnings;</li> <li>• reliable;</li> <li>• compulsory for new cars only and subsidised;</li> <li>• cost no more than \$1,000<sup>1</sup>;</li> <li>• cost no more than \$2,000<sup>2</sup>.</li> </ul>
FCW	Medium	<ul style="list-style-type: none"> <li>• does not automatically initiate braking if a collision is imminent;</li> <li>• also function as FDW system;</li> <li>• can be enabled/disabled at will;</li> <li>• inexpensive to repair and maintain;</li> <li>• reliable;</li> <li>• low false alarm rate;</li> <li>• display located so drivers can easily see warnings;</li> <li>• installed on every vehicle, including heavy vehicles;</li> <li>• subsidised if made compulsory;</li> <li>• cost no more than \$1,000<sup>1</sup>;</li> <li>• cost no more than \$500<sup>2</sup>.</li> </ul>
FDW	Medium	<ul style="list-style-type: none"> <li>• combined with FCW system;</li> <li>• have low false alarm rate;</li> <li>• reliable;</li> <li>• display located so drivers can easily see warnings;</li> <li>• visual warnings presented in eye-catching colours;</li> <li>• subsidised if made compulsory;</li> <li>• cost no more than \$1,000<sup>1</sup>;</li> <li>• cost no more than \$500<sup>2</sup>.</li> </ul>
LDW	Low	<ul style="list-style-type: none"> <li>• does not take control of vehicle;</li> <li>• able to detect different road surfaces;</li> <li>• have low false alarm rate, particularly when turning corners and changing lanes;</li> <li>• reliable;</li> <li>• tamper proof;</li> <li>• not compulsory;</li> <li>• cost nothing to purchase.</li> </ul>

Table 6.1 continued.

FWS	Low <sup>1</sup> Medium <sup>2</sup>	<ul style="list-style-type: none"> <li>• does not take control of vehicle;</li> <li>• detects various signs of fatigue;</li> <li>• reliable;</li> <li>• low false alarm rate;</li> <li>• auditory warning loud enough to wake drivers<sup>2</sup>;</li> <li>• display located so drivers can easily see warnings;</li> <li>• compulsory only for drivers who drive long distances (e.g., truck and taxi drivers);</li> <li>• cost nothing to purchase<sup>1</sup>;</li> <li>• cost no more than \$1,000<sup>2</sup>.</li> </ul>
ALC	Medium to high (interlock) Low (Sniffer & Performance Test)	<ul style="list-style-type: none"> <li>• Interlock system only;</li> <li>• gives drivers BAC reading, not judgment of ability to drive;</li> <li>• gives option of taking the test;</li> <li>• breathalyzer compact and unobtrusive;</li> <li>• compulsory, particularly for recidivist drink drivers and P-platers;</li> <li>• cost no more than \$200<sup>1</sup>;</li> <li>• cost no more than \$500<sup>2</sup>.</li> </ul>
SBR	Medium to high	<ul style="list-style-type: none"> <li>• not seat belt interlock;</li> <li>• low false alarm rate;</li> <li>• not too sensitive to weights on seat;</li> <li>• sensitive enough to detect small children;</li> <li>• inexpensive to repair;</li> <li>• subsidised if made compulsory;</li> <li>• cost no more than \$50.</li> </ul>
LIC*	Low to medium	<ul style="list-style-type: none"> <li>• card works on all cars, but option of restricting it to less cars;</li> <li>• has identification system linking card to owner (e.g., PIN or fingerprint system);</li> <li>• card small enough to hook onto key ring;</li> <li>• low false alarm rate;</li> <li>• compulsory only if reliable and subsidised;</li> <li>• cost no more than \$100.</li> </ul>

Note. ISA = Intelligent Speed Adaptation; FCW = Forward Collision Warning; FDW = Following Distance Warning; LDW = Lane Departure Warning; FWS = (Fatigue Warning system); ALC = Alcohol Sniffer, Interlock & Drink Driving Performance Test; SBR = Seat Belt Reminder; and LIC = Electronic Licence.

Wagga Wagga participants only

1 = Wagga Wagga participants, 2 = Sydney participants

### 6.1.3 Differences in Acceptability Between Metropolitan and Rural Participants

At present, there is little segmentation of the ITS market to cater for the different needs of drivers from different age and gender groups and for drivers from different geographical locations who may have differing driving needs given the different road environments and traffic conditions of these areas. The findings from the current study suggest that, although the participants from metropolitan and rural areas raised many of the same issues in terms of the barriers to, and acceptable attributes of, the technologies, differences between these two

groups in their acceptability of certain aspects of the technologies were apparent. The similarities and major differences between the Sydney and Wagga Wagga groups in the acceptability of each technology are as follows:

- ***Intelligent Speed Adaptation*** - The Wagga Wagga and Sydney participants held similar attitudes towards the ISA technology and raised many of the same issues regarding the acceptability of the system. It therefore appears that the acceptability of this technology may not differ considerably across male metropolitan and rural drivers in the 17 to 25 year old age group.
- ***Forward Collision Warning*** – The Wagga Wagga and Sydney participants appeared to hold similar attitudes towards the Forward Collision Warning system and raised many of the same issues regarding the system’s acceptability. However, they did have different attitudes regarding several aspects of the system: the Sydney participants felt that the system would be more useful on freeways and country roads, while the Wagga Wagga participants felt that it would be more useful around town in heavier traffic. In addition, for the Sydney participants, cost was the key factor influencing their willingness to purchase the system, while for Wagga Wagga participants, proven effectiveness was the most critical factor. This suggests that while the overall acceptability of the Forward Collision Warning system may not differ considerably across metropolitan and rural drivers in the 17 to 20 year age group, the specific aspects of the system that influence acceptability may differ across these driving populations.
- ***Following Distance Warning*** – While the Sydney participants agreed that the Following Distance Warning system had some advantages, they generally thought that the system would be less effective and were less willing to purchase it compared to the Wagga Wagga participants.
- ***Lane Departure Warning*** – The Sydney participants appeared to hold a marginally more positive attitude towards the Lane Departure Warning system compared to the Wagga Wagga participants. In general, the Sydney participants believed that the system would be more effective for preventing fatigue-related accidents than the Wagga Wagga participants. The Sydney participants also felt that the non-controlling system should be compulsory for certain road user groups, while the Wagga Wagga participants were adamant that the system should not be made compulsory under any circumstances.
- ***Fatigue Warning System*** – The Sydney participants generally appeared to hold a slightly more positive attitude towards the Fatigue Warning system compared to the Wagga Wagga participants. Overall, the Sydney participants thought that the system would be more effective and should be compulsory for certain road user groups, such as truck drivers. They were also more willing to purchase the system than the Wagga Wagga participants.
- ***Alcohol Interlock and Sniffer Systems and the Drink Driving Performance Test*** – The Sydney and Wagga Wagga participants held similar attitudes towards the three alcohol detection systems. They were positive towards the Alcohol Interlock system and raised many of the same issues regarding its acceptability. Both groups were happy for the Interlock system to become compulsory and were willing to purchase it; however, the Sydney participants were willing to pay more than twice as much for the Interlock system than the Wagga Wagga participants.
- ***Seat Belt Reminder and Interlock Systems*** – The Sydney and Wagga Wagga participants held similar attitudes towards the Seat Belt Reminder and Interlock systems. They both held negative attitudes towards the Interlock; however, they were positive towards the

Seat Belt Reminder system and raised many of the same issues regarding its acceptability. The main difference between the two groups in terms of their acceptance of the reminder system was that the Sydney participants were more concerned about the systems taking control away from them than were the Wagga Wagga participants.

These differences between metropolitan and rural drivers in the acceptability of the relevant technologies suggest that these two groups of drivers have a number of different driving needs, which will need to be considered by the relevant authorities and incorporated into the design of the technologies, if the technologies are to be deemed acceptable by different driving populations.

## 6.2 Summary and Implications of the Current Findings for Phases 2 and 3

By examining the crash data for young drivers, it was possible to identify, and select for further examination, those ITS technologies which have the greatest potential to address young driver crash problems and therefore reduce road trauma among this driving population. Based on the current findings, the acceptability of these selected technologies varied both across the technologies examined and between the metropolitan and rural drivers. More specifically, the Alcohol Interlock and Seat Belt Reminder systems were deemed the most acceptable by young drivers, while ISA, Lane Departure Warning and Fatigue Warning (for rural participants only) had the lowest levels of perceived acceptability. In addition to the overall perceived levels of acceptability of each system, several specific attributes of the systems that were viewed positively and negatively by the young drivers were also identified. In order to stimulate voluntary uptake of the examined technologies by young drivers, it is important that manufacturers and relevant road authorities take note of those attributes of the systems that were deemed acceptable by the participants, or that the participants suggested would make the systems more acceptable, and incorporate these as much as possible into their design. Consideration should also be given by manufacturers and road authorities to the potential barriers to the voluntary uptake and successful implementation of these technologies and strategies to best overcome these barriers should be developed.

As discussed earlier, the current study constitutes Phase 1 of a proposed larger multi-phased project, which it is hoped will culminate in an on-road evaluation of one or more ITS technologies for use by young novice drivers. The choice of which ITS technologies to include in the subsequent phases of the project depends on many factors. The results of the current study suggest that cost and reliability are the factors that are critical to the acceptance of ITS technologies by young drivers. From this perspective, therefore, possible candidate systems for Phases 2 and 3 of the study are:

- ***Intelligent Speed Adaptation*** – This system is relatively inexpensive, it is technically mature and although it was rated as having low perceived acceptability by the participants in the current study, there is the potential to increase the acceptability of the system by incorporating those attributes of the system that participants deemed acceptable into its design. For example, it can be designed as a speed alerting system, which can be enabled and disabled as the driver pleases and which contains accurate speed data that is easily updated.
- ***Alcohol Interlock*** – This system is relatively inexpensive, relatively reliable and has relatively high acceptability among young drivers.

- ***Seat Belt Reminder System*** – This system is relatively inexpensive and reliable and has relatively high perceived acceptability among young drivers.

The authors considered that the remaining systems that were examined, although they are likely to confer large safety benefits, are in the short term likely to be too expensive and not reliable enough for voluntary use by young drivers.

### **6.3 The Current Findings in Context**

The findings from the present study can be compared and contrasted to previous studies examining ITS acceptability that were discussed in Chapter 1 of this report.

It is difficult to compare the results of the current study to the findings of Cairney (1995), as the only technology common to both studies was the Fatigue Warning system. More importantly, Cairney did not provide any descriptions in his report of the technologies he examined and, therefore, it is not possible to determine if the two Fatigue Warnings systems were similar in function (Regan, Mitsopoulos, Haworth et al., 2002).

Harrison et al., (2000) examined the Seat Belt Reminder System. This system was functionally similar to the Seat Belt Reminder system examined in the current study. The results from the current study are consistent with those found by Harrison et al.: the participants from both studies held positive attitudes towards the Seat Belt Reminder system and felt that it would be useful as a reminder on the odd occasion that they forget to put on their seat belt. Participants in both studies also raised the concern that the sensors in the seat may not be sensitive enough to detect small children, or that they may be too sensitive and issue warnings if heavy objects such as luggage are placed on the seats.

Gray (2001) measured user attitudes and opinions towards ISA, Forward Collision Warning and Route Guidance systems through the use of a telephone survey. Although Gray's study did not involve the use of focus groups to determine participants' attitudes towards the technologies, it is still interesting to compare the results of his study with those of the current study. In regard to the speed alerting and speed limiting systems, the participants in the current study, as in Gray's study, seemed to be reluctant to accept the speed limiting system. In addition, the participants in both studies felt that the Forward Collision Warning system would be effective, but has the potential to distract the driver.

The only other study conducted in Australia that has examined the acceptability of ITS was undertaken by Regan, Mitsopoulos, Haworth et al. (2002). This study assessed the acceptability of several in-vehicle ITS technologies to Victorian car drivers of varying ages through the use of focus group discussions. These technologies were: Forward Collision Warning; ISA; Emergency Notification (Mayday); Electronic Licensing; Alcohol Interlock; Fatigue Monitoring and Lane Departure Warning. Of interest here is that the Regan, Mitsopoulos, Haworth et al. study examined the acceptability of Intelligent Speed Adaptation, Alcohol Interlock and Sniffer systems, Lane Departure Warning and the Fatigue Monitoring System to young drivers aged 18 to 24 years. It is interesting to compare the results of the Regan, Mitsopoulos, Haworth et al. and the current study to determine any similarities and differences in the acceptability of these technologies to young drivers from different states.

In the Regan, Mitsopoulos, Haworth et al. (2002) study, male and female participants aged 18 to 39 years from Melbourne discussed ISA, while male participants aged 17 to 25 years from Sydney and Wagga Wagga discussed this technology in the present study. The difference in the acceptability of ISA between the participants from the two studies is notable. Participants from both studies were reluctant to embrace the speed *limiting* system. However, the acceptability of the speed *alerting* system was considered to be relatively high among the Melbourne participants, yet the participants in the current study held negative attitudes towards this system. The more favourable attitude towards the ISA system by the Melbourne participants may be due to the fact that females were involved in the group (only males were involved in the discussion of this technology in the present study) and/or to the older overall age of these participants compared to the current study participants. Alternatively, the differences may result from differences in speed enforcement and/or speed compliance between Victoria and New South Wales. For example, the 2002 Community Attitudes to Road Safety report shows that a greater percentage of Victorian drivers stated that speed enforcement had increased in the last two years, compared to NSW drivers. Furthermore, compared to 2 percent of Victorian drivers, 20 percent of the NSW drivers sampled indicated that driving in excess of 69 km/h in a 60 km/h zone is allowed without being booked for speeding (Mitchell-Taverner, 2002). Victorian drivers may therefore hold more favourable attitudes towards ISA, as they view speeding as more of a problem than NSW drivers.

In addition, male participants aged 18 to 39 years from Melbourne discussed the Alcohol Interlock and Sniffer systems in the Regan, Mitsopoulos, Haworth et al. (2002) study, while male participants aged 17 to 25 years from Sydney and Wagga Wagga discussed these technologies in the present study. The Melbourne participants' acceptability of the alcohol detection systems was quite low, whereas, the participants from the current study held positive attitudes towards the Alcohol Interlock system. In particular, the Melbourne participants felt that it was unacceptable for drivers to have to blow into the breathalyser each time they started their car, while the current participants felt that these inconveniences were outweighed by the potential safety benefits of the system.

