



CHAIR IN DIGITAL ECONOMY

THE FUTURE OF COMPULSORY THIRD PARTY
INSURANCE IN QUEENSLAND

PREPARED FOR
MOTOR ACCIDENT INSURANCE COMMISSION
QUEENSLAND GOVERNMENT
MARCH 2016

PART B - SUPPLEMENTARY REPORT

CONTENTS

1.	Introduction	4
1.1.	Report Structure	4
1.2.	Study Method	4
1.3.	Background	4
1.4.	Looking at CTP through a Digital Lens	4
1.5.	Scenario thinking	5
	SNAPSHOT OF the FOUR SCENARIOS - QUEENSLAND IN 2025	6
2.	Expansion Cycles of the Digital Economy and CTP	7
2.1.	Business Economy	7
2.1.1	Connected Vehicles	7
2.1.2	Driverless Vehicles	10
2.1.3	Augmented and Virtual Reality	12
2.1.4	Interlocks	12
2.1.5	Mobile Apps	13
2.1.6	New Pricing Strategies	13
2.1.7	Digital innovation in the insurance sector	14
2.1.8	Big Data	14
2.1.9	Bitcoin and Blockchain	15
2.1.10	3D Bio fabrication Systems	15
2.1.11	Wearables and Quantified Self	16
2.2.	Economy of People	16
2.2.1	Car sharing	16
2.2.2	Ride sharing	17
2.2.3	Peer-to-peer insurance	17
2.3.	Economy of Things	18
2.3.1	Things as Customers or Service Providers	18
2.3.2	Affective Computing	18
2.3.3	Brain Computer Interface	18
3.	External environment trends	19
3.1.	Road trauma statistics	19
3.2.	Driver Behaviour	20
3.3.	Car ownership	21
3.3.1	Perceptions of automated motor vehicles	22
3.4.	Demographic Trends	23
3.4.1	Geographic Distribution	24
3.5.	Medical Trends	25
3.5.1	Application of digital technologies in health	25
3.6.	Health Costs	26
4.	Conclusion	27

CONTENTS continued...

References	28
Glossary	33
Appendix A: Scenarios	34
Scenario 1: “The glass is full” (Hi Tech/Hi Demand) - 2025	34
Scenario 2: “The glass is half full” (Hi Tech/Lo Demand) - 2025	35
Scenario 3: “The glass is half empty” (Lo Tech/Hi Demand) - 2025	36
Scenario 4: “The glass is empty” (Lo Tech/Lo Demand) - 2025	37
Appendix B: QUT Student Survey, December 2015	39

List of acronyms

AEB	Autonomous Emergency Braking
ANCAP	Australasian New Car Assessment Program
BITRE	Bureau of Infrastructure, Transport and Regional Economics
B2T	Business-to-thing
CARRS-Q	Centre for Accident Research and Road Safety - Queensland
CTP	Compulsory Third Party Insurance
ESC	Electronic Stability Control
G2T	Government-to-thing
IOT	Internet of Things
ITS	Intelligent Transportation System
MAIC	Motor Accident Insurance Commission
QUT	Queensland University of Technology
V2I	Vehicle-to-Infrastructure
V2V	Vehicle-to-Vehicle
V2X	Vehicle-to-Anything

1. INTRODUCTION

This supplementary report documents information, evidence and analysis that supports the executive report entitled: Future of Compulsory Third Party Insurance in Queensland, Part A (March 2016).

1.1. REPORT STRUCTURE

In the remainder of section 1, the study method is outlined and the purposes of compulsory third party insurance (shortened to 'CTP' for this report) and Motor Accident Insurance Commission (MAIC) are presented for background purposes.

Section 2 of this report explores the opportunities that digital technologies and solutions offer to reach a desirable outcome, such as reducing road trauma, increasing efficiency in administrative processes and assisting injured persons.

Section 3 provides an overview of external trends that are not necessarily digital in nature, but may increasingly alter the underlying demand and supply variables for the CTP scheme. These trends include changes in driver behaviour, car ownership trends, demographic change and medical advances and health expenditure trends.

Section 4 contains the conclusion.

1.2. STUDY METHOD

In late 2015, MAIC engaged the PwC Chair in Digital Economy (the Chair) based at Queensland University of Technology (QUT) to investigate how the Queensland CTP scheme would be impacted by, and improved, in light of advances in the digital economy. An extensive literature review was undertaken, as was consultation with domain expert researchers at QUT. A scenario thinking exercise enabled 10 participants from MAIC and QUT to consider the vast and disparate set of events that could influence the future of the CTP scheme. The scenario thinking method (Wright & Cairns, 2011) aimed to help decision makers and others examine the level of certainty and impact for each of the various trends. Finally, a survey of 49 QUT students sought to identify their preferences for motor vehicle ownership, transportation modes and attitudes towards vehicle automation in order to understand emerging patterns and implications for the scheme.

1.3. BACKGROUND

Since the 1930s, CTP has been a mandatory insurance for all vehicles registered in Queensland. It is an important social and economic policy with two main benefits for individuals:

- ensuring that people injured by an 'at fault' driver can claim compensation for their injuries and loss of income; and,
- providing affordable indemnity insurance for all Queensland vehicle owners who may be liable for harm caused when they were 'at fault'.

MAIC and the Nominal Defendant are regulatory bodies tasked with administering the CTP scheme in Queensland. MAIC is principally concerned with providing an affordable, sustainable liability scheme where people injured by an 'at fault' driver or vehicle are adequately compensated for medical costs and loss of income. MAIC also influence better societal and individual outcomes through policy development and funding research, education and infrastructure to reduce road trauma and improve outcomes for injured persons.

The strategic focus for MAIC for 2015-2016 and beyond is as follows:

1. *Reduce the incidence of road trauma to save lives and improve scheme outcomes;*
 2. *Support seriously injured people to improve health and vocational outcomes;*
 3. *Innovate and improve to remain efficient and adaptable; and,*
 4. *[Conduct] prudential supervision[...] to maintain a viable and affordable scheme.*
- (MAIC Annual Report 2014-15, p. 7)*

1.4. LOOKING AT CTP THROUGH A DIGITAL LENS

This report informs the strategic planning activities of MAIC. The intent and focus of the report is to identify key trends in the external environment that may impact on the operation and sustainability of the CTP scheme in Queensland. The examples presented are relevant to the CTP scheme and the strategic focus of MAIC. As this study has been undertaken by the PwC Chair in Digital Economy based at Queensland University of Technology (QUT), the research has been conducted from a digital economy viewpoint.

1.5. SCENARIO THINKING

In looking at what the future may be for the CTP scheme in Queensland, this study employed scenario thinking (Wright & Cairns, 2011). Scenario thinking is a research technique aimed at positing a range of **possible** and **plausible** futures to assist decision-makers and others to consider consequences and actions that are needed to address such future events. Further, as Prof George Wright explains, when reading a scenario that contain highly plausible events that have strong causal links, the reader can picture the scenario in its entirety as more probable than the individual events considered in isolation of each other. This is referred to as the simulation heuristic (G. Wright, personal communication, December 2015). Another benefit of scenario thinking is that it helps to determine the level of impact and uncertainty surrounding various trends.

Four scenarios were prepared using two independent factors as the key variables: level of technological progress (particularly motor vehicle automation) *and* consumer sentiment/uptake of vehicle automation (The four scenarios are placed in Appendix A). Technological progress was selected as the first variable as it is expected to have a high impact on the CTP scheme and there is a high level of certainty that high levels of automation will be increasingly available over the next 5 to 10 years. Consumer sentiment and uptake of vehicle automation was selected as the second variable as the benefits of automation will correspond to the level of technological diffusion across Queensland's vehicle fleet. Figure 1 illustrates the four scenarios: one optimistic scenario, two middle ground scenarios and one pessimistic scenario. In reality, a few of the ideas from across each of the scenarios may eventuate while none is likely to be realised in every detail. However, the important outcome is that policy makers can visualise and discuss possible events. The discussions are intended to direct thinking toward actions that they can enact to influence positive outcomes or prepare for and perhaps minimise negative outcomes.

Important findings from the scenario thinking exercise were:

- Economic, social and political factors are important moderators that may slow or accelerate trends, such as the uptake of driverless vehicle technology. For example, if global and local economies enter recession, this will dampen new vehicle sales, thus slow the progression of driverless vehicles. Costs will initially be high and only a select few will move to driverless vehicles. Costs

for infrastructure outside large population centres may impede the take up of driverless vehicles and other technologically advanced transportation infrastructure.

- High uncertainty exists for many trends, including: economic outlook, climate change policy, driving behaviour, ability for driverless vehicles to navigate dirt roads or roads affected by flooding, willingness of policymakers to push through legislative changes, community acceptance and demand for driverless vehicles. More attention should be directed towards trends that are uncertain. Where there is a high level of certainty, policy makers can respond early or be proactive in developing new policy. However, where high uncertainty exists, policy makers need to increase their understanding of the underlying variables that influence these uncertain trends. They also can start to formulate policy initiatives that can either mitigate negative trends or encourage positive outcomes. MAIC is encouraged to improve its preparedness or robustness for Black Swans, i.e. surprising, high impact and difficult to predict events.
- Information gaps in road trauma statistics impede analysis and slow decision making. Greater collaboration and information sharing across government agencies, medical research institutions, insurers, hospitals, and researchers is required in order to gain a better understanding of trends and impacts.
- MAIC has the ability to influence some of the desirable outcomes either through advocating changes in other government agencies and making changes to the legislation underlying the CTP scheme.

SNAPSHOT OF THE FOUR SCENARIOS

- QUEENSLAND IN 2025

SCENARIO

1

HIGH tech

HIGH demand

In this best case scenario, Queensland's economy has prospered and the community embraces smart car technology. CTP insurers are able to provide flexible and individualised insurance services (including more streamlined, digital claims processing). Advances in trauma care, such as ability to grow new biological tissue, 3D bio printing, and tailored pain medications have improved outcomes for trauma victims. In this scenario, the costs associated with road trauma have decreased significantly since 2016.

SCENARIO

2

HIGH tech

LOW demand

In this middle ground scenario, the economy and political landscape have been 'business-as-usual' over the past decade. The community sentiment towards smart cars and car sharing was subdued for several years earlier in the decade, although higher levels of automation in public transportation have been achieved. Health and support services continue to improve through application of medical advances, albeit at a slower pace than Scenario 1. Eventually, the community and government embrace smart car technology and the number of crashes decreases at a fast pace from 2022.

SCENARIO

3

LOW tech

HIGH demand

In this second middle ground scenario, the economy has been in reasonable shape over the past decade. The community has been eager to adopt smart cars however car manufacturers have been slow to overcome technological and compliance issues. Health advances have also been slow to diffuse due to technological failures and high costs. The community responded to the need to reduce road trauma by adopting slower speeds and increasing expenditure to improve road infrastructure. Road crashes reduce at a very slow rate after 2015, however crashes reduce significantly from around 2022.

SCENARIO

4

LOW tech

LOW demand

In this worst case scenario, Global Financial Crisis 2 decimated the Queensland economy in 2018 and unemployment has persisted ever since. Technological progress was set back significantly and there has been a very low renewal of Queensland's passenger vehicle fleet. The public health system has struggled to contain costs and health outcomes for trauma patients have deteriorated. The incidence of crashes caused by distraction, speeding, alcohol and drug abuse has been steadily increasing since 2016.

Figure 1: Snapshot of the four scenarios
(The full scenarios are placed in Appendix A)

2. EXPANSION CYCLES OF THE DIGITAL ECONOMY AND CTP

In this section we provide an overview on how the CTP scheme would be impacted by, and improved, in light of advances in the digital economy¹. Our approach in this section is to align the trends with the three expansion cycles of the digital economy (Barrett and Bennett, 2015).

In the PwC Chair of Digital Economy Working Paper 1/2015, Barrett and Bennett (2015) provide a comprehensive overview of the various aspects and components of the digital economy. The paper describes the digital economy being as disaggregated into three overlapping cycles that are evolving and expanding over time. The cycles are described below:

Business Economy, Cycle 1, can be simplistically described as the cycle of digital economy where traditional organisations are in focus. Three themes underpin the business economy: (1) *better processing of information thanks to digital technologies*, (2) *ability to trade online*, and (3) *usage of digital technologies in innovation*.