Finally, male and female participants aged 18 to 24 years from Melbourne discussed the Lane Departure Warning and Fatigue Warning systems in the Regan, Mitsopoulos, Haworth et al. (2002) study, while male and female participants aged 17 to 25 years from Sydney and Wagga Wagga discussed these technologies in the present study. Overall, the participants from the present study were less accepting of these systems than the Melbourne participants. Relative to the Melbourne participants, the current participants appeared to believe that the systems would be less effective in reducing fatigue-related accidents (Lane Departure Warning system in particular) and were concerned about their unreliability in terms of detecting different road surfaces (for the Lane Departure Warning system) and signs of fatigue (for the Fatigue Warning system).

In summary, it is often difficult to compare the results of the current study to many of the previous studies conducted on ITS acceptability, given the differences between studies in terms of methodology used, technologies examined, participant sample and the definition of acceptability adopted. Nevertheless, it appears that the findings of the current study are largely consistent with those of previous research. The only notable inconsistencies between studies were observed between the current study and the Regan, Mitsopoulos, Haworth et al. (2002) study. Overall, the current participants appeared to be less accepting than the Melbourne participants of the ISA, Lane Departure Warning and Fatigue Warning systems. However, the current participants were more accepting of the Alcohol Interlock system compared to the Melbourne participants.

## **6.4 Methodological Issues**

### **6.4.1 Effects of Time and Interaction with ITS on Acceptability**

The present study did not examine changes in participants' acceptability of the selected ITS technologies before and after the focus group discussions. It was decided, on the basis of the previous studies by Cairney (1995) and Harrison et al. (2000), not to measure changes in attitudes and opinions towards the technologies, as the focus groups were only of short duration and it was therefore unlikely for any meaningful changes in acceptability to occur. It is, however, possible that young drivers' acceptability of certain technologies may change over time, particularly if drivers are exposed to the system either directly, by driving cars equipped with these systems, or indirectly, by sharing the road network with cars equipped with ITS. The participants in the present study also had no prior experience or physical interaction whatsoever with the technologies that were discussed and it is not known if and how the participants' acceptability of the technologies may have altered if they had actually experienced the technologies. Clearly there is a need for further research, particularly on-road trials such as the TAC SafeCar project (Regan, Mitsopoulos, Triggs et al., 2002), to establish if interaction with ITS technologies affects the acceptability of these technologies and to gauge the potential for young driver attitudes towards ITS technologies to change over time. The present findings, nonetheless, provide some baseline data that can be used to inform the initial design and deployment of ITS technologies.

### **6.4.2 Representativeness of the Participant Sample**

The composition of the focus groups in the current study was selected based on the analysis of NSW crash statistics. While this ensured that the participants discussed the technologies from which they were most likely to derive the greatest safety benefit, it meant that the sample was not representative of the young driver population in general and therefore, generalising the result of the study to the wider young driver population is difficult. In particular, the sample was biased towards males, who constituted over 80 percent of the sample, and the number of participants in each focus group was quite small, ranging from 4 to 11. Nevertheless, the group discussions did raise a wide range of issues, many of which were similar to those raised in previous studies.

### **6.4.3 Similarity of Metropolitan and Rural Focus Group Samples**

While the Sydney and Wagga Wagga focus group samples were similar in terms of their occupation, driving experience and exposure, and use of technologies, they differed on several demographic variables. In particular, compared to the Wagga Wagga participants, the Sydney participants were: employed in a wider range of occupations; were more likely to have obtained their full driver's licence; more likely to have been booked for speeding; were involved in a greater number of crashes; and committed a greater number of violations and lapses due to inattention (as measured by the DBQ). At present, it is unknown what effect such differences in driver behaviour and infringements would have on the acceptability of the ITS technologies discussed here. Clearly, further research is required to determine whether and how differences on such variables influence young drivers' acceptance of particular ITS technologies.

#### **6.4.4 Use of Telephone Survey to Recruit Participants**

The response rate for the telephone recruitment survey was very low, particularly for the Sydney respondents and, as such, we were forced to abandon the survey for the Sydney participants and hire a professional recruitment and research company to carry out the recruitment of this sample. Although the response rate for the Wagga Wagga survey was higher than that for the Sydney survey, it was still quite low despite attempts to conduct the surveys at times when it was most likely that respondents would be at home. Also a large number of respondents who had originally agreed to participate in the focus groups pulled out when they were called back to be booked into a session. It has long been acknowledged that young people are a difficult population to recruit, particularly through telephone surveys (e.g., Regan, Mitsopoulos, Haworth et al., 2002). However, over the last few years the difficulty in recruiting this population through the use of telephone surveys has increased (Krosnick, 1999). In addition, there is evidence that telephone surveys are biased towards respondents who have completed lower levels of education and who are in the lower income levels (Krosnick, 1999). It is therefore important that researchers carefully consider the recruitment method to be used and perhaps consider alternatives to telephone recruitment, as this may no longer be the most practical or successful method to recruit younger participants.

#### **6.4.5 Effect of Driving Styles on Acceptability**

The Driver Behaviour Questionnaire (DBQ) was also administered as part of a larger questionnaire administered during each focus group. The purpose of the DBQ was to assess whether participants' driving styles were similar across focus groups and across the Sydney and Wagga Wagga participants, as it is acknowledged that different driving styles may influence the perceived acceptability of certain technologies (Regan, Mitsopoulos, Haworth et al., 2002). Analysis of the DBQ responses revealed that the participants across the four Wagga Wagga focus groups did not differ significantly on any of the four DBQ factors and, hence, were largely equivalent in their driving styles. As with the Wagga Wagga groups, the four Sydney focus groups also did not differ significantly on any of the four DBQ factors. However, while the Sydney and Wagga Wagga focus group participants did not differ significantly on the mistakes or lapses due to inexperience factors, the two samples did differ significantly on the violations and the lapses due to inattention factors, with Sydney participants committing more violations and more lapses due to inattention than the Wagga Wagga participants. It is currently unclear what influence, if any, these differences in driving styles may have had on the two samples' acceptability of the selected technologies. Clearly further research is required to establish the role, if any, of driving styles on the acceptability of ITS technologies.

### **6.5 The Future**

#### **6.5.1 Future Directions**

Based on the current research, it is evident that the potential road safety benefits of many in-vehicle ITS technologies may never be realised unless they are deemed acceptable to young drivers. In order, to enhance the acceptability of ITS technologies to younger drivers, the following suggestions can be made.

- From the results of the focus group discussions it appears that young drivers are generally unaware of the existence of in-vehicle ITS technologies. It is therefore important for manufacturers, road authorities and ITS stakeholders to inform young drivers about the purpose and operation of these systems and their potential safety benefits.
- It is important to make young drivers more aware of the crash types (e.g., their incidence and severity) that are addressed by the technologies. One of the issues that emerged from the focus group discussions was participants' lack of knowledge about the frequency and severity of certain crash types, particularly rear-end crashes, and this appeared to influence participants' opinions regarding how useful certain technologies would be.
- It is clear from the current research that increasing young driver acceptability of in-vehicle ITS technologies will require a commitment from road authorities to develop the required infrastructure to support these technologies. One theme that emerged from the focus group discussions, particularly in relation to Intelligent Speed Adaptation, is that young drivers were aware of the need to have appropriate infrastructure to support the deployment of this technology. The participants mentioned that in order for Intelligent Speed Adaptation to be deemed acceptable, the speed limits contained in the on-board digital map would need to correspond exactly to the posted speed limits in the road network. They also stressed that updating the digital map to reflect changes in speed zones, or when moving to another jurisdiction, would need to be straightforward.
- In order to facilitate the acceptability of ITS technologies among young drivers, it is important for manufacturers to consider the issues raised by the young drivers in this study regarding the design and location of system hardware, particularly the visual display screen, and incorporate these suggestions into the design of the systems.
- It is important for road authorities and ITS manufacturers to consider the differences observed between the metropolitan and rural drivers in the acceptability of several technologies. These differences suggest that these two groups of drivers have different driving needs that must be considered in the design of the technologies if they are to be deemed acceptable by different driving populations.

### **6.5.2 Future Research**

Based on the results of the present study and previous research, the following suggestions can be made for further research.

- Further research is required using a larger sample of participants from the young driver population to establish the critical issues that influence the acceptability of in-vehicle ITS. It is also important for research to focus on identifying the needs of young drivers from different geographical locations and to determine exactly how these needs may differentially influence their acceptability of ITS technologies.
- The current study only focused on ITS acceptability among young drivers. Further research is required with a wider range of age groups in order to establish if acceptability of ITS differs between younger and older drivers and, therefore, if specific strategies for ITS development and deployment for young drivers are necessary.
- It is important to measure young drivers' acceptability of ITS technologies before, during and after exposure to them, to determine those aspects of acceptability that are most likely to change after short or long term exposure to the systems.
- It is important that research be conducted to establish the most effective means of enhancing the acceptability to young drivers of in-vehicle ITS technologies, particularly

those such as Intelligent Speed Adaptation, which had low perceived acceptability by young drivers in this study, but appears to have the potential to confer substantial safety benefits for this population based on the findings of overseas trials (e.g., the Swedish ISA trials, Biding & Lind (2002)).

- Further research is needed to establish the acceptability of in-vehicle ITS to other road user groups, such as heavy vehicle drivers, motorcyclists, bicyclists and pedestrians (Regan, Mitsopoulos, Haworth et al., 2002). A project funded by Austroads is currently being undertaken to assess the potential costs and benefits of an Intelligent Speed Adaptation (ISA) limiting system for heavy vehicles and to evaluate the effectiveness of such a system through a trial with heavy vehicles. This is expected to yield some data on the acceptability of ISA to heavy vehicle drivers.
- Further research is required to better establish whether and how factors such as age, gender, socioeconomic status, driving style and geographical location affect drivers' perceptions of acceptability of in-vehicle ITS technologies (Regan, Mitsopoulos, Haworth et al., 2002).
- To the knowledge of the authors, at present no research has been conducted in Australia to assess driver's acceptance of the large range of out-of-vehicle ITS technologies (e.g., variable message and speed limit signs) that are beginning to emerge.
- There is a need for research to better establish the constructs that underlie acceptability, determine the dimensions of acceptability that are most important to consumers in choosing certain ITS technologies and to determine the constructs underlying acceptability that are most likely to change over time and with exposure to the systems (Regan, Mitsopoulos, Haworth et al., 2002).
- A priority for research in the acceptability area is the development of a valid and reliable tool that can be used to measure the various constructs underlying acceptability (Regan, Mitsopoulos, Haworth et al., 2002).
- Finally, there is a need for further investigation of how ITS technologies can best be utilized to support young drivers. In particular, field and on-road trials of ITS technologies need to be conducted to determine young drivers' acceptability of these system after experience with the technologies and to assess young drivers' behavioral adaptation to ITS.

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# Appendix A. RECRUITMENT TELEPHONE SURVEY

**MAA ITS Acceptability Project  
Focus Group Recruitment Survey**

Section A: Introduction | Section B: Driving Experience | Section C: Demographics | Section D: Focus Group Recruitment | Section E: Result of Call

**Section A: Introduction**  
  

Phone Number:

Participant code:

"Hi. My name is XXXXX from the Monash University Accident Research Centre in Melbourne. We are conducting a short survey on people's driving experience. Your phone number was randomly selected from the WhitePages and I was wondering if there is someone in your household who is aged between 17 and 25 who would be happy to answer a few questions."

If refusal...	"Thanks anyway, Goodbye"	END OF CALL GO TO SURVEY CLOSE
If agree...	"Thanks, that's great"	READ TEXT BELOW

"The purpose of the survey is to determine people's eligibility to take part in a group discussion on technologies for cars that are designed to cut the road toll. The survey is confidential and you can stop at any time."

[GO TO QUESTION A.1](#)

**A.1** "Can you please tell me your age in years?"

**If not age between 17 and 25...** "Thankyou, but we are only looking to interview people between the ages of 17 and 25 years."

[GO TO QUESTION A.2](#)

**A.2** Enter sex of interviewee (Shouldn't need to ask)

[GO TO QUESTION A.3](#)

**A.3** "Do you hold a current car driver's licence?"

**If Yes...** [GO TO QUESTION A.4](#)

**If No...** "Thanks very much for your time, but we are only interviewing people who have a driver's licence. Have a good night."

**END OF CALL  
GO TO SECTION E**

**A.4** "Do you currently drive a car?"

**If Yes...** [GO TO SECTION B](#)

**If No...** "Thanks very much for your time, but we are only interviewing people who drive a car. Have a good night."

**END OF CALL  
GO TO SECTION E**

## MAA ITS Acceptability Project Focus Group Recruitment Survey

Section A: Introduction

Section B: Driving Experience

Section C: Demographics

Section D: Focus Group Recruitment

Section E: Result of Call

### Section B: Driving Experience

"These next questions deal with your experience as a driver"

**B.1** "Do you currently hold a Learner's Permit, Probationary or Full car driver's licence?"

[GO TO QUESTION B.2](#)

[If Learner's Permit, Discontinue survey.](#)

[GO TO SURVEY CLOSE](#)

[If Probationary or Full licence...](#)

[GO TO QUESTION B.2](#)

**B.2** "How old were you when you were first licenced to drive a car?" (If necessary, ask for age they obtained their probationary licence).

[GO TO QUESTION B.3](#)

**B.3** "Are you licenced to drive a motorcycle?"

[If Yes...](#) [GO TO QUESTION B.4](#)

[If No...](#) [GO TO QUESTION B.5](#)

**B.4** "Of the time you spend driving, what percentage of that time do you spend driving a motorcycle?"

[If 20% or more...](#) "Okay, that's all I need. Thanks very much for your time and assistance. Have a good night."

[If less than 20%...](#) [GO TO QUESTION B.5](#)

**B.5** "Are you licenced to drive a truck or other heavy vehicle, such as a bus?"

[If Yes...](#) [GO TO QUESTION B.6](#)

[If No...](#) [GO TO SECTION C](#)

**B.6** "Of the time you spend driving, what percentage of that time do you spend driving a heavy vehicle?"

[If 20% or more...](#) "Okay, that's all I need. Thanks very much for your time and assistance. Have a good night."

**END OF CALL  
GO TO SECTION E**

[If less than 20%...](#) [GO TO SECTION C](#)

## MAA ITS Acceptability Project Focus Group Recruitment Survey

Section A: Introduction

Section B: Driving Experience

Section C: Demographics

Section D: Focus Group Recruitment

Section E: Result of Call

### Section C: Demographics

"Just to make sure we have a broad cross section of people answering the survey, I'd like to ask you just a few more questions."

**C.1** Firstly, are you...

- A high school student
- A student in tertiary education
- In full time employment
- In part time employment
- Involved in full time home duties
- Unemployed
- Other      What would that be:

If in full or part time employment...

[GO TO QUESTION C.2](#)

If NOT in full or part time employment...

[GO TO QUESTION C.3](#)

**C.2** "What type of work do you do?" (read out options if necessary)

- Manager/Administrator**      (Includes all managers, government officials, administrators)
- Professional**      (Includes architects, lawyers, accountants, doctors, scientists/researchers, teachers, health professionals, artists)
- Technical or Para-professional**      (e.g. technical officers, technicians, medical officers, police officers, computer programmers or operators, teaching or nursing aides)
- Trades Person**      (e.g. building, electrical, metal, printing, vehicle, food handling, horticulture)
- Clerk**      (e.g. secretarial, data processing, telephonist, filing, messengers, reception)
- Labourer and Related Worker**      (e.g. Trades assistants, factory hands, farm labourers, cleaners, construction and mining labourers)
- Sales and Personal Service Worker**      (e.g. investment insurance, real estate agents, sales reps, executive or personal assistants, shop assistants)
- Plant Machine Operator/Driver**      (e.g. road, rail, machine, mobile or stationary plant operators/drivers)
- Other**      Please sepecify:

C.3

What is the highest level of education you have completed so far? (read out options if necessary)

- Still in high school
- Year 11 or less - did not complete Year 12
- Year 12 or equivalent
- Trade Certificate
- Other Certificate
- Associate Diploma
- Bachelor's Degree
- Honours year or Graduate Diploma
- Masters and/or PhD
- Other      **Please Specify:**
- Don't Know

C.4

"Which suburb do you live in please?"

GO TO SECTION D

## MAA ITS Acceptability Project Focus Group Recruitment Survey

Section A: Introduction

Section B: Driving Experience

Section C: Demographics

Section D: Focus Group Recruitment

Section E: Result of Call

### Section D: Focus Group Recruitment

D.1

"As I said at the start of the survey, we are taking this opportunity to invite people to take part in a group discussion on what people think about new technologies for cars that are designed to cut the road toll. So, for example, technologies such as those that warn you if you are becoming fatigued.

The discussion will be in a small group and will take around 2 hours. Those who take part will be offered \$30 to compensate them for their time and travel expenses. Sessions are being conducted in the evenings or on the weekends and are being held at a location in the township of Wagga Wagga.

So if you are interested in taking part, we are taking contact details now and in a few weeks one of our staff will contact you to organise a session time. Even if you say yes now you can still change your mind and all of your details will be kept confidential."

"So can I add your name to our list?"

If Yes...

GO TO QUESTION D.2

If No...

GO TO SURVEY CLOSE

D.2

"Can I have your name please, your first name will be fine?"

GO TO QUESTION D.3

D.3

"Can I have your contact phone number please?"

GO TO QUESTION D.4

D.4

"When is the best time to contact you on that number?"

GO TO QUESTION D.5

D.5

"Okay, finally when would you prefer the groups to be held: on the weekend or on a weekday?"

If weekend...

GO TO QUESTION D.6

If weekday...

GO TO QUESTION D.7

**D.6**

"What time would you prefer the group to be held on the weekend?"  
(Read out options)

- 10am - 12noon
- 2pm - 4pm
- 4pm - 6pm

**D.7**

"What time would you prefer the group to be held on a weekday?"  
(Read out options)

- 5pm - 7pm
- 6pm - 8pm
- 7pm - 9pm

Go to Survey Close

Survey Close

"Okay that's all I need. Thanks very much for your time and assistance. Have a good night."

END OF CALL  
GO TO SECTION E

## MAA ITS Acceptability Project Focus Group Recruitment Survey

Section A: Introduction

Section B: Driving Experience

Section C: Demographics

Section D: Focus Group Recruitment

Section E: Result of Call

### Section E: Result of Call

Please select option for the result of call...

Result of call:

# **Appendix B. EXPLANATORY STATEMENT AND CONSENT FORM**

## **Explanatory Statement for Participants**

### **In-Vehicle Intelligent Transport Systems and Young Novice Driver Safety**

Dr. Michael Regan of the Monash University Accident Research Centre in Clayton, Victoria is conducting research investigating the acceptability of new in-vehicle intelligent transport systems among young novice drivers. While these new systems have the potential to reduce road crashes and injury, they are unlikely to have a positive effect on driver behaviour if they are not acceptable to drivers. It is important, therefore, that the development of these new systems be accompanied by research to investigate factors that influence their acceptability among groups of road users, such as young novice drivers who are over-represented in crashes, and who, as a consequence, might benefit from the use of certain in-vehicle ITS technologies.

To be eligible to participate you must be aged between 17 and 25 years of age inclusive; hold a valid car drivers licence and not drive either a motorcycle or a truck for more than 20 percent of your time spent driving.

If you agree to take part in the project, you will be asked to participate in a small discussion group, which will be led by an experienced and trained researcher. The discussion group will begin with an explanation of the rationale behind the project, and some detail about the types of new systems that may be introduced into new cars. This will be followed by administration of a short questionnaire to gather some background information on your driving experience and experience with technology, and a group discussion of views relating to the potential use and acceptability of these new systems. The group discussion will take approximately 2 hours. You will be offered \$30 to compensate you for your time and any expenses involved in travelling to the session.

As focus group participation is a public event involving several members, the confidentiality of any information provided during the focus group cannot be guaranteed. However, no findings that could identify any individual participant will be published. Only members of the research group will see the information you provide. To ensure the accurate recording of information, the discussion group will be video-taped, but the tapes will be erased at the end of the project. No names or identifying information will be put into any written records of the group discussion. All other data from this project will be kept at the Monash University Accident Research Centre. Only members of the research group will have access to this data, which must be stored for five years under university regulations, without any identifying information.

Participation in this research is entirely voluntary, and you are free to withdraw at any time and for any reason. If you are happy to participate could you please read the attached consent form and bring it with you to your discussion group. At the commencement of the discussion group you will be asked to sign your consent form.

If you have any queries, or would like to be informed of the aggregate research findings, please do not hesitate to contact me on telephone (03) 9905 1838 or email [michael.regan@general.monash.edu.au](mailto:michael.regan@general.monash.edu.au). Alternatively, you can contact Kristie Young on telephone (03) 9905 1258 or email [kristie.young@general.monash.edu.au](mailto:kristie.young@general.monash.edu.au).

You can complain about the study if you do not like something about it. To complain about the study, you need to phone (03) 9905 2052. You can then ask to speak to the secretary of the Human Ethics Committee and tell him or her that the number of the project is **2002/319**. You could also write to the secretary. That person's address is:

The Secretary  
The Standing Committee on Ethics in Research Involving Humans  
Monash University  
Clayton Victoria 3800  
Telephone (03) 9905 2052 Fax (03) 9905 1420  
Email: [SCERH@adm.monash.edu.au](mailto:SCERH@adm.monash.edu.au)

Thank you

**Dr Michael Regan**  
Senior Research Fellow

## **Explanatory Statement for Parents/Guardians**

### **In-Vehicle Intelligent Transport Systems and Young Novice Driver Safety**

Dr. Michael Regan of the Monash University Accident Research Centre in Clayton, Victoria is conducting research investigating the acceptability of new in-vehicle intelligent transport systems among young novice drivers. While these new systems have the potential to reduce road crashes and injury, they are unlikely to have a positive effect on driver behaviour if they are not acceptable to drivers. It is important, therefore, that the development of these new systems be accompanied by research to investigate factors that influence their acceptability among groups of road users, such as young novice drivers who are over-represented in crashes, and who, as a consequence, might benefit from the use of certain in-vehicle ITS technologies.

For your son/daughter to be eligible to participate he/she must be aged between 17 and 25 years of age inclusive; hold a current and valid car drivers licence and not drive either a motorcycle or a truck for more than 20 percent of his/her time spent driving.

If you are happy for your son or daughter to take part in the project, they will be asked to participate in a small discussion group, which will be led by an experienced and trained researcher. The discussion group will begin with an explanation of the rationale behind the project, and some detail about the types of new systems that may be introduced into new cars. This will be followed by administration of a short questionnaire to gather some background information on your driving experience and experience with technology, and a group

discussion of views relating to the potential use and acceptability of these new systems. The group discussion will take approximately 2 hours. Your son or daughter will be offered \$30 to compensate them for their time and any expenses involved in travelling to the session.

As focus group participation is a public event involving several members, the confidentiality of any information provided during the focus group cannot be guaranteed. However, no findings that could identify any individual participant will be published. Only members of the research group will see the information your son or daughter provides. To ensure the accurate recording of information, the discussion group will be video-taped, but the tapes will be erased at the end of the project. No names or identifying information will be put into any written records of the group discussion. All other data from this project will be kept at the Monash University Accident Research Centre. Only members of the research group will have access to this data, which must be stored for five years under university regulations, without any identifying information.

Participation in this research is entirely voluntary, and you are free to withdraw your son or daughter at any time and for any reason. If you are happy for your son or daughter participating in this project could you please sign the attached consent form and give it to your son or daughter to bring with them to their discussion group. If you have any queries, or would like to be informed of the aggregate research findings, please do not hesitate to contact me on telephone (03) 9905 1838 or email [michael.regan@general.monash.edu.au](mailto:michael.regan@general.monash.edu.au). Alternatively, you can contact Kristie Young on telephone (03) 9905 1258 or email [kristie.young@general.monash.edu.au](mailto:kristie.young@general.monash.edu.au).

You can complain about the study if you do not like something about it. To complain about the study, you need to phone (03) 9905 2052. You can then ask to speak to the secretary of the Human Ethics Committee and tell him or her that the number of the project is **2002/319**. You could also write to the secretary. That person's address is:

The Secretary  
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Monash University  
Clayton Victoria 3800  
Telephone (03) 9905 2052 Fax (03) 9905 1420  
Email: [SCERH@adm.monash.edu.au](mailto:SCERH@adm.monash.edu.au)

Thank you

**Dr Michael Regan**  
Senior Research Fellow

## Participant Consent Form

### In-vehicle Intelligent Transport Systems and Young Novice Driver Safety

I agree to take part in the above Monash University research project. I have had the project explained to me, and I have read the Explanatory Statement, which I keep for my records. I understand that agreeing to take part means that I am willing to:

- Take part in a discussion group concerning the acceptability of intelligent transport system applications, and
- Allow the group discussion to be videotaped.

I understand that focus group participation is a public event and therefore the confidentiality of any information provided cannot be guaranteed. However, any information that could lead to the identification of any individual will not be disclosed in any reports on the project, or to any other party.

I also understand that my participation is voluntary, that I can choose not to participate in part or all of the project, and that I can withdraw at any stage of the project without being penalised or disadvantaged in any way.

Participant's Name:..... (Please print)

Signature:..... Date:.....

## Parental Consent Form

### In-vehicle Intelligent Transport Systems and Young Novice Driver Safety

I agree that.....(full name of participant) may take part in the above Monash University research project. The project has been explained to.....(participant's name) and to me, and I have read the Explanatory Statement, which I keep for my records.

I understand that agreeing to take part means that I am willing to allow ..... (participant's name) to:

- Take part in a discussion group concerning the acceptability of intelligent transport system applications, and
- Allow the group discussion to be videotaped.

I understand that focus group participation is a public event and therefore the confidentiality of any information provided cannot be guaranteed. However, I understand that any information that.....(participant's name) provides that could lead to his/her identification will not be disclosed in any reports on the project, or to any other party.

I also understand that.....(participant's name) participation is voluntary, that s/he can choose not to participate in part or all of the project, and that s/he can withdraw at any stage of the project without being penalised or disadvantaged in any way.

Participant's Name:.....(Please print)

Participant's Age:.....

Parent/Guardian's Name:.....(Please print)

Your relationship to the participant:.....

Parent/Guardian's Signature:.....

Date:.....

## Appendix C. MODERATOR'S DISCUSSION GUIDE

1. What are your first impressions of the technology?
  - What do you like about the technology?
  - What don't you like about the technology?
2. Do you think that driving a car with this system will make you drive any differently?
  - Will it make you a safer driver? In what ways? Under what conditions? (i.e. different speed zones; residential vs. freeway, etc.)
  - Will it make you a less safe driver? In what ways? Under what conditions?
3. How *useful* would you find the technology? Would it serve a purpose for you?
  - In what ways?
  - Under what conditions? (i.e. different speed zones; residential vs freeway, etc.)
4. How do you think your passengers would react to the system?
  - Do you think that they would find it distracting?
  - Or do you think that they might be more relaxed because they might think of the technology as an extra set of eyes?
5. Would you want to cheat the system? Can you think of any ways to cheat the system?
6. Can you think of any potential problems or concerns that you might have in using the system?
  - Do you think it could be a distraction?
  - Do you think that you might end up relying on it too much?
  - Reliability problems
  - False alarms
  - Maintenance issues
7. Would you be able to put up with the system even if were not 100% reliable? Or if it issued false warnings? Or if there were potential problems or concerns with maintenance?
8. How would you feel about the system taking control away from you as the driver?  
(*Compare alerting with limiting system.*)
9. What would stop you from buying the system?
  - Cost
  - Hard to use and understand
  - Perceived usefulness
  - Perceived effectiveness

10. What would encourage you to buy the system?
  - Avoid traffic fines
  - May save my life
  - May save passenger and other lives
11. If you were buying a car and the system were a standard feature, would it make the car more appealing?
12. If you were buying a car and the system were not a standard feature, would you buy the system? If so, how much would you be willing to pay for it?
13. How do you think the system could be better designed to make it more appealing to you?
14. Would driving a car with this system make you drive other cars that are not equipped with this system any differently?
  - In what ways?
15. How would you feel if it were compulsory for you to fit this technology to your vehicle? Should it be compulsory?
16. Any other comments or issues?