Economy of people, Cycle 2, is where products and services, as well as business models, are completely re-imagined in order to disrupt 'industrial age' approaches. Here, mobile technologies, new applications and to some extent, social media have enabled individuals to create their own markets and to create new ways of supplying and consuming goods and services. The economy of people includes recent phenomena, such as the sharing economy and gig economy.

Economy of things, Cycle 3, focuses on the emergence of solutions and economic activity where 'things' (devices, robots, buildings etc.) become participants in the markets where they can proactively offer their services, trade capacity, and access goods and services from other 'things'.

These cycles are illustrated, along with possible applications within the CTP scheme, in figure 2. It is important to note that the cycles overlap and some trends apply to more than one cycles, particularly

as they develop over time. One notable example is vehicle automation. Vehicle automation can help existing businesses carry out their activities in a more cost effective and productive manner. For example, public transport authorities may use automated buses instead of conventional buses. Driverless vehicles will be 'things' that can interact with other virtual objects and will revolutionise the transportation sector. Driverless vehicles will also make car and ride sharing more attractive thus expanding the sharing economy.

2.1. BUSINESS ECONOMY

For MAIC, the digital trends within this cycle are applicable to possible innovation across the administration of the CTP scheme and also to the day-to-day operation of activities in health care, transportation, road infrastructure, motor vehicle production, traffic management and law enforcement.

A selection of current trends that are shaping the evolution of the business economy in which MAIC operates within are presented below.

2.1.1 CONNECTED VEHICLES

While driverless vehicles grab the headlines, the technology sits within the broader field of vehicle connectivity. Connected vehicles are equipped with computers and wireless technology that allow communication between other vehicles (V2V), infrastructure (V2I) or other devices (V2X) via the internet, local network or the cloud (Weeratunga & Sommers, 2015, p iii). Transport authorities also refer to a broader Intelligent Transport System (ITS) where connectivity aims to improve safety, productivity and better environmental outcomes. Examples of ITS include: "traffic management systems, information and warning systems installed in individually vehicles, as well as cooperative ITS (C-ITS) applications involving vehicle-to-infrastructure and vehicle-to-vehicle communications" (Australian government, 2015). Thus, connected vehicles and ITS are part of the broader Internet of Things (IoT) phenomenon.

Connectivity and Road Safety

The primary benefit of vehicle connectivity, particularly from the CTP scheme viewpoint is the potential for reducing road trauma.

¹ The Australian Government defines Digital Economy as "The global network of economic and social activities that are enabled by digital technology, such as the Internet, mobile and sensor networks" (Australian Government, 2009, p2).

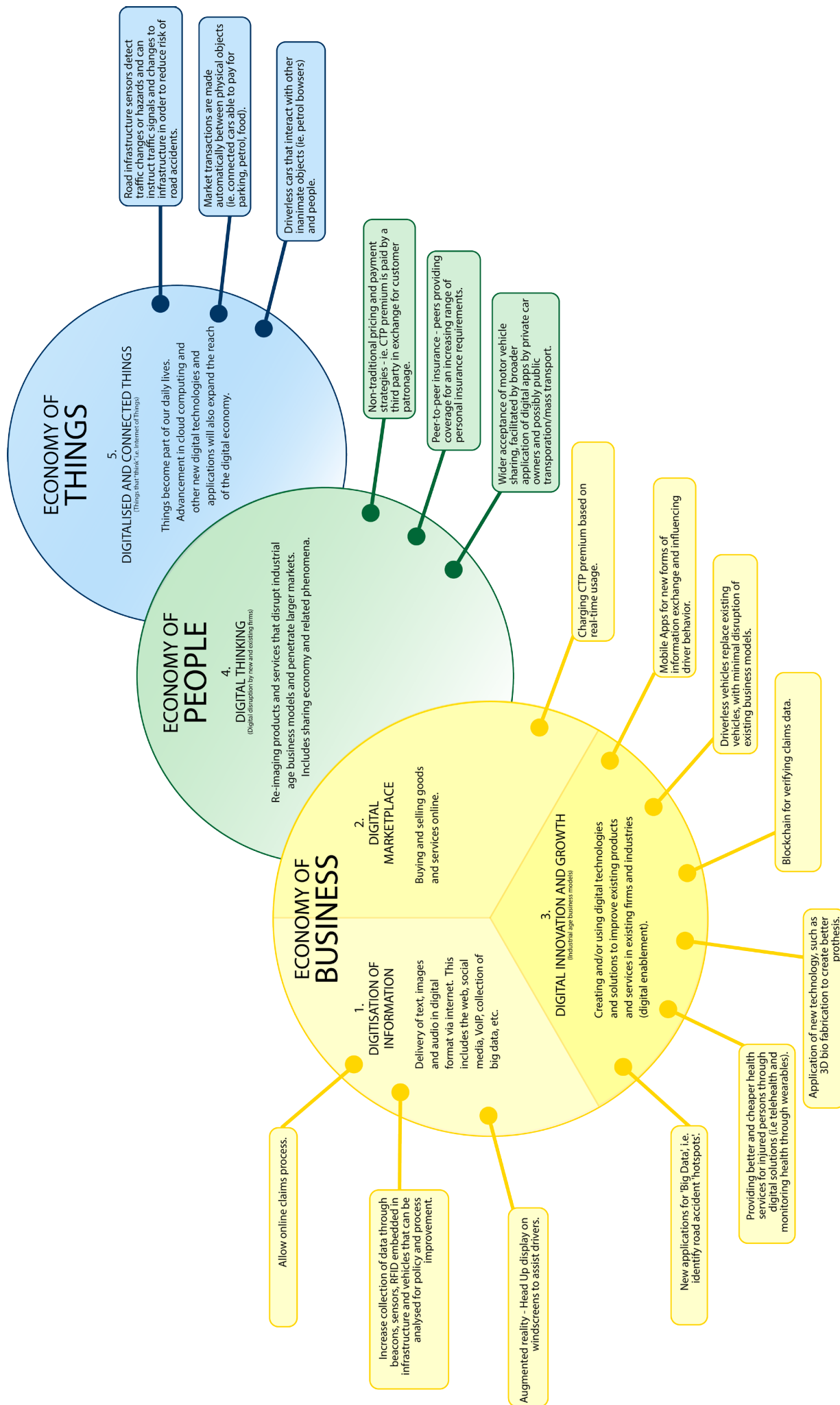


Figure 2: Expansion Cycles of the Digital Economy

Weeratunga and Somers (2015) present a subset of safety C-ITS applications which are listed below:

- Emergency vehicle warning (ETSI UC001)
- Intersection collision warning (ETSI UC003)
- Motorcycle approaching warning (ETSI UC004)
- Emergency brake lights warning (ETSI UC005)
- Traffic condition warning (ETSI UC009)
- Collision risk warning (ETSI UC012)
- Regulatory/contextual speed limit notification (ETSI UC018)
- Traffic light optimal speed advice (ETSI UC019)
- Driver fatigue for light and heavy vehicles (to be developed and considered as an Australian addition to the 32 applications or use cases).

(Weeratunga and Somers, 2015, p. 6)

A high proportion of connected vehicles within a mature ITS is anticipated to significantly reduce serious crashes. Doeck, Grant & Anderson (2015) explain that the information exchanged between connected vehicles and infrastructure “can be used to detect risks or potential crashes and could be used to trigger a vehicle response such as providing a warning to the driver and/or to autonomously intervene using the vehicles braking or steering systems” (2015, p. 31). These researchers conducted a study to test the effectiveness of connected vehicle technologies that are currently available. They selected a sample of 89 real-world crashes to simulate what would have happened if the vehicles had fully autonomous braking or a warning system to alert the driver. The results were promising showing that between 37 and 86 per cent of the simulated crashes would have been avoided and at least 78 per cent of the crashes would have had the impact speed reduced by at least 37.1 km per hour on impact (Doeck et al., 2015, p.34). The autonomous braking system was most effective, however results were also positive for human drivers with a reaction time of at least 1.2 seconds.

In Europe, the European Parliament has recently introduced laws that require new cars and vans to be equipped with automated emergency call devices by March 31, 2018 (Moore-Coyler, 2015). Installation of these autonomous emergency call devices in new vehicles is anticipated to reduce deaths by 10 per cent in Europe (Murphy, 2015). Note: automating

emergency response is currently available in limited makes in Australia (e.g. BMW, Ford, and Mercedes).

In Queensland, the State Government plans to conduct trials of different forms of connected vehicles technology during and beyond 2016. These trials may include testing technology that aims to reduce accidents involving pedestrians and cyclists, auto-braking technology and warning systems to make turning right at intersections safer.

Other applications of connectivity

Internet connectivity (with a consumer focus) has been available in Australian vehicles for more than five years, however it has largely been limited to premium priced cars. This is changing however and it is anticipated that by 2020 the majority of new cars will have internet connectivity (Greenough, 2015). Increased connectivity will enable dynamic pricing of transport related services and drivers could be notified of pricing changes as they drive, thus be able to change their travel plans or other factors based on price differentials.

It is worth noting that for several years many drivers have already been equipped with smartphones that connect them to the internet as well as directing them to particular destinations. Google and Apple’s maps applications for example, can provide real-time traffic information and offer alternative routes if there are traffic jams en route. Microsoft, Apple and Google are all working towards extending their reach beyond mobile technologies by heavily investing in technologies that integrate into motor vehicles (e.g. Apple CarPlay, Android Auto). Apple and Google are also working towards releasing entirely new motor vehicles that will compete with established car manufacturers.

There is ongoing work surrounding management of data (including managing privacy and safety concerns) and how devices are interacting with the environment. Coordination of their activities is a challenge. Creating a unified network or network protocol, allowing for standardised communications with such devices, may be the solution.

The two main benefits of vehicle connectivity for the CTP scheme are (1) reducing road trauma and (2) enabling real-time tracking of motor vehicle activity and the ability to charge vehicles (or their owners) for their use of public road infrastructure and liability cover.

2.1.2 DRIVERLESS VEHICLES

One of the major considerations for a CTP scheme and motor vehicle insurers generally is the progression towards driverless vehicles. Driverless vehicles (also referred to as self driving vehicles, fully automated vehicles, robotic cars, autonomous vehicles) use technologies such as sensors, cameras, ultrasound, lidar, radar to sense the external environment. The information provided by these technologies is processed by an on-board computer and other systems to control and navigate the vehicle without human input. Removing human error from motor vehicle operation is expected to dramatically reduce road trauma. Commentators suggest that if manufacturers can resolve technical challenges and consumer uptake is positive, the incidence of road trauma may reduce by 90 per cent by mid-century (McKinsey, 2015). The dramatic reduction in road trauma removes the need for a CTP scheme in the long term.

In the short to medium term, as automation systems take over more and more driving tasks from human drivers, liability for property and personal injury harm will shift from drivers to car manufacturers and/or ITS. This effect of automation will necessitate a review of the CTP scheme as it is configured around conventional vehicle classes and a driver, and not an algorithm, being 'at fault'.

There are ongoing trials of driverless vehicles occurring in California and other locations across the globe. Google commenced driverless vehicles trials in 2009. In November 2015, the first Australian trial of driverless cars was conducted in South Australia using Volvo's XC90 SUV (Tucker, 2015). Many established and new car manufacturers have announced their intention to release highly automated vehicles with internet connectivity in the four years to 2020. The Renault – Nissan alliance, for example plans to release more than 10 vehicle models with autonomous capabilities in the United States, Europe, Japan and China (Renault – Nissan Alliance, 2016).

Challenges to overcome

While many car manufacturers are bullish in plans for releasing automated vehicles, the sentiment among consumers and researchers is a little more subdued. Commentators, such as Prof Andry Rakotonirainy from QUT suggests that there are policy and human acceptance issues that need to be addressed: *"Are we ready yet? Do we have the policies in place? Are road users ready for it? Do we have a clear human acceptance of that type of technology?..."* (Rakotonirainy as cited in Griffith, 2015).

One of the current technical challenges (which there are a few) is the inability of driverless vehicles to enact judgement calls in certain traffic conditions, such as merging in heavy traffic. In these scenarios, driverless vehicles are programmed to be cautious and follow road rules exactly. They are reportedly much quicker than the average human driver in sensing and responding to possible impacts by applying braking systems effectively in order to avoid collision. Naughton (2015) reports that driverless vehicles have twice the accident rate of normal vehicles, but the accidents [at the time the article was written] have never been the fault of the driverless vehicle – "they're usually hit from behind in slow-speed crashes by inattentive or aggressive humans unaccustomed to machine motorists that always follow the rules and proceed with caution" (Naughton, 2015).