## Appendix D. FOCUS GROUP QUESTIONNAIRE

Participant code:

Date:



Accident Research Centre

### In-Vehicle Intelligent Transport Systems and Young Novice Driver Safety Questionnaire

Thank you for coming along today. Your involvement is greatly appreciated. We would be grateful if you could take a few minutes to answer the following questions. We are interested in your honest opinion, and remember, all of the information that you provide will be kept confidential.

#### Part A - Personal Details

1. What is your age in years?
2. Are you male or female?  Male  Female
3. Are you:
  - A student in secondary education
  - A student in tertiary education
  - In full time employment
  - In part time employment
  - Involved in full time home duties
  - Unemployed
  - Other, please specify
4. If you are in Full time or Part time employment, what type of work do you do?
5. What is the highest level of education you have so far completed?
  - Currently in Year 11 or 12

- Year 11 or less – did not complete Year 12
- Year 12 or equivalent
- Trade certificate
- Other certificate
- Associate diploma
- Bachelor's degree
- Honours year or Graduate diploma
- Masters and/or PhD
- Other, Please specify

Part B – Driving experience, travel patterns and driving record

1. Do you currently hold a Probationary or a Full car driver's licence?

- Probationary       Full

2. How old were you when you were first licensed to drive a car (i.e. when you received your probationary licence)?

3. On average, how many hours do you spend driving a car each week, including weekends, for work purposes? This **does not** include the time that you might spend driving to and from work.

4. On average, how many hours do you spend driving a car each week, including weekends, for private purposes? This **does** include the time that you might spend driving to and from work.

5.  months have you been caught/booked for:

a. Speeding?

- Yes       No

If YES, on how many occasions?

b. Having a blood alcohol concentration at or above the legal limit?

Yes

No

If YES, on how many occasions?

c. Not wearing a seat belt?

Yes

No

If YES, on how many occasions?

d. Driving outside the conditions of your licence?

Yes

No

If YES, on how many occasions?

e. Tailgating?

Yes

No

If YES, on how many occasions?

6. In the last 12 months, have you been involved in any crashes as the **driver**?

Yes

No

If YES, on how many occasions?

For each crash, what type of crash was it? (e.g. rear-end, head-on, lost control of vehicle on a bend)

1.

2.

3.

7. In the last 12 months, have you been involved in any crashes as a **passenger**?

Yes

No

If YES, on how many occasions?

For each crash, what type of crash was it? (e.g. rear-end, head-on, lost control of vehicle on a bend)

1.

2.

3.

8. Each of the statements below is a situation in everyday driving. Your task is to state how often the described situation has happened to you while driving. The boxes give a scale from never on the left to very often on the right.

Deliberately disregard the speed limit to stay with the traffic flow

Never

Very seldom

Rather seldom

Sometimes

Often

Very often

Overtake when the car in front is slowing down approaching an area with a lower speed limit

Never

Very seldom

Rather seldom

Sometimes

Often

Very often

Fail to notice a green arrow at a traffic signal allowing you to turn

Never

Very seldom

Rather seldom

Sometimes

Often

Very often

Forget to loosen the park brake when driving off

Never

Very seldom

Rather seldom

Sometimes

Often

Very often

Drive especially close to the car in front as a signal to its driver to go faster or to get out of the way

Never

Very seldom

Rather seldom

Sometimes

Often

Very often

Forget to dip the lights when driving at night and are reminded to do so by other drivers flashing their lights

Never

Very seldom

Rather seldom

Sometimes

Often

Very often

Speed up at traffic lights when the lights are yellow or green

Never

Very seldom

Rather seldom

Sometimes

Often

Very often

Deliberately park your car illegally in order to run an errand

Never

Very seldom

Rather seldom

Sometimes

Often

Very often

Break a traffic rule because you hadn't noticed the newly put up sign

Never

Very seldom

Rather seldom

Sometimes

Often

Very often

Misread signs and find yourself lost

Never

Very seldom

Rather seldom

Sometimes

Often

Very often

Fail to notice when a traffic light turns green

Never

Very seldom

Rather seldom

Sometimes

Often

Very often

Deliberately exceed the speed limit on main roads when there is little traffic

Never

Very seldom

Rather seldom

Sometimes

Often

Very often

Find yourself driving in the next to highest gear even though you are driving fast enough to be in the highest gear

Never

Very seldom

Rather seldom

Sometimes

Often

Very often

Uncertain where you parked your car in a large parking area

Never

Very seldom

Rather seldom

Sometimes

Often

Very often

Intend to reverse but find that the car is moving forward because it is in the wrong gear

Never

Very seldom

Rather seldom

Sometimes

Often

Very often

Deliberately exceed the speed limit when overtaking

Never

Very seldom

Rather seldom

Sometimes

Often

Very often

Fail to notice a traffic sign telling you that the road is temporarily closed

Never

Very seldom

Rather seldom

Sometimes

Often

Very often

Intend to drive to destination A, only to suddenly find yourself on the road to destination B, perhaps because destination B is your more usual destination

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Never	Very seldom	Rather seldom	Sometimes	Often	Very often

Miss your exit on a freeway and have to make a lengthy detour

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Never	Very seldom	Rather seldom	Sometimes	Often	Very often

Misjudge the road surface and when braking find the distance needed to stop is longer than you expected

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Never	Very seldom	Rather seldom	Sometimes	Often	Very often

Shift into the wrong gear while driving

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Never	Very seldom	Rather seldom	Sometimes	Often	Very often

Switch on the wipers for example, when you meant to switch on something else, such as the head lights

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Never	Very seldom	Rather seldom	Sometimes	Often	Very often

Forget which gear you are currently in and have to check with your hand

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Never	Very seldom	Rather seldom	Sometimes	Often	Very often

Deliberately turn onto a main road just in front of an oncoming vehicle even though there is no other traffic behind the oncoming vehicle

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Never	Very seldom	Rather seldom	Sometimes	Often	Very often

Misjudge the gap to the oncoming vehicle (in the opposite lane) when overtaking and you are forced to just sweep in front of the vehicle you overtake

Never

Very seldom

Rather seldom

Sometimes

Often

Very often

Turn right onto a main road into the path of an oncoming vehicle that you hadn't seen, or whose speed you misjudged

Never

Very seldom

Rather seldom

Sometimes

Often

Very often

Try to shift into a higher gear even though you're already in the highest gear

Never

Very seldom

Rather seldom

Sometimes

Often

Very often

Park against parking rules because you can't find a parking space

Never

Very seldom

Rather seldom

Sometimes

Often

Very often

Misjudge your speed when you exit from a main road and have to slam on the brakes

Never

Very seldom

Rather seldom

Sometimes

Often

Very often

Cut corners and occasionally cut into the opposing lane when driving around sharp bends in rural areas

Never

Very seldom

Rather seldom

Sometimes

Often

Very often

Misjudge the gap to an oncoming vehicle when you are turning right and force the oncoming vehicle to slam on the brakes

Never

Very seldom

Rather seldom

Sometimes

Often

Very often

Underestimate the speed of an oncoming vehicle (in the opposite lane) when overtaking

Never

Very seldom

Rather seldom

Sometimes

Often

Very often

## Part C – Vehicle Purchase

1. If you were buying a car, how important would each of the following factors be in influencing your purchase? The boxes give a scale from very important on the left to very unimportant on the right.

### Price

Very important

Important

Neutral

Unimportant

Very unimportant

### Manufacturer (e.g. Ford, Holden)

Very important

Important

Neutral

Unimportant

Very unimportant

### Type of vehicle (e.g. sports, hatchback, sedan, wagon)

Very important

Important

Neutral

Unimportant

Very unimportant

### Colour of the vehicle

Very important

Important

Neutral

Unimportant

Very unimportant

### Age of the vehicle

Very important

Important

Neutral

Unimportant

Very unimportant

### Size of the vehicle/Internal space

Very important

Important

Neutral

Unimportant

Very unimportant

### Engine capacity

Very important

Important

Neutral

Unimportant

Very unimportant

### Power

Very important

Important

Neutral

Unimportant

Very unimportant

### Fuel economy

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Very important	Important	Neutral	Unimportant	Very unimportant

### Reliability

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Very important	Important	Neutral	Unimportant	Very unimportant

### Air conditioning

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Very important	Important	Neutral	Unimportant	Very unimportant

### CD Player

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Very important	Important	Neutral	Unimportant	Very unimportant

### Safety features

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Very important	Important	Neutral	Unimportant	Very unimportant

2. If you responded IMPORTANT or VERY IMPORTANT for "safety features" in Question 1 above, which safety features would you be most likely to seek when purchasing a car (you can tick more than one response)?

Driver side airbag

Driver and passenger airbags

Side airbags

ABS brakes

Child restraint anchorage points

Crash test results/Safety ratings

Other, Please specify

Part D – Use of Technologies

1. Have you ever used **in-vehicle route navigation**?

Yes

No

If YES, would you use in-vehicle route navigation again?

Yes

No

2. Have you ever used **cruise control**?

Yes

No

If YES, would you use cruise control again?

Yes

No

3. Have you ever used a **reverse parking aid**?

Yes

No

If YES, would you use the reverse parking aid again?

Yes

No

4. Have you ever used **manual speed alert**?

Yes

No

If YES, would you use manual speed alert again?

Yes

No

5. Have you ever used **adaptive cruise control**?

Yes

No

If YES, would you use adaptive cruise control again?

Yes

No

6. On average, how often do you access each of the following facilities:

Email?

- Several times a day
- Once a day
- Once every two/three days
- Once a week
- Less than once a week
- Never

Internet?

- Several times a day
- Once a day
- Once every two/three days
- Once a week
- Less than once a week
- Never

Telephone banking?

- Several times a day
- Once a day
- Once every two/three days
- Once a week
- Less than once a week
- Never

Automatic teller machine?

- Several times a day
- Once a day
- Once every two/three days
- Once a week
- Less than once a week
- Never

Cable television (e.g. Foxtel)?

- Several times a day
- Once a day
- Once every two/three days
- Once a week
- Less than once a week
- Never

7. Which of the following do you own (you can tick more than one)?

- |   |  |
|---|--|
| <input type="checkbox"/> Personal computer/laptop   | <input type="checkbox"/> Play station (or similar) |
| <input type="checkbox"/> Mobile phone               | <input type="checkbox"/> WAP enabled mobile phone  |
| <input type="checkbox"/> CD writer and/or Zip drive | <input type="checkbox"/> Digital camera            |
| <input type="checkbox"/> PDA (e.g. Compaq iPAQ)     | <input type="checkbox"/> DVD player                |

*End of Questionnaire*

*Thank you very much for your time and participation.*

## **Appendix E. ITS FUNCTIONAL DESCRIPTIONS**

### **Intelligent Speed Adaptation – Alerting and Limiting Systems**

Technologies have been developed that warn you if you exceed the speed limit or prevent you from exceeding the speed limit.

Speed alerting or warning systems, as the name implies, warn you if you exceed the speed limit and it is up to you to decide whether or not to slow down when a warning is issued by the system. Usually these systems give the driver a visual warning when the speed limit is exceeded. If the visual warning is ignored – perhaps because the driver failed to see the visual warning - then the system issues an audio warning a short time later. The audio warning keeps sounding until the driver slows the car down to below the speed limit.

Speed limiting systems, on the other hand, physically prevent you from exceeding the speed limit. Usually these systems give the driver a visual warning when the car is approaching the speed limit. If the person continues to speed, the system prevents fuel from reaching the engine and the brakes are automatically applied so that the speed limit is not exceeded.

The technology behind these systems is fairly simple. Each vehicle has a global positioning system, so that the car knows exactly where it is in Wagga Waaga. The car also has a CD ROM containing an electronic map of Wagga Wagga with all of the roads and the speed limits on those roads. So when the car passes a speed sign, the car knows where it is and what the new speed limit is and either warns the driver or slows the car down automatically if it is speeding.

### **Forward Collision/Following Distance Warning System**

Special technologies have been developed that warn you if you are about to collide with a stationary or slow moving object ahead. These are known as forward collision warning systems.

Pretend you are driving on a road with two lanes in each direction and that you are in the right lane. Pretend that you have a truck in front of you and that there is a car in front of the truck – but that you can't see the car in front of the truck. All of a sudden the car in front of the truck decides to turn right into a side street and slows down rapidly. In turn, the truck ahead of you slams on its brakes. If you weren't watching what was going on, you would crash into the back of the truck – that's how many rear end crashes happen. However, if you had a forward collision warning system, it would detect that you were rapidly approaching the truck in front and warn you early enough to give you enough time to brake and avoid a collision with the truck. These systems usually give you an aggressive audio warning to spring you into action.

These systems rely on a special radar unit that is mounted at the front of the vehicle. The radar unit sends out radar beams that hit the car in front and then bounce back to the radar unit. The rate at which these beams bounce back tells the car how rapidly it is approaching the vehicle in front. A computer in the vehicle warns the driver if the radar beams indicate that a collision is likely to occur.

Other systems warn you if you are driving too close to the car in front of you. These are known as Following Distance Warning Systems.

Pretend that you are driving along a freeway. You start to close in on the car in front of you. Once you are less than 2 seconds from the car in front, the Following Distance Warning system gives you a visual warning, indicating that you are driving too close to the car in front and that you need to slow down to increase the gap between your car and the car in front. If you get even closer to the car ahead, the system issues you with an auditory tone, warning you that you are dangerously too close to the car ahead and need to pull back.

The Following Distance Warning system uses a microwave radar-based system mounted on the front of the car to detect whether the vehicle is driving too close to the car ahead.

## **Lane Departure Warning and Fatigue Warning Systems**

Special technologies have been developed that are capable of detecting if you are about to drive off the road – for example, because you are falling asleep – and warn you early enough to give you enough time to react. These are known as Lane Departure Warning systems.