Another topical issue is how the vehicles are programmed to respond in scenarios where a crash is inevitable and the driverless vehicle must choose between two or more parties that may be hurt by the car. The vehicles can be programmed to respond in a variety of ways, such as protecting the driverless vehicle occupants above others or choosing the option with the least number of casualties, which may include sacrificing the driverless vehicle occupants (referred to as the utilitarian model). Bonnefon, Shariff & Rahwan (2015) conducted some studies to understand how the public perceived the utilitarian model. They found that while most agreed that the vehicles should be programmed to minimise road trauma (including sacrificing the occupants of the driverless vehicle), they were less inclined to own or travel in a vehicle that may sacrifice their own safety (Bonnefon, Shariff & Rahwan, 2015, p. 8). Governments can lead the discussion by deciding how driverless vehicles must be programmed.

With regard to high levels of semi-automation, Johns et al. (2015, p. 405) discovered it takes 7 seconds for the driver to regain sufficient attention to control a vehicle after being cued to take over control from the automation system. This is potentially a major problem if the driver is required to undertake a complex driving task in a shorter period of time. The researchers plan to perform experiments with more complexity and using participants who are novice drivers or older drivers (Johns et al. 2015, p. 406).

Other challenges, which can also be viewed as risks that insurers should account for, regarding driverless vehicle technology include, but are not limited to:

- potential security threats from hackers or viruses;
- potential for frequent software failures; and,

- ability to operate in challenging environmental conditions, such as heavy precipitation, flooding or situations where the technology cannot navigate effectively.

When considering these challenges, plus the likely high cost of early generation driverless vehicles and complimentary road and internet infrastructure, it may be more than 10 years before the majority of motor vehicles in Queensland are driverless. Yet, for insurers and MAIC, the above challenges describe new risks that need to be evaluated in this transition period and policies will need to be formulated to account for harm that may arise in certain scenarios.

Driverless cars: a new digital platform

Driverless vehicle technology will dramatically alter the perception of a car as a means of transportation: from indispensable, personal belonging to yet another tool. Electric, driverless vehicles do not need driver controls or bulky space for combustion engines thus the vehicles of the future may have radical designs that have little resemblance to today's conventional, passenger motor vehicles.

A change of mindset on motor vehicles will cause an emergence of new attitudes, ownership preferences and ultimately potentially dramatically change the way cars are used in the society. Thus, smart vehicles will become a new platform for services and products, a new digital engagement channel, mobile places of working, communication, learning and consumption of culture, propelling new economic and social activity that is similar to the step change that mobile technologies triggered during the late 2000s. Some of these applications have already been developed. For example, ParkWhiz and Visa have developed an app for digital dashboard displays that allows parking costs to be paid automatically without obtaining tickets or accessing a wallet (Newcomb, 2016).

Vehicle semi-automation

While further research and development along with policy and legislative change progresses the pathway to full automation, the community will benefit from increasing levels of semi-automation in vehicles. Increasing levels of semi-automation will help to reduce the frequency and severity of crashes.

Most people are aware that automation has been gradually increasing in motor vehicles for several decades. Examples of earlier forms of automation include basic cruise control, anti-lock braking systems (ABS) and electronic stability control (ESC). More advanced automation technologies, sometimes referred to as driver-assist technologies, include lane

departure warning systems, adaptive cruise control, self-parking controls, and collision avoidance/brake assist (also known as autonomous emergency braking [AEB]). This level of automation is what this report refers to as a level of semi-automation – a human driver is still required to be behind the wheel and able to take control of the vehicle in the event the car's computer cannot navigate difficult or uncertain driving tasks.

There has been considerable research on the benefits of semi-automation. The Insurance Institute for Highway Safety (2015) reports that "AEB technology can reduce insurance injury claims by as much as 35 per cent". In Australian research, BITRE published a report entitled: *Impact of road trauma and measures to improve outcomes* (2014), which evaluated the benefits of AEB alongside several other measures. Australia-wide, the modelling conducted for BITRE estimates that if AEB was mandated from 2018 "could save approximately 600 lives and prevent 24,000 hospitalisations by 2033" (BITRE 2014, p. x).

BITRE (2014, p. x) also reported that: (1) upgrading road infrastructure so 85 per cent of roads were 3 stars or above over a 20 year period, (2) installing more centre median strips, roadside barriers and rumble strips (3) reducing speed limits (particularly on rural roads), (4) installing roundabouts and (5) eliminating filter turns would also significantly reduce road trauma.

In addition to the findings presented by BITRE, Fildes et al. (2015) found that at lower speeds, AEB can reduce the likelihood of hitting the back of another car by up to 38 per cent (Fildes et al., 2015, p.27). However, these researchers also discovered that the car with AEB is more likely to be rear-ended. This suggests that there is further room for improvement with this technology. This may also be addressed by government requiring new cars to incorporate AEB technology as early as possible.

Automation in public transport

Internationally, automation in public transport is also progressing fast. In 2013, there were 32 cities, mostly in Asia, Europe and the US that had some automated metro lines (International Association of Public Transport, 2013). There are no examples of automated public transportation currently in operation in metropolitan cities in Australia. However, the West Australian automobile club recently announced a trial of a driverless electric bus in Perth planned for later in 2016 (O'Connor, 2016). The first fully automated rail system will be Sydney Metro Northwest which will open in 2019. Increasing levels of automation in public transportation could significantly increase

usage particularly if fares were cheaper (due to lower operating costs) and more frequent services could be provided.

For the CTP scheme, vehicle automation will increasingly have a significant impact on the CTP scheme. In the next 5 to 10 years, it is anticipated that road trauma will reduce at an increasing pace as better semi-automation technology (i.e. AEB) permeates Queensland's motor vehicle fleet. In the longer term, road trauma may reduce to insignificant levels. Second, liability for personal injury will shift away from drivers to car manufacturers and Intelligent Transportation System (ITS) if harm is due to an error or malfunction in the automated vehicle or ITS. Third, when driverless vehicles are commonplace, in 10+ years, this may trigger significant changes in private vehicle ownership.

In summary, vehicle automation alone will likely render the current CTP scheme redundant in 20 years, perhaps earlier. In the meantime, many other trends discussed in this report will also trigger a rethink in how the scheme is configured.

2.1.3 AUGMENTED AND VIRTUAL REALITY

The application of augmented and virtual reality technologies are broad, however in this section we highlight the advantages for improving driver behaviour. Augmented reality involves enhancing physical worlds with digital information, in transportation, a common application is head up display. Virtual reality on the other hand, involves delivering a digital simulation experience for the user.

Augmented reality technology, in the form of digital displays on windscreens, has been available in premium makes, such as BMW, for several years. A basic head up display can also be created by retrofitting a projection device into cars that are fitted with appropriate interfaces (i.e. suitable for most cars manufactured from 2009). The aim of the technology is to provide useful information, such as speed, directions, without drivers having to take their eyes off the road. More advanced applications include BMW's 'pedestrian on the road' feature to alert drivers to obstacles on the road at night (in conjunction with BMW Night Vision) (BMW, 2016). This head up display information is gathered by the same technologies (e.g. sensors, cameras, radar) that exist in driverless vehicles. There has been several research studies conducted that test the effectiveness of augmented reality in alerting drivers to possible obstruction on the road as well as determining if the displays are distracting (see Rusch, Schall, Lee, Dawson & Rizzo,

2014, p.211; Fu, Gasper & Kim). The research and development of augmented reality is reasonably new and many studies completed in the last five years were conducted in simulated environments rather than in more naturalistic settings, however the research indicates the technology has merit (Rusch et al., 2014).

The Centre for Accident Research and Road Safety – Queensland (CARRS-Q) at QUT is about to commence a multi-year project with the Honda Research Institute to develop an in-vehicle virtual driving coach aimed at reducing risky driving behaviour. The project will feature augmented reality and 3D displays projected onto windscreens.

Volumetric display, such as holographs are also being developed for transportation purposes. Microsoft is investing heavily in the HoloLens which may have broad applications in transportation. For example, instead of human traffic controllers stopping and redirecting traffic during road maintenance, volumetric displays or holographs may be substituted.

Driver training through simulation apps and games, using virtual reality headsets such as Oculus Rift, have been available for a few years. The first Australian application of Oculus Rift for driver training was at an exhibition held in NSW in 2014 (Bender, 2014). The purpose of the demonstration was to immerse people in a simulated motor vehicle crash. Visitors wore an Oculus Rift headset while sitting in a stationary vehicle that was linked to a hydraulic system. During the virtual crash, the car moved in a way that matched the visual content.

We expect the application of these technologies will expand, particularly as the technology is aligned with self-driving car technology. Broader application may improve some aspects of driver behaviour and potentially reduce the number of crashes on the roads.

2.1.4 INTERLOCKS

Interlocks are embedded within vehicles to prevent a driver from operating a vehicle or to inactivate another device (i.e. prevent access to SMS while car is being driven). Common examples are interlocks used to prevent mobile phone usage, drink driving or driving without using a seatbelt. New technologies such as "face recognition, biometric (fingerprint) recognition, real-time report of violations and GPS tracking" can overcome issues such as substituting users (Fitzharris et al. 2015, p. iv). Also, new technologies and processes are under development that can "assess the presence and level of alcohol using skin sensors, alcohol 'sniffer' systems, transdermal

perspiration measurements and eye movements, with a view to integrating these systems within the vehicle and minimising driver effort. The development of unobtrusive alcohol ignition interlocks would help to achieve broad community end-user acceptability and ultimately, widespread voluntary use” (Fitzharris et al. 2015, p. iv).

While all states, except WA, use alcohol interlocks to prevent prior offenders from drink driving, AustRoads recently called for interlocks to be made mandatory for other groups of drivers (Carey, 2015). There could be political resistance as this may be perceived as unfair to compliant drivers. Further, a possible dilemma with mandatory interlocks is the harm that may arise if a person is unable to mobilise a car if they or passengers are in danger at the present location.

Wider application of interlock technologies would likely result in less crashes, thus would reduce the cost of road trauma.

2.1.5 MOBILE APPS

Mobile apps which are contained and accessed using mobile devices have enabled completely new ways of communicating, trading and other activities that were not possible prior to the late 2000’s. The application of mobile apps for recent phenomena such as ride sharing is well-established and discussed in more detail in section 2.2. Just like in any other context, transportation scenarios are and will continue to be highly impacted by mobile applications and solutions. New vehicles now feature touchscreens that function very similarly to mobile phones and are yet another platform for apps.

We acknowledge that an obvious negative outcome of ubiquitous use of mobile technology is its role in driver distraction. BITRE (2014) notes that there is conjecture on the amount of mobile phone distraction contributing to crashes however they nominate 7 per cent in their study. Until driverless cars replace conventional vehicles, a solution may be to disable the phone while driving or disable the vehicle with an interlock if the driver’s mobile phone is being used for texting, phone calls, browsing the internet, etc. Technology has already been developed for this purpose; however it is optional, rather than mandatory.

On the other hand, new apps can be employed to improve driver behaviour by engaging them in the driving task or by measuring driving performance. Young drivers, particularly males, are over-represented in car accidents (Steinberger F., Schroeter, R., Lindner, V., Fitz-Walter, Z. Hall, J. & Johnson, D., 2015, p. 320). Steinberger et al. 2015

have drawn a link between boredom and sensation seeking and why young males may speed or become distracted by mobile devices (2015, p. 320). These researchers are currently investigating if this behaviour can be modified by applying gamification to the driving experience.

2.1.6 NEW PRICING STRATEGIES

In the late 20th century, a number of large organisations started to offer their services completely free of charge (while ensuring costs are covered in other ways, for instance by selling data to advertisers). This has enabled an avalanche of new business models. New pricing strategies have been continuously introduced for the past two decades. Models such as freemium, pay-what-you-want, time-based and value-based are becoming more and more common.

We acknowledge that CTP insurance is not the same as other forms of insurance, where the consumer can choose among varying levels of cover, features, and methods of premium payment. However, examples of how other forms of insurance are evolving, particularly with digital business models, are discussed below.

Zero-cost insurance

Zero-cost insurance is where an organisation may offer to pay a customer’s insurance premium in exchange for patronage, or some other item that the customer owns. The following examples illustrate how digital technologies could make this concept possible.