These systems usually rely on video cameras mounted at the front of the vehicle that take continuous video footage of the road ahead, particularly of the lines on either side of the road. A computer in the vehicle constantly analyses the video footage and issues a warning if it looks like the car is drifting out of its lane. The warning is usually an audio warning and it normally sounds like the rumbling sound you hear when you drive over a rumble strip on the edge of a freeway.

Other special technologies have also been developed that detect if you are showing signs of falling asleep at the wheel of the car and issue a warning to wake you up. These are known more generally as Fatigue Warning Systems.

People behave in predictable ways when they become fatigued – their steering wheel movements become more erratic; they blink more slowly; they close their eyes for longer; they relax their grip on the steering wheel; and so on. Fatigue warning systems monitor these vital signs using video cameras and other sensing devices. If they detect that a person is becoming fatigued, they usually sound audio warnings. Some systems also release refreshing citrus fragrances – and some even make the seat and the steering wheel vibrate.

## **Seatbelt Reminder Warning/Interlock System**

Special technologies have been developed that warn you if you or one of your passengers is not wearing their seatbelt.

Pretend that you start to drive off in your car and you or one of your passengers has forgotten to put their seatbelt on. As you start moving, a visual icon depicting a person wearing their seatbelt flashes on a display screen mounted on the dashboard. As you reach 10 km/h, an auditory tone is given warning you to buckle up. This tone and the flashing icon continue until you or your passenger buckles up.

Now pretend that you have just gotten into your car and you don't put your seatbelt on. You try to turn on the ignition, but the car won't start. You put on your seatbelt and try again. This

time the car starts up. This more stubborn version of the seatbelt reminder system is called a seatbelt interlock system.

Both the seatbelt reminder and interlock systems contain seatbelt buckle and weight sensors in the car seats. These detect whether there is a person sitting in the seat and can determine whether they have their seatbelt buckled. If they haven't, the system issues the reminder warnings, or in the case of the interlock, sends a message to the ignition preventing it from starting until everyone in the car has buckled up.

## **Electronic Licensing System**

Pretend that you hop into a car and drive it away even though you are not licensed to drive a car.

Nowadays, there is really nothing to stop a person from engaging in unlicensed driving. All they have to do is hope that, while they are driving, they don't get pulled over by a police officer and asked to produce their licence.

But let's pretend that cars will be different in the future. Pretend that instead of using a key to start a car, you have to use a smart card that looks like a credit card. In the car of the future you insert the smart card into a small slot in the dashboard of the car – just like inserting your credit card into an ATM to withdraw money.

The smart card contains personal information about you like your name, your age, whether you are a learner, a P-plater or a full licence holder; and so on. It might also contain information about how many demerit points you have accumulated. When you insert the card, the on-board computer reads the information on the card – and if the computer decides that you are licensed to drive the car – the car will automatically start. If not, the car will not start.

Smart cards like this are known as electronic licenses and the technology already exists to enable them to be used as car ignition keys.

## **Alcohol Sniffer/Interlock/Drink Driving Performance Test**

Pretend that you hop into your car after you have had a heavy drinking session with your mates at a nightclub. You are by yourself.

When you hop into the car, there is a special breathalyser unit, called a "sniffer", which you cannot see. You start the car and drive off.

As you breathe, the sniffer sensor silently analyses your breath to determine if there is alcohol in it. If alcohol is detected on your breath, a voice tells you to take a drink driving performance test before you start the car. A road scene appears on a screen mounted on the dashboard. Your task is to stay on the winding road while keeping to the correct speed limit. You use the steering wheel to steer around the road scene and the accelerator to control your speed. You take the test, which lasts about 1 minute. At the end you are informed that either you have failed the test and are advised not to drive the car, or that, even though you have had a couple of drinks, you are okay to drive.

This system is called a drink driving performance test and is designed to detect whether your driving is impaired by alcohol. This system requires you to take the test a few times when you are sober so that it can determine how well you drive when you are sober. It then compares your performance after drinking alcohol with your sober driving performance and determines if you are in a position to drive safely.

Another version of this system is called an Alcohol Sniffer system. Pretend that you have just gotten into the car after drinking. The sniffer system in the car detects alcohol on your breath and a voice message from the car tells you to blow into a special breathalyser unit in the car just like the one the Police use for random breath testing.

If your alcohol reading is over the legal limit after you take the breath test, a voice message tells you that you have got 2 minutes to pull over and park the car before the engine stops.

Now pretend again that you hop into a car after you have had a heavy drinking session with your mates at a nightclub. You are by yourself. The car is more stubborn this time. When you try to start the engine, it won't start. A voice message from the car tells you to blow into a special breathalyser unit located in the car which is a bit like the one the Police use for random breath testing. If your alcohol reading is over the legal limit, the car won't start.

This, more stubborn, version of the technology is called an alcohol interlock and it already exists.

# Appendix F. FOCUS GROUP QUESTIONNAIRE

## Focus Group Questionnaire – Summary of Results

The purpose of the focus group questionnaire was to obtain information regarding the participants' demographic details, including details about their occupation and level of education, their driving experience and their experience with and use of in-vehicle ITS and other technologies (e.g., DVD's). In order to explore any differences between the rural and metropolitan participants, the results of the questionnaire will be reported separately for Sydney and Wagga Wagga.

### Occupation, Work Type and Level of Education

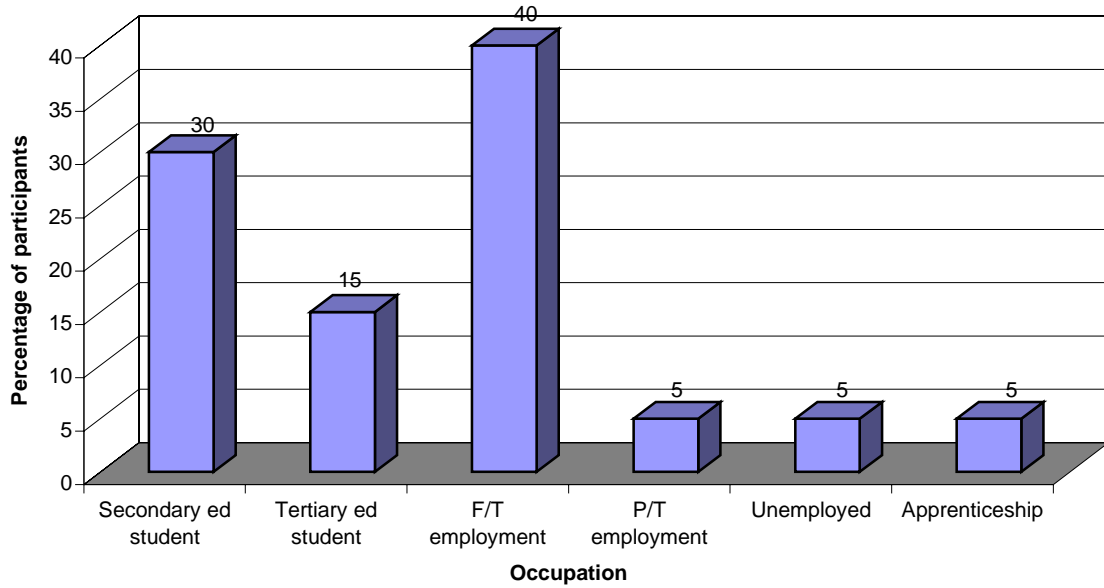
As part of the questionnaire, participants were asked two questions regarding their current occupation and one question about the highest level of education they have completed. These three questions were also used in the telephone survey in order to obtain information on the socio-economic spread of the survey respondents.

#### Wagga Wagga - occupation

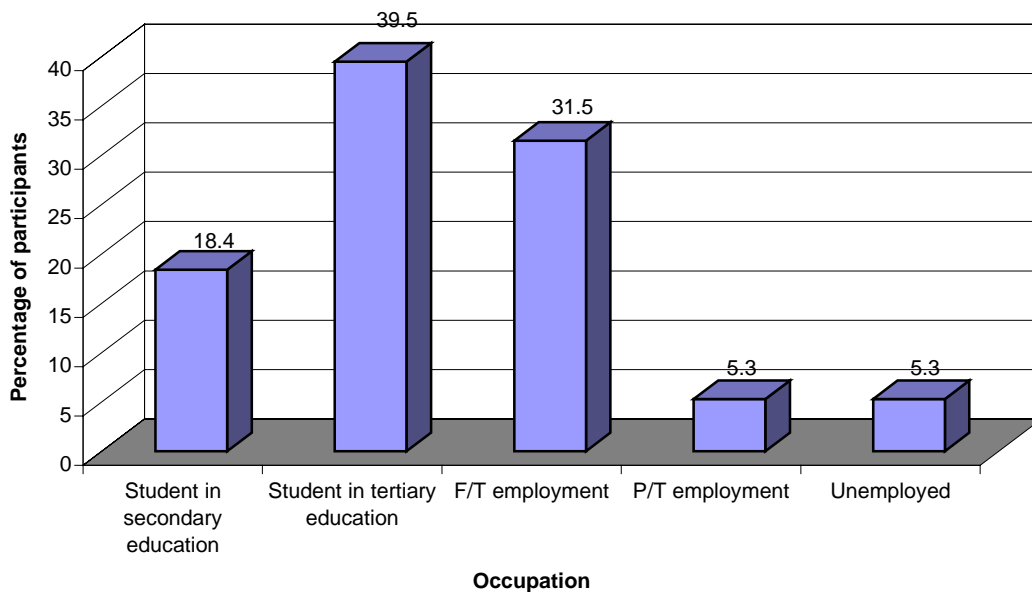
As illustrated in Figure F.1, 40% of the Wagga Wagga participants were in full time employment. Thirty percent of the participants were secondary school students and 15% were tertiary education students. An equal number of participants (5%) were in part-time employment, were unemployed or were completing an apprenticeship. It is important to note that the distribution of focus group participants across the occupation categories was very similar to that found for the telephone survey respondents.

#### Sydney - occupation

Figure F.2 displays the percentage of Sydney focus group participants as a function of occupation. As illustrated, 39.5% of participants were tertiary education students, 31.5% were in full time employment and 18.4% were secondary education students. The same proportion of participants (5.3%) were in part time employment or were unemployed. These figures are similar to the Wagga Wagga participants, however, a higher proportion of Sydney participants were in tertiary education and none of the Sydney participants were completing an apprenticeship. As a professional recruitment company recruited the Sydney participants, the composition of the telephone survey respondents is unknown and therefore cannot be compared to the composition of the focus group participants.



**Figure F.1.** Percentage of Wagga Wagga focus group participants as a function of occupation.



**Figure F.2.** Percentage of Sydney focus group participants as a function of occupation.

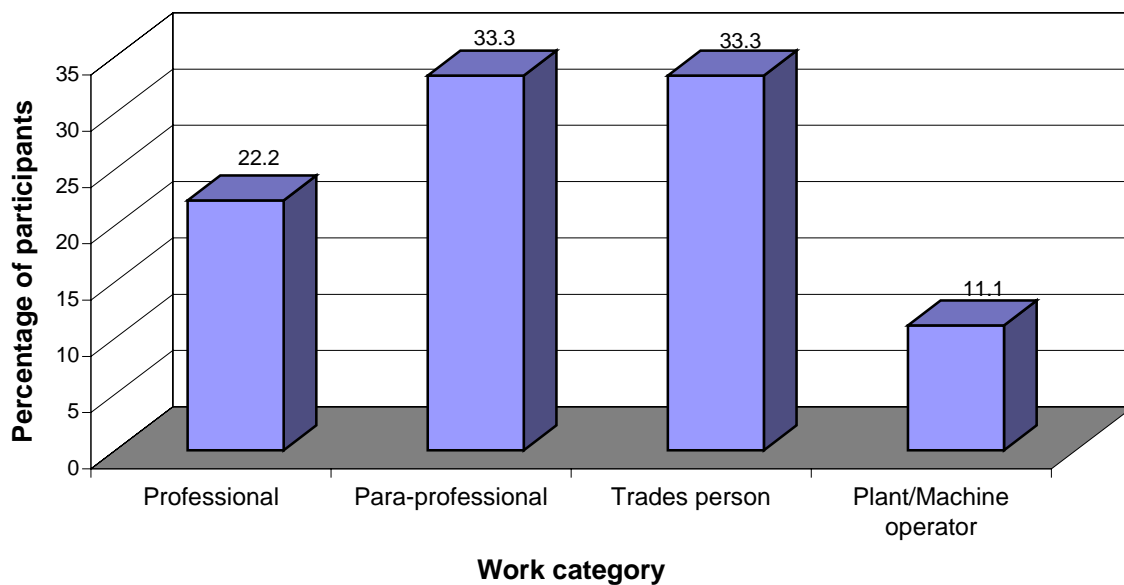
### Wagga Wagga – Work Type

Participants who indicated that they were in full or part time employment were asked to specify their type of work. These responses were then coded using the same coding system used for the telephone survey. As displayed in Figure F.3, the same proportion of focus group participants (33.3%) indicated that they were a tradesperson or worked in a para-professional position, such as a computer programmer or a nursing aide. A smaller number of participants

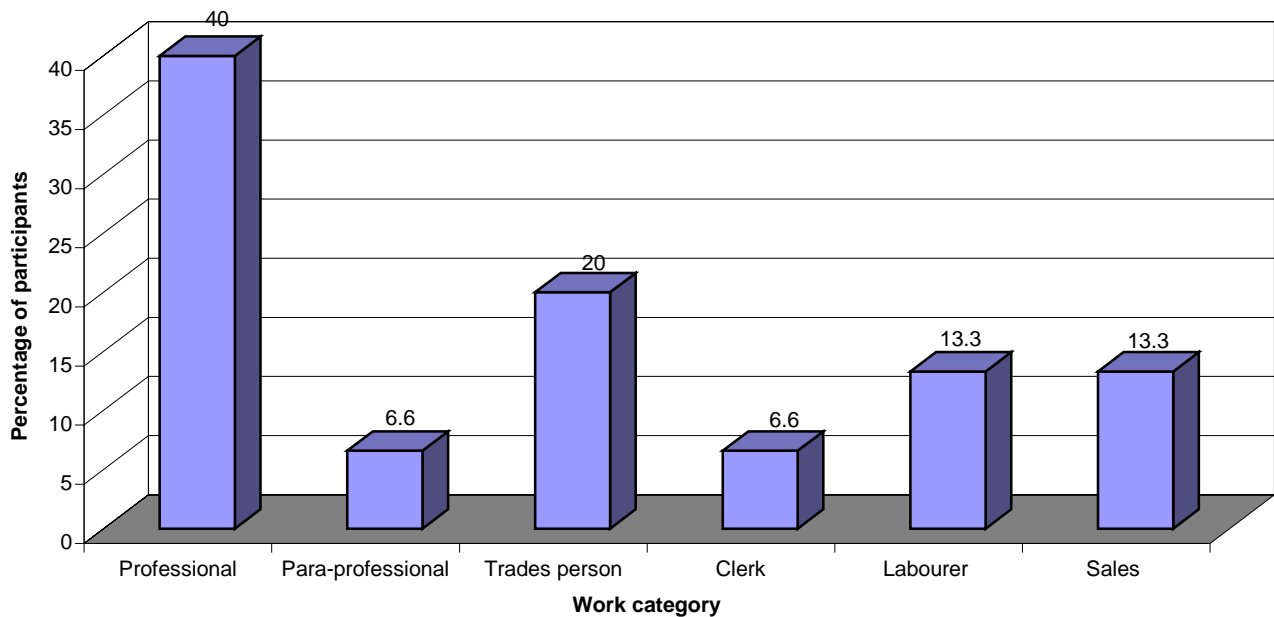
were in professional positions (22.2%) and 11.1% of the participants indicated that they were a plant/machine operator. Compared to the telephone survey respondents, the focus group participants were employed in a smaller range of work types.