Example 1: a retail business pays the insurance premium in exchange for customer patronage. Ng (2014) provides the following example:

“(W)e often need a car to go the supermarket, it might not be too far-fetched for the supermarket to subsidise car insurance and fuel only for supermarket trips (which could be digitally visible, measurable and automated), resulting in loss of revenues to fuel or insurance providers” (Ng, 2014, p. 153).

Example 2: All or part of the insurance premium is paid by an online market research firm in exchange for the customer participating in online surveys.

Example 3: A customer agrees to share data in exchange for free insurance coverage. A comparable example is an internet firm providing free email in exchange for access to the email contents and accepting advertisements tailored to the profile of the email account owner.

Real-time pricing

Calculating insurance premiums based on distance travelled has been available for general comprehensive car insurance for several years. In Australia, for comprehensive motor insurance, the driver's risk profile is assessed using characteristics such as age, location, type of vehicle, where vehicle is parked, etc. In the United States, there are a few insurance firms that also calculate premiums based on telematics that are collected from in-vehicle telemetry devices that track driver behaviour, such as hard braking, fast acceleration and airbag deployment (National Association of Insurance Commissioners, 2015). As cars become more computerised and connected, the collection of relevant telematics and other data will be more widely available for insurers as well as other business-to-business (B2B) and government-to-thing (G2T) applications.

A highly connected motor vehicle, coupled with highly connected infrastructure and systems will enable insurers to calculate premiums or adjustments to premiums based on real-time driving events or behaviours. If premiums are calculated while the vehicle is driven, the premium may increase if there are more people in the vehicle or if the driver opts to take an 'off-road' route rather than a motorway. Drivers may be able to modify their travel plans based on real-time pricing indicators, for example it may be cheaper to travel during an off-peak period.

Another possible extension of real-time pricing is the ability for drivers to switch insurance providers when there is a clear differentiation between the premium and coverage provided.

The above examples could be considered fairly radical for the application to the CTP scheme. However, the technologies that make real-time pricing possible are already on Queensland roads (albeit in limited examples). We believe that the time to start planning for new mechanisms to pay for CTP insurance, including real-time pricing, is now.

2.1.7 DIGITAL INNOVATION IN THE INSURANCE SECTOR

Insurance firms were early to adopt digital technologies to sell insurance policies online. Consumers are able to choose from a range of coverage options, and at the same time insurance firms collect personal and factual information that enables them to produce a policy at a competitive price. Along with well-established 'bricks and mortar' insurance firms, there are also a range of firms who sell insurance solely on the digital basis. Further, in recent years

we have seen organisations, such as supermarkets, enter the insurance business. For example, Coles, in partnership with two insurance firms, offers car, home, landlord, and life insurance (Coles, 2016).

Significant digital innovation within the financial sector is leading to evolving business models that see traditional institutions such as insurance firms, banks, credit unions, investment funds managers tap into micro-finance, crowd funding activities (Bruton, G., Khavul, S., Siegel, D. & Wright, M., 2014). Section 2.2.3 (peer-to-peer insurance) provides more information about new business models applied in insurance.

If MAIC continue on the path of developing digital platforms across its business, greater scale can be achieved which may open up the possibility of including a broader range of insurance providers.

2.1.8 BIG DATA

In order to stay competitive or simply operate effectively, organisations need to efficiently process exponentially growing amounts of information. For MAIC there is a broad range of information and data describing all sorts of variables that underlie the CTP scheme including, but not limited to: vehicle crashes, claims data, vehicle registrations, financial data, medical costs, research data, macroeconomic and demographic data. Not all this data is available on a timely basis, and there are inter-agency issues, such as managing privacy of individuals. One of our main recommendations is for creating a platform for managing and presenting this data for all decision makers in government.

This is not necessarily what we refer to as 'big data'. Big data generally refers to analysis of extremely large datasets that require significant computing power, specialised software and technical knowledge. The analysis is often conducted on a real-time basis as well. An example of a large dataset is millions of photos of Earth that are captured by hundreds of satellites that scan the surface of the planet many times over the course of a day (Kearns, 2015). While the images alone may have little information, as a set of real-time images, patterns can be identified. A company called Orbital Insights in the US uses these satellite images to track a broad number of national and global trends ranging from estimating sales at restaurant chains to generating "a global poverty map and predict illegal deforestation by watching for road construction and other signs of logging" (Kearns, 2015).

Given enormous amounts of telemetry data from vehicles, road systems, as well as health-related

information; the big data trend is directly relevant for organisations providing services to motorists. Listed below are some examples:

1. Information derived from big data will allow for new optimisation scenarios for traffic flow management which may reduce crashes or speed.
2. Better analysis of data that explains environmental factors, infrastructure elements, driver behaviour and vehicle condition, etc. preceding a collision will enhance understanding of certain crashes, thus may lead to new ways of averting road trauma or improve the allocation of funding that prioritises road hazard hotspots. If sensors, cameras and other devices were embedded within road infrastructure, real-time information that identifies objects on the road could be relayed automatically to vehicles that are approaching the obstacle.
3. Big data analytics may also enable MAIC and insurers generally to devise new methods for assessing risk and pricing this risk.

The salient issue with big data is that as we expand our capabilities to collect and process large datasets we will learn more about things that we had not considered beforehand. It is a case of “we don’t know what we don’t know”. For cost efficiency purposes it may be worthwhile to coordinate investment in big data analysis with other government agencies or organisations.

2.1.9 BITCOIN AND BLOCKCHAIN

Current approaches in financial markets require a trusted partner to validate every transaction. This introduces unnecessary transaction costs as well as potentially placing the security of transaction information at risk. The issue can be addressed by creating highly secure systems for information exchange that remove the need for a trusted, certifying party. Blockchain protocol (and its implementation in cryptocurrency Bitcoin) demonstrates that it is possible to securely exchange transaction information without a single trusted party, relying on a distributed trust network.

Technologies like blockchain are being explored as means for information exchange in business applications, and cryptocurrencies such as Bitcoin could in future be used just like national currencies are used now. Further, insurers may employ blockchain for verifying data associated with compensation claims. As technical and business application research into blockchain is still progressing, we expect the possibilities of blockchain and other

means to share data will advance in the near future.