### Sydney – Work Type

Figure F.4 displays the percentage of Sydney focus group participants as a function of work type. As shown, the Sydney participants were involved in a wider range of work types than the Wagga Wagga participants and a greater proportion of the Sydney participants (40%) were in a professional position, such as an accountant or a teacher. Twenty percent of participants indicated that they were a tradesperson. A smaller proportion of participants indicated that they were a labourer (13.3%) or in a sales position (13.3%). The remainder of the sample was equally divided between para-professional positions (6.6%) and clerks (6.6%).



**Figure F.3.** Percentage of Wagga Wagga participants as a function of work type.



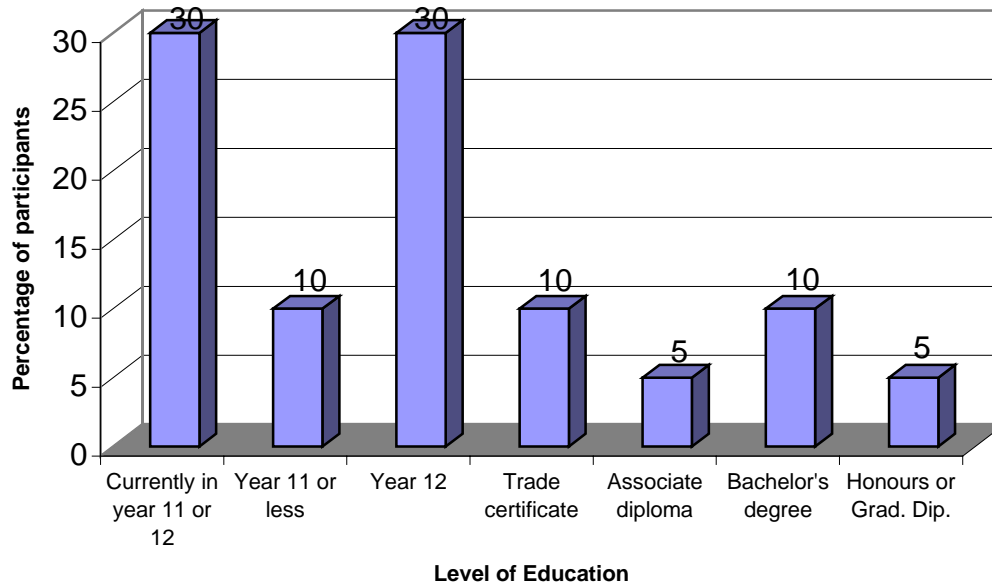
**Figure F.4.** Percentage of Sydney focus group participants as a function of work type.

### Wagga Wagga – Level of Education

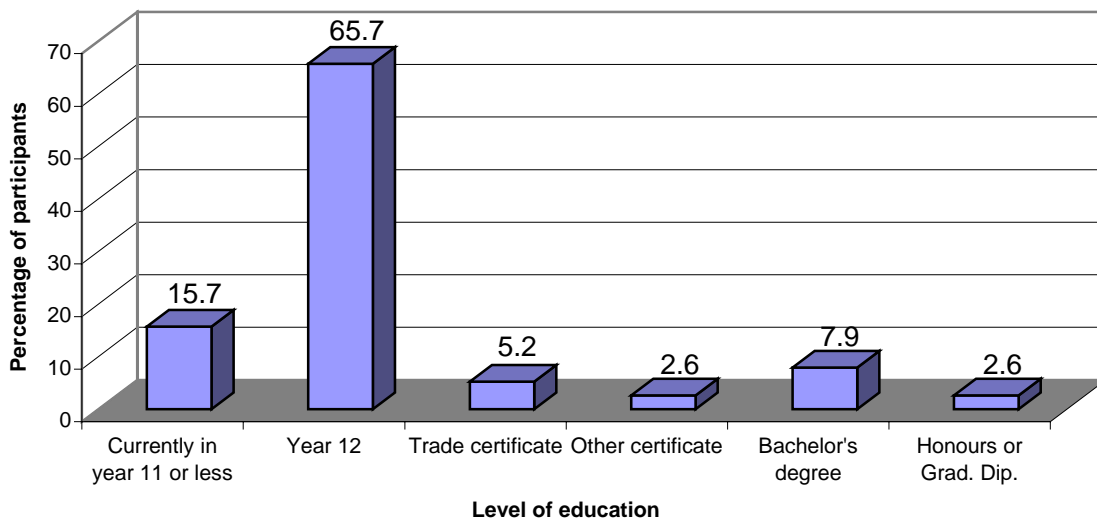
The focus group participants were also asked to indicate the highest level of education they had completed at present. As shown in Figure F.5, 30% of the Wagga Wagga participants indicated that they were currently completing years 11 or 12 and 30% reported that they had completed year 12. The same proportion of participants (10%) indicated that they had completed year 11 or less, a trade certificate, or a Bachelor’s degree. The remaining participants reported that they had completed an Associate Diploma (5%) or an Honours year/Graduate Diploma (5%). Importantly, the distribution of focus group participants in terms of education level was similar to that of the telephone survey respondents, with the only notable difference being that a greater proportion of the focus group participants were still completing years 11 or 12.

### Sydney – Level of Education

The percentage of Sydney focus group participants as a function of education level is displayed in Figure F.6. As illustrated, 65.7% of the participants had completed year 12, which is more than double the proportion of Wagga Wagga participants who had completed year 12. Only 15.7% of the Sydney participants were still completing years 11 or 12, compared with 30% of the Wagga Wagga participants. A similar proportion of the Sydney participants had completed a trade certificate (5.2%) or a Bachelor’s degree (7.9%). Of the remaining sample, 2.6% indicated that they had completed some “other” type of certificate and 2.6% had completed Honours or a Graduate Diploma.



**Figure F.5.** Percentage of Wagga Wagga participants as a function of education level.



**Figure F.6.** Percentage of Sydney participants as a function of education level.

## Use of In-vehicle and Other Technologies

One section of the questionnaire focused on obtaining information about the participants' experience with various in-vehicle technologies as well as to several commonly available technologies, such as mobile phones and DVD players. The purpose of this section was to determine if there were any differences across focus groups with regard to participants' experience with and use of technologies, as people who are more likely to purchase and use new technologies may have more positive attitudes towards the in-vehicle technologies

discussed in the focus groups (Regan, Mitsopoulos, Haworth et al., 2002). It was important to therefore, identify any differences that may exist, as these may influence the interpretation of the focus group findings.

## Wagga Wagga – Purchase Decision

First, participants were asked to specify the factors which influenced their decision to purchase a car. Responses to this question were recorded on a 5-point scale, ranging from “Very Important” to “Very Unimportant”. As shown in Table F.1, several factors were listed as important in influencing this decision including, price, reliability and safety features. While the responses were mixed across the Wagga Wagga groups, all were in agreement that price was the most important factor and that a CD player was the least influential factor in their decision.

**Table F.1.** Mean (and standard deviation) responses to each car purchase decision as a function of Wagga Wagga focus group, where 1 = very important and 5 = very unimportant.

Purchase decision	Focus Group			
	Group 1	Group 2	Group 3	Group 4
<i>Price</i>	1.14 (0.38)	1.75 (0.96)	1.80 (0.84)	1.75 (0.96)
<i>Manufacturer</i>	2.57 (1.13)	2.25 (0.96)	3.20 (1.50)	1.50 (0.58)
<i>Vehicle Type</i>	2.43 (0.98)	1.50 (0.58)	2.20 (0.84)	1.25 (0.50)
<i>Colour</i>	2.57 (0.98)	3.00 (0.82)	2.40 (1.14)	2.25 (0.96)
<i>Vehicle Age</i>	1.86 (0.69)	1.75 (0.96)	1.80 (0.84)	2.75 (0.50)
<i>Vehicle Size</i>	2.00 (0.58)	2.75 (0.96)	1.80 (0.84)	2.50 (0.58)
<i>Engine Capacity</i>	2.14 (0.69)	2.00 (1.41)	2.80 (0.84)	2.00 (0.00)
<i>Power</i>	2.14 (0.69)	2.00 (1.41)	3.20 (1.10)	1.75 (0.50)
<i>Fuel Economy</i>	1.43 (0.79)	2.75 (1.71)	1.80 (0.45)	2.50 (1.00)
<i>Reliability</i>	1.29 (0.49)	2.00 (1.41)	1.00 (0.00)	1.50 (0.58)
<i>Air Conditioning</i>	1.86 (0.69)	3.00 (1.41)	1.80 (1.30)	2.00 (0.82)
<i>CD Player</i>	3.14 (1.46)	3.25 (1.26)	3.00 (1.87)	2.25 (1.26)
<i>Safety Features</i>	1.86 (1.07)	1.75 (0.96)	1.40 (0.55)	2.25 (0.96)

Note. Group 1 = males 17-25 years (Alcohol Sniffer, Interlock & Performance Test); Group 2 = males 17-25 years (Seat Belt Reminder & Electronic Licence); Group 3 = males and females 17-20 years (Forward Collision Warning, Following Distance Warning, Lane Departure Warning & Fatigue Warning); Group 4 = males 17-25 years (ISA).

## Sydney – Purchase Decision

Table F.2 displays the Sydney focus group participants’ responses to the factors that would influence their decision to purchase a car. Similar to the Wagga Wagga participants, the Sydney participants indicated that price was the most important factor, followed by reliability and fuel economy. However, the Sydney participants felt that the colour of the vehicle was the factor that would be least influential in their purchase decision.

**Table F.2.** Mean (and standard deviation) responses to each car purchase decision as a function of Sydney focus group, where 1 = very important and 5 = very unimportant.

Purchase decision	Focus Group			
	Group 1	Group 2	Group 3	Group 4
<i>Price</i>	1.45 (0.93)	1.13 (0.35)	1.78 (0.67)	1.40 (0.70)
<i>Manufacturer</i>	2.18 (0.40)	2.38 (0.74)	1.78 (0.44)	2.50 (0.53)
<i>Vehicle Type</i>	1.82 (0.40)	1.75 (0.46)	2.11 (0.60)	2.20 (1.14)
<i>Colour</i>	3.18 (0.75)	2.88 (0.83)	2.56 (1.13)	3.30 (1.57)
<i>Vehicle Age</i>	2.09 (0.83)	2.50 (0.93)	1.78 (0.67)	2.40 (0.84)
<i>Vehicle Size</i>	2.18 (0.75)	2.25 (0.89)	1.89 (0.78)	2.50 (1.08)
<i>Engine Capacity</i>	2.91 (0.54)	2.38 (0.74)	2.00 (0.50)	2.70 (1.16)
<i>Power</i>	2.73 (0.65)	2.25 (0.71)	2.22 (0.83)	2.60 (1.17)
<i>Fuel Economy</i>	1.91 (0.70)	2.00 (0.93)	2.00 (1.00)	1.90 (0.74)
<i>Reliability</i>	1.27 (0.47)	1.63 (0.52)	2.78 (4.24)	1.50 (0.53)
<i>Air Conditioning</i>	3.36 (1.57)	1.75 (0.89)	2.00 (1.00)	2.40 (1.17)
<i>CD Player</i>	3.36 (1.50)	2.75 (0.89)	2.11 (0.78)	2.90 (1.37)
<i>Safety Features</i>	1.91 (1.04)	2.38 (1.19)	1.89 (0.60)	2.40 (0.97)

Note. Group 1 = males 17-25 years (Alcohol Sniffer, Interlock & Performance Test); Group 2 = males 17-25 years (Seat Belt Reminder & Electronic Licence); Group 3 = males and females 17-20 years (Forward Collision Warning, Following Distance Warning, Lane Departure Warning & Fatigue Warning ); Group 4 = males 17-25 years (ISA).

### Wagga Wagga – Safety Features

Those participants who indicated that safety features was an important or very important factor influencing their purchase decision were asked to indicate the safety features that they would most likely seek when purchasing a car. Table F.3 displays the number of Wagga Wagga participants in each focus group who indicated that they would seek each feature. As shown, ABS brakes were the most sought after feature by participants in each group, followed by driver and passenger airbags. Across all groups the least sought after feature were the child restraint anchorage points.

**Table F.3.** Number of Wagga Wagga participants as a function of safety feature and focus group.

Safety Features	Focus Group			
	Group 1 (n=6)	Group 2 (n=3)	Group 3 (n=5)	Group 4 (n=3)
<i>Driver side airbag</i>	3	1	2	2
<i>Driver and passenger airbags</i>	4	2	4	0
<i>Side airbags</i>	0	1	3	0
<i>ABS brakes</i>	6	3	4	3
<i>Child restraint anchorage points</i>	2	1	0	0
<i>Crash test results/safety ratings</i>	4	0	3	1

Note. Group 1 = males 17-25 years (Alcohol Sniffer, Interlock & Performance Test); Group 2 = males 17-25 years (Seat Belt Reminder & Electronic Licence); Group 3 = males and females 17-20 years (Forward Collision Warning, Following Distance Warning, Lane Departure Warning & Fatigue Warning); Group 4 = males 17-25 years (ISA).

## Sydney – Safety Features

As displayed in Table F.4, the responses of the Sydney focus group participants regarding the safety features they would most likely seek when purchasing a car were very similar to the Wagga Wagga participants. All groups agreed that ABS brakes were the feature they would most likely seek when purchasing a car, followed by driver and passenger airbags. As with the Wagga Wagga participants, across all groups the least sought after feature were the child restraint anchorage points.

**Table F.4.** Number of Sydney participants as a function of safety feature and focus group.

Safety Features	Focus Group			
	Group 1 (n=8)	Group 2 (n=7)	Group 3 (n=9)	Group 4 (n=5)
<i>Driver side airbag</i>	5	2	2	1
<i>Driver and passenger airbags</i>	7	5	8	4
<i>Side airbags</i>	4	0	2	0
<i>ABS brakes</i>	8	6	8	4
<i>Child restraint anchorage points</i>	2	2	0	0
<i>Crash test results/safety ratings</i>	4	1	3	3

Note. Group 1 = males 17-25 years (Alcohol Sniffer, Interlock & Performance Test); Group 2 = males 17-25 years (Seat Belt Reminder & Electronic Licence); Group 3 = males and females 17-20 years (Forward Collision Warning, Following Distance Warning, Lane Departure Warning & Fatigue Warning); Group 4 = males 17-25 years (ISA).

## Wagga Wagga – Use of In-vehicle Technologies

Participants were asked whether they had driven a car equipped with any of the following ITS technologies: Route Navigation, Cruise Control, Reverse Parking Aid, Manual Speed Alert or Adaptive Cruise Control. As displayed in Table F.5, at least some of the Wagga Wagga participants in every group had driven a car equipped with Cruise Control and a Manual Speed Alert system. The Route Navigation and Adaptive Cruise Control were the systems least used by participants, with only two participants having used these systems across all four focus groups.

**Table F.5.** Number (and percentage) of Wagga Wagga focus group participants as a function of ITS technology and focus group.

Technologies	Focus Group			
	Group 1	Group 2	Group 3	Group 4
<i>Navigation</i>	0 (0%)	1 (25%)	1 (20%)	0 (0%)
<i>Cruise control</i>	4 (57%)	3 (75%)	5 (100%)	3 (75%)
<i>Reverse parking</i>	1 (14%)	2 (50%)	0 (0%)	1 (25%)
<i>Manual speed alert</i>	3 (43%)	3 (75%)	2 (50%)	2 (50%)
<i>ACC</i>	0 (0%)	0 (0%)	1 (25%)	1 (25%)

Note. Group 1 = males 17-25 years (Alcohol Sniffer, Interlock & Performance Test); Group 2 = males 17-25 years (Seat Belt Reminder & Electronic Licence); Group 3 = males and females 17-20 years (Forward Collision Warning, Following Distance Warning, Lane Departure Warning & Fatigue Warning); Group 4 = males 17-25 years (ISA).

## Sydney – Use of In-vehicle Technologies

The number of Sydney participants from each focus group who had driven a car equipped with each technology is displayed in Table F.6. Similar to the Wagga Wagga participants, the majority of the Sydney participants in each group had driven a car equipped with Cruise Control. The Manual Speed Alert was the next most commonly used technology with participants in every focus group except Group 2 having used this system. None of the Sydney participants had driven a car equipped with Adaptive Cruise Control.

**Table F.6.** Number (and percentage) of Sydney focus group participants as a function of ITS technology and focus group.

Technologies	Focus Group			
	Group 1	Group 2	Group 3	Group 4
<i>Navigation</i>	0 (0%)	0 (0%)	1 (11.1%)	1 (10.0%)
<i>Cruise control</i>	5 (54.5%)	6 (25.0%)	6 (66.6%)	6 (60.0%)
<i>Reverse parking</i>	1 (9.09%)	3 (37.5%)	0 (0%)	0 (0%)
<i>Manual speed alert</i>	5 (54.5%)	0 (0%)	1 (11.1%)	3 (30.0%)
<i>ACC</i>	0 (0%)	0 (0%)	0 (0%)	0 (0%)

Note. Group 1 = males 17-25 years (Alcohol Sniffer, Interlock & Performance Test); Group 2 = males 17-25 years (Seat Belt Reminder & Electronic Licence); Group 3 = males and females 17-20 years (Forward Collision Warning, Following Distance Warning, Lane Departure Warning & Fatigue Warning); Group 4 = males 17-25 years (ISA).

## Wagga Wagga – Facilities

Participants were asked how often they accessed the following technology-based facilities: email, internet, phone banking, ATM and Cable TV. Responses were recorded on a 6-point scale, where 1 = several times a day and 6 = never. As shown in Table F.7, email was the most frequently used facility, with focus group participants accessing it on average once a day. Phone banking and cable TV were the least accessed facilities with participants accessing these on average less than once a week.

**Table F.7.** Mean (and standard deviation) responses to each facility as a function of Wagga Wagga focus group, where 1 = several times a day and 6 = never.

Facilities	Focus Group			
	Group 1	Group 2	Group 3	Group 4
<i>Email</i>	2.45 (0.98)	2.50 (0.58)	2.60 (2.07)	2.25 (2.50)
<i>Internet</i>	2.14 (0.69)	3.25 (1.26)	2.60 (2.07)	2.25 (1.89)
<i>Phone Bank</i>	5.43 (0.79)	5.00 (1.15)	5.80 (0.45)	5.00 (1.15)
<i>ATM</i>	4.29 (0.95)	4.00 (1.41)	4.20 (0.45)	3.25 (0.50)
<i>Cable</i>	5.71 (0.49)	4.75 (1.50)	5.20 (1.30)	4.00 (1.63)

Note. Group 1 = males 17-25 years (Alcohol Sniffer, Interlock & Performance Test); Group 2 = males 17-25 years (Seat Belt Reminder & Electronic Licence); Group 3 = males and females 17-20 years (Forward Collision Warning, Following Distance Warning, Lane Departure Warning & Fatigue Warning); Group 4 = males 17-25 years (ISA).

## Sydney – Facilities

As displayed in Table F.8, the facilities most frequently accessed by the Sydney participants differed slightly from the Wagga Wagga participants. The internet was the most commonly accessed facility, with participants accessing it on average once a day. The least commonly used facility was phone banking, with participants accessing this facility less than once a week on average.

**Table F.8.** Mean (and standard deviation) responses to each facility as a function of Sydney focus group, where 1 = several times a day and 6 = never.

Facilities	Focus Group			
	Group 1	Group 2	Group 3	Group 4
<i>Email</i>	2.27 (1.01)	1.38 (0.74)	2.89 (1.83)	2.10 (1.60)
<i>Internet</i>	1.73 (0.79)	1.25 (0.46)	2.89 (1.83)	1.60 (1.26)
<i>Phone Bank</i>	5.27 (1.01)	4.75 (1.04)	5.33 (1.00)	5.60 (0.52)
<i>ATM</i>	3.64 (1.12)	3.88 (0.83)	3.56 (0.88)	4.00 (0.82)
<i>Cable</i>	3.00 (1.95)	3.38 (2.00)	4.22 (2.11)	3.30 (2.16)

Note. Group 1 = males 17-25 years (Alcohol Sniffer, Interlock & Performance Test); Group 2 = males 17-25 years (Seat Belt Reminder & Electronic Licence); Group 3 = males and females 17-20 years (Forward Collision Warning, Following Distance Warning, Lane Departure Warning & Fatigue Warning); Group 4 = males 17-25 years (ISA).

## Wagga Wagga – Own Technologies

Finally, participants were asked to indicate whether they own certain technologies. These technologies and the number of Wagga Wagga participants who indicated that they owned them are displayed in Table F.9. As illustrated, the technologies most commonly owned by participants were mobile phones and DVD players. The technology that was least commonly owned by the participants was the PDA (hand held computer).

**Table F.9.** Number (and percentage) of Wagga Wagga participants in each focus group who own each technology.

Technology	Focus Group			
	Group 1	Group 2	Group 3	Group 4
<i>PC</i>	5 (71%)	1 (25%)	3 (60%)	1 (25%)
<i>Mobile phone</i>	6 (89%)	2 (50%)	5 (100%)	4 (100%)
<i>CD writer/Zip drive</i>	4 (57%)	1 (25%)	2 (40%)	0 (0%)
<i>PDA (e.g. Compaq)</i>	0 (0%)	0 (0%)	1 (20%)	0 (0%)
<i>Play Station</i>	3 (43%)	3 (75%)	1 (20%)	1 (25%)
<i>WAP enabled mobile phone</i>	2 (29%)	1 (25%)	1 (20%)	1 (25%)
<i>Digital Camera</i>	1 (14%)	1 (25%)	1 (20%)	1 (25%)
<i>DVD player</i>	6 (89%)	3 (75%)	1 (20%)	4 (100%)

Note. Group 1 = males 17-25 years (Alcohol Sniffer, Interlock & Performance Test); Group 2 = males 17-25 years (Seat Belt Reminder & Electronic Licence); Group 3 = males and females 17-20 years (Forward Collision Warning, Following Distance Warning, Lane Departure Warning & Fatigue Warning); Group 4 = males 17-25 years (ISA).

## Sydney – Own Technologies

As shown in Table F.10, the technology most commonly owned by the Sydney participants was a mobile phone, followed by a personal computer. As with the Wagga Wagga participants, the technology that was least commonly owned by the Sydney participants was the PDA (hand held computer).

**Table F.10.** Number (and percentage) of Sydney participants in each focus group who own each technology.

Technology	Focus Group			
	Group 1	Group 2	Group 3	Group 4
<i>PC</i>	7 (63.6%)	7 (87.5%)	6 (66.7%)	8 (80.0%)
<i>Mobile phone</i>	10 (90.9%)	8 (100%)	8 (88.9%)	10 (100%)
<i>CD writer/Zip drive</i>	5 (45.5%)	5 (62.5%)	5 (55.6%)	9 (90.0%)
<i>PDA (e.g. Compaq)</i>	0 (0%)	1 (12.5%)	1 (11.1%)	1 (10.0%)
<i>Play Station</i>	3 (27.3%)	5 (62.5%)	7 (77.8%)	6 (60.0%)
<i>WAP enabled mobile phone</i>	2 (18.2%)	3 (37.5%)	2 (22.2%)	1 (10.0%)
<i>Digital Camera</i>	4 (36.4%)	3 (37.5%)	2 (22.2%)	4 (40.0%)
<i>DVD player</i>	4 (36.4%)	6 (75.0%)	5 (55.6%)	5 (50.0%)

Note. Group 1 = males 17-25 years (Alcohol Sniffer, Interlock & Performance Test); Group 2 = males 17-25 years (Seat Belt Reminder & Electronic Licence); Group 3 = males and females 17-20 years (Forward Collision Warning, Following Distance Warning, Lane Departure Warning & Fatigue Warning); Group 4 = males 17-25 years (ISA).

## Driving Experience and Driving Exposure

Another section of the questionnaire focused on participants' driving experience and exposure. More specifically, this section asked several questions about the participants' licence type, age when they first obtained their licence, how many years they have been driving and how many hours, on average, they spend driving for work and private purposes.

### Wagga Wagga – Driving Experience

Table F.11 displays information on the Wagga Wagga participants' driving experience in terms of their licence type, age when they obtained their probationary licence and their driving experience. As illustrated, almost half the participants were still on their probationary licence, which is not surprising given that many of the drivers were under 20 years of age. The average age at which drivers had obtained their probationary licence was similar across the groups. However, in groups 1 and 4, the age at which some participants had obtained their licence was lower than the age at which a probationary licence can be obtained in NSW (17 years). Although it is not certain, it is assumed that these participants obtained their probationary licence in another state or in another country (e.g., New Zealand) or they misread the question and provided the age at which they obtained their learner's permit. The number of years participants had been driving varied with age. Participants in focus group 3, which comprised 17 to 20 year old males and females, had been driving for the least amount of time, whereas focus groups which had a higher proportion of 21 to 25 year olds (e.g., focus group 4) had been driving for around 5 years longer.

**Table F.11.** Wagga Wagga focus group participants' driving experience details as a function of focus group.

Driving experience measure	Focus Group			
	Group 1	Group 2	Group 3	Group 4
<i>Licence type</i>				
Probationary	1	3	4	1
Full	6	1	1	3
<i>Age obtained licence (years)</i>				
Mean	16.57	17	17	16.25
SD	0.53	0	0	0.96
<i>Driving experience (years)</i>				
Mean	4.43	1.25	0.8	5.75
SD	2.51	0.96	0.83	1.89

*Note.* Group 1 = males 17-25 years (Alcohol Sniffer, Interlock & Performance Test); Group 2 = males 17-25 years (Seat Belt Reminder & Electronic Licence); Group 3 = males and females 17-20 years (Forward Collision Warning, Following Distance Warning, Lane Departure Warning & Fatigue Warning); Group 4 = males 17-25 years (ISA).

### Sydney – Driving Experience

The Sydney focus group participants' driving experience details are displayed in Table F.12. A greater proportion of the Sydney participants had obtained their full driver's licence compared to the Wagga Wagga participants. Only in focus group 1 (comprising males and females aged 17 to 20 years), did the majority of participants still have their probationary licence. The average age participants obtained their probationary licence was similar across groups. Several participants indicated that they obtained their probationary licences at age 16. It is assumed that these participants obtained their licence in another state or country, or provided the age at which they obtained their learner's permit. The mean number of years that participants had been driving varied with age, with Group 1, which contained the youngest participants (17 to 20 years) having driven for the least number of years.

**Table F.12.** Sydney focus group participants' driving experience details as a function of focus group.

Driving experience measure	Focus Group			
	Group 1	Group 2	Group 3	Group 4
<i>Licence type</i>				
Probationary	6	1	0	4
Full	5	7	9	6
<i>Age obtained licence (years)</i>				
Mean	17.2	17	17.3	17.7
SD	0.06	0.53	0.71	1.05
<i>Driving experience (years)</i>				
Mean	1.6	4.8	4.9	2.2
SD	1.21	3.15	2.31	1.98

*Note.* Group 1 = males 17-25 years (Alcohol Sniffer, Interlock & Performance Test); Group 2 = males 17-25 years (Seat Belt Reminder & Electronic Licence); Group 3 = males and females 17-20 years (Forward Collision Warning, Following Distance Warning, Lane Departure Warning & Fatigue Warning); Group 4 = males 17-25 years (ISA).

## Wagga Wagga – Driving Exposure

Participants were asked to specify the number of hours they spend driving each week for work purposes and for private purposes in order to gain information on their driving exposure. As can be seen in Table F.13, the amount of hours that the Wagga Wagga participants spent driving for work purposes varied substantially across the focus groups, with focus group 1 (comprising males aged 17 to 25 years) driving only 0.71 hours per week on average, while focus group 4 (comprising males aged 17 to 25 years) spent an average of 6.38 hours per week driving for work purposes. This difference is not surprising given that the majority of participants in Group 1 were either secondary or tertiary students or unemployed, while all the participants in Group 4 were in full time employment. There was also variation across focus groups in the number of hours participants spent driving for private purposes. Group 1 (comprising males aged 17 to 25 years) spent the greatest number of hours each week driving for work purposes (8.42 hours), while Group 2 (comprising males aged 17 to 25 years) spent the least amount of time (3.75 hours). All groups spent more time driving for private purposes each week than for work purposes.

**Table F.13.** Number of hours Wagga Wagga participants spent driving for work and private purposes.

Driving exposure	Focus Group			
	Group 1	Group 2	Group 3	Group 4
<i>Work driving exposure (hours)</i>				
Mean	0.71	3.5	2.70	6.38
Standard Deviation	0.75	3.11	5.24	6.57
<i>Private driving exposure (hours)</i>				
Mean	8.42	3.75	5.80	7.50
Standard Deviation	7.11	3.09	4.15	5.80

*Note.* Group 1 = males 17-25 years (Alcohol Sniffer, Interlock & Performance Test); Group 2 = males 17-25 years (Seat Belt Reminder & Electronic Licence); Group 3 = males and females 17-20 years (Forward Collision Warning, Following Distance Warning, Lane Departure Warning & Fatigue Warning); Group 4 = males 17-25 years (ISA).

## Sydney – Driving Exposure

The number of hours Sydney participants spent driving for work and private purposes each week is displayed in Table F.14. Similar to the Wagga Wagga participants, the number of hours Sydney participants spent driving for work purposes varied across focus groups. Focus group 4 (comprising males aged 17 to 25 years) spent 1.10 hours on average driving for work purposes each week, while Group 3 (comprising males aged 17 to 25 years) spent an average of 7.11 hours per week driving for work purposes. Again, this difference is not surprising given that the majority of participants in Group 4 were either secondary or tertiary students or unemployed, while many of the participants in Group 3 were in full time employment. The average number of hours spent each week driving for private purposes also varied across focus groups, with Group 3 again driving the greatest number of hours (14.11 hours) and Group 4 driving the least (7.1 hours). Consistent with the Wagga Wagga participants, the Sydney participants spend a greater number of hours per week driving for private purposes than for work purposes. However, on average, the Sydney participants drive a greater number of hours for private purposes than do the Wagga Wagga participants.

**Table F.14.** Number of hours Sydney participants spent driving for work and private purposes.

Driving exposure	Focus Group			
	Group 1	Group 2	Group 3	Group 4
<i>Work driving exposure (hours)</i>				
Mean	1.81	3.25	7.11	1.10
Standard Deviation	3.06	3.95	3.72	1.73
<i>Private driving exposure (hours)</i>				
Mean	7.73	8.75	14.11	7.1
Standard Deviation	6.56	7.91	12.94	5.17

Note. Group 1 = males 17-25 years (Alcohol Sniffer, Interlock & Performance Test); Group 2 = males 17-25 years (Seat Belt Reminder & Electronic Licence); Group 3 = males and females 17-20 years (Forward Collision Warning, Following Distance Warning, Lane Departure Warning & Fatigue Warning); Group 4 = males 17-25 years (ISA).

## Driving Violations and Crash Record

At present it is unknown to what extent a history of traffic infringements and/or a crash record has on an individual's acceptability of given technologies (Regan, Mitsopoulos, Haworth et al., 2002). It was, therefore, important to obtain information on the participants' history of driving violations and crashes to establish whether there were differences across focus groups in the nature and frequency of traffic violations and crashes.

### Wagga Wagga Participants

Across the four Wagga Wagga focus groups, only one participant, a 22-year-old male, indicated that he had been booked for speeding. This occurred on only one occasion during the past 12 months. This participant was in a group discussing Intelligent Speed Adaptation. One participant, a 20-year-old male, indicated that he had been booked on one occasion within the last 12 months for driving with a Blood Alcohol Concentration (BAC) over the legal limit. This participant was in a group discussing Intelligent Speed Adaptation. Across all four groups, none of the participants indicated that they had been booked in the last 12 months for not wearing their seatbelt, driving outside the conditions of their driver's licence or for tailgating.

A total of two participants indicated that they had been involved in one crash where they were the driver within the last 12 months. Both of these participants were male, aged 18 and 19 years of age. One of the crashes involved the car hitting an emu and the other crash involved the car hitting another vehicle on a bend. In addition, three drivers indicated that they had been involved in a crash as a passenger. All three participants were male, aged 18, 20 and 22 years. Each participant was involved in only one crash in the last 12 months. Two of the crashes were rear-end crashes and the third crash was a head-on crash.

### Sydney Participants

Across the four Sydney focus groups, a total of eight participants indicated that they had been booked for speeding within the last 12 months. Of these participants, seven were male and one was female. Of the males, two were aged 19 years, one was 20 years old, two were 23 years of age, one was 22 years, and two were 25 years of age. These males came from

different focus groups: one participated in the group on Forward Collision Warning, Following Distance Warning, Lane Departure Warning and Fatigue Warning systems; two participated in the Alcohol systems group, three participated in the Intelligent Speed Adaptation group and the remaining two were in the group discussing Seat Belt Reminder systems. The female booked for speeding was 20 years of age and participated in the Forward Collision Warning, Following Distance Warning, Lane Departure Warning and Fatigue Warning discussion. Of these eight participants booked for speeding, seven indicated that they were only booked once, while one, a 23 year old male, indicated that he was booked twice for speeding within the last 12 months.

None of the participants across the four Sydney focus groups indicated that they had been booked with the last 12 months for driving with a BAC above the legal limit, driving without their seatbelt on, driving outside the conditions of their licence or for tailgating.

With regard to crash history, five participants indicated that they had been involved in a crash in the last 12 months where they were the driver. Of these participants, one was female and four were male. The female was 19 years of age, while one male was 19 years, one was 20 years old and two were 21 years of age. Each of the participants were involved in only one crash, four of these were rear-end crashes and one was a sideswipe crash. In addition, six participants indicated that had been involved in a crash within the last 12 months as a passenger. Of these, two were female and four were male. The females were aged 19 and 20 years of age, while the males were aged 17, 19, 22 and 25 years. All participants indicated that they were involved in only one crash as a passenger in the last 12 months and all of these crashes were rear-enders.

Overall, a greater number of the Sydney participants compared to Wagga Wagga participants indicated that they had been booked for speeding in the last 12 months. This may be due to greater police presence and the greater level of speed enforcement in general (e.g., through the use of speed cameras) in metropolitan areas. Also, a greater number of the Sydney participants were involved in crashes, as a driver and as a passenger, compared to the Wagga Wagga participants and the vast majority of these crashes were rear-end crashes. This may be due to the greater amount of traffic in metropolitan areas and the fact that cars in metropolitan areas are made to slow or stop more (e.g. at traffic and pedestrian lights) and thus have more opportunity to run into the back of each other than in rural traffic.

## **Driver Behaviour Questionnaire**

As part of the demographics and driving experience questionnaire, the focus group participants were also administered the 32-item Driver Behaviour Questionnaire (DBQ; Åberg & Rimmö, 1998). The purpose of the DBQ was to establish whether participants' driving style differed across focus groups and between the Sydney and Wagga Wagga participants. It is important to establish whether participants' driving styles differ, as this may affect their acceptability of a given technology (Regan, Mitsopoulos, Haworth et al., 2002).

As discussed earlier, Åberg and Rimmö (1998) propose that four factors underlie unsafe driver behaviour: violations, mistakes, lapses due to inattention and lapses due to inexperience. Provided that the reliability of the items comprising each of these factors is high, it is permissible to use this same factor structure for further analysis of the current study's data. In the present study, the internal consistency of items comprising each factor was acceptable (violations  $\alpha = 0.84$ ; mistakes  $\alpha = 0.73$ ; inattention lapses  $\alpha = 0.72$ ; inexperience lapses  $\alpha = 0.68$ ).

Mean scores were calculated for each of the four DBQ factors for each of the four Sydney and four Wagga Wagga focus groups. These data are displayed in Table F.15; with the Wagga Wagga data displayed in the top half of the table and the Sydney data in the bottom half.

## **Wagga Wagga**

Four one-way ANOVAs were conducted in order to determine if there were any differences between the Wagga Wagga focus groups on the four DBQ factors. In order to control for Type 1 error (stating that the independent variable had an effect when it did not), a Bonferroni correction was applied, thus, the ANOVAs were tested against a significance level of 0.0125. The results of the ANOVAs revealed that the focus groups did not differ significantly on any of the four DBQ factors and therefore, the participants in each focus group were largely equivalent in their driving styles.

## **Sydney**

Four one-way ANOVAs were also conducted to determine if there were any differences between the Sydney focus groups on the four DBQ factors. Again a Bonferroni correction was applied to control for Type 1 error. The results of the ANOVAs revealed that, as with the Wagga Wagga groups, the Sydney focus groups did not differ significantly on any of the four DBQ factors and hence, the participants in each focus group were comparable in their driving styles.

In order to determine if there were differences between the Sydney and Wagga Wagga focus group samples on the four DBQ factors, four independent samples t-tests were conducted. To control for Type 1 error, a Bonferroni correction was again applied, hence, the t-tests were tested against a significance level of 0.0125. The results revealed that the Sydney and Wagga Wagga focus group participants did not differ significantly on the mistakes or lapses due to inexperience factors. The two samples did, however, differ significantly on the violations ( $t(56) = 3.45, p < .0125$ ) and the lapses due to inattention ( $t(56) = 2.79, p = .007$ ) factors, with Sydney participants committing more violations and more lapses due to inattention than the Wagga Wagga participants. One explanation for the Sydney participants committing more violations and lapses due to inattention is that many of the questions for these sub-scales pertain to driving situations that may be experienced more often by metropolitan drivers (e.g., situations at traffic lights and on freeways and parking difficulties) than by rural drivers and, hence, the Sydney drivers scored higher on these two factors due to their greater exposure to the situations described. Alternatively, it is possible that the Sydney participants commit more violations because they may become frustrated by the heavier traffic. It is also possible that they make more lapses due to inattention because they have many more things competing for their attention (e.g., more traffic, pedestrians, traffic lights) and hence they may be less likely to notice altered road signage.

**Table F.15.** Mean factor score as a function of driver behaviour measure and focus group.

Driver behaviour measure	Focus Group			
	Group 1	Group 2	Group 3	Group 4
<i>Wagga Wagga</i>				
Violations	2.7	2.7	1.9	2.8
Mistakes	1.9	2.2	1.4	1.6
Lapses due to inattention	1.8	1.9	1.5	2.0
Lapses due to inexperience	1.8	2.2	1.6	1.6
<i>Sydney</i>				
Violations	3.8	3.6	3.1	3.2
Mistakes	2.3	1.9	2.3	1.9
Lapses due to inattention	2.1	2.2	2.5	2.1
Lapses due to inexperience	2.0	2.0	2.0	1.6

*Note.* Group 1 = males aged 17 to 25 years (Alcohol Sniffer, Interlock & Performance Test); Group 2 = males aged 17 to 25 years (Seat Belt Reminder (& Electronic Licence for the Wagga Wagga groups)); Group 3 = males and females aged 17 to 20 years (Forward Collision Warning, Following Distance Warning, Lane Departure Warning & Fatigue Warning system); Group 4 = males aged 17 to 25 years (Intelligent Speed Adaptation).

## Summary

Overall, the questionnaire results revealed that the participants from both the Sydney and Wagga Wagga groups were employed in a range of occupations, however the Sydney participants were employed in a wider range of occupations compared to the Wagga Wagga participants and in particular, a greater proportion of the Sydney participants were employed in professional positions, such as accountants or teachers. In terms of highest education level completed, more than twice as many Wagga Wagga participants than Sydney participants were still completing years 11 or 12. The proportion of participants who had completed some form of post-secondary education, however, was similar across groups. In terms of the factors influencing their decision to purchase a car, the participants from both groups indicated that cost and reliability were the most important factors influencing their decision and that ABS brakes was the safety feature they would most likely seek when purchasing a vehicle.

In regard to their use of in-vehicle technologies, the majority of both Sydney and Wagga Wagga participants indicated that they had driven a car equipped with Cruise Control, while very few participants had used in-vehicle Route Navigation or Adaptive Cruise Control. The most commonly used technology based facilities were email and the internet and this was similar across groups.

The Sydney and Wagga Wagga focus group samples were similar in terms of their driving experience and exposure, however more Sydney participants had obtained their full driver's licence than Wagga Wagga participants. In addition, more Sydney participants had been booked for speeding and were involved in a greater number of crashes than the Wagga Wagga participants. In terms of driving styles, which were measured by the DBQ, the Sydney participants committed a greater number of violations (e.g., exceeding the speed limit) and lapses due to inattention (e.g., failing to notice signal changes) compared to the Wagga Wagga participants.