We acknowledge that the blockchain algorithm is currently surrounded with a significant amount of hype. While the inflated expectations will likely soon be confronted with the reality – limitations of the approach – we expect the technology to prove very useful in certain, well defined scenarios in CTP insurance, such as the ones listed above.

2.1.10 3D BIO FABRICATION SYSTEMS

Evolution of 3D bio fabrication technologies will enable superior healthcare and higher likelihood of quicker and better recovery. One of many applications for 3D printing in health care is the ability to create scaffolds that repair or replace damaged tissue, including bone and soft tissues. Internationally, there have already been several examples of 3D printed parts to replace damaged hips, vertebrae, pelvic and jaw bones.

“The hospital of the future, from our point of view is going to have the patient go into hospital, you scan them and immediately next to that operating table you can print them that scaffold” (Woodruff as cited in Williams, 2015).

QUT researchers have developed bio fabrication machines that produce 3D plastic scaffolds emulating the structure of bone tissue. These scaffolds are superior in strength, using fewer materials than titanium prostheses and can be combined with stem cells to regenerate tissue (Williams, 2015). Clinical trials using large animals have been underway for two years and the next stage will be human trials.

In another research project, researchers from three international universities (including QUT) have recently discovered a process to reinforce hydrogels using 3D printing to produce a material that is similar to cartilage tissue (Visser et al., 2015). This process is expected to result in more functional joint repair/replacement in the future.

Better psychological outcomes may also occur with the introduction of these new technologies. For example, a new knee joint that feels and looks very similar to the other, non-damaged knee may provide the patient with more confidence and satisfaction compared to the current prostheses used for joint/bone replacement (C. Aitken, personal communication, November 2015).

Improved outcomes of injured persons through better and efficient medical treatment may significantly reduce costs, particularly in reducing economic loss compensation. More information on medical

advances and trends in health expenditure can be found in section 3.5.

2.1.11 WEARABLES AND QUANTIFIED SELF

Individuals show increasing interest in collecting and analysing data pertaining to their health and activities. Numerous platforms for collecting health, sport, and physical activity data are popular such as smart phones, watches and exercise tracking devices. In addition to informing the user, the information can be shared with other parties. Medical practitioners can also ask patients to wear specifically designed wearables to monitor health metrics remotely, such as blood pressure monitoring systems.

In transportation, more quantified self solutions will become available, allowing individuals to analyse their driving behaviour, learn and improve their skills. This will enable new applications to improve driver behaviour. One example is the Automatic app which is currently available in the US (<https://www.automatic.com/>). This app automatically records car data via a special plug-in device and can be used to allow drivers to monitor their driving habits such as speeding, hard braking etc. This app also has features that help with driver training which would be useful for improving outcomes for learner drivers. The Automatic app is not currently supported outside the US. Further research into the effectiveness of this approach is required to ensure any recommendation is evidence-based.

2.2. ECONOMY OF PEOPLE

Economy of people is the second cycle of digital economy, in which products and services, as well as business models, are completely re-imagined in order to disrupt “industrial age” approaches and penetrate global markets much more easily. The economy of people includes recent phenomena, such as sharing economy or gig economy. The sharing economy or collaborative consumption, allows individuals to increase the utilisation of their time and/or assets (Botsman & Rogers, 2010 as cited in Cohen & Kietzmann, 2014, p. 279). Increasing acceptance of collaborative consumption is driven partly by convenience as well as environmental consciousness and frugality (Cohen & Kietzmann, 2014, p. 279).

The first two trends discussed in this section are car and ride sharing which offer new modes of mobility and may influence the shift away from traditional private car ownership. The third trend discussed is peer-to-peer insurance models.

2.2.1 CAR SHARING

Purchasing access a car for a specific purpose and time period has been available on a commercial basis ever since hire car companies have been available. A more recent form of commercial car hire services are car share programs such as GoGet that have been available in Australian metropolitan areas since the 2000's. In 2011, the City of Sydney, a relatively high density locality, set a target of 10% of all households using shared vehicles by 2016 (City of Sydney, 2011). GoGet has 1,207 parking hubs in the greater Sydney region. There are 310 hubs in Melbourne and a relatively modest 11 hubs in Brisbane and Adelaide (GoGet, December 2015).

Brisbane City Council has not set targets for increasing car share patronage. The Brisbane Parking Taskforce Report (2014, p. 26) recommended that Council should encourage car share schemes that utilised off-street parking, such as car parks within new developments. A reluctance to allocate on-street car parking for car share programs will make this form of transportation less convenient for users.

However, a recent development in car sharing that may impact the CTP scheme is peer-to-peer vehicle sharing enabled by digital technologies. An example of a new company offering a peer-to-peer car share platform is the Sydney-based firm, Car Next Door. This new firm allows car owners to capitalise on capacity (i.e. an idle car) by allowing other people to access their vehicles while the owner does not require it. One of their strategies is to encourage travellers who normally park at long stay car parks at airports to make their vehicles available to other travellers who have arrived at the airport and need a car for a short time period.

Car manufacturers overseas are also offering on-demand car share. For example, BMW created the DriveNow platform that allows people to hire vehicles in nine European cities on a per minute basis. People can park the cars anywhere in the business districts and all expenses such as petrol, parking tickets, insurance and taxes are included (DriveNow, 2016).

Car sharing may become more prevalent in the more distant future when fully automated, driverless vehicles are available as they will be able to be summoned on demand and collect passengers without a driver being present.

For the CTP scheme, the emergence of new forms of car sharing, particularly peer-to-peer car sharing where some vehicles are on the road more frequently and driven by different drivers necessitates the need for the conventional

vehicle classes to be reviewed and changed so they reflect their level of risk.

2.2.2 RIDE SHARING

Sharing a vehicle or trip with friends, families, co-workers or hitchhikers is not a new activity. However, ride sharing applications that use real-time communication and algorithms to connect fare-paying passengers with nearby, private car drivers who accept payment of the trip to be processed entirely online, is a relatively new phenomenon.

One of the most widely known ride sharing apps is Uber. Despite Uber being illegal in Queensland, Uber is experiencing exponential growth through more customers and usage. Figure 3 provides some indication of the use of car and ride sharing models by university students, based on the survey conducted for this study at QUT in December, 2015 (See Appendix B). While the majority of those surveyed had not used a car/ride share service in the previous month, approximately 40 per cent had used Uber or another similar ride sharing service. A much smaller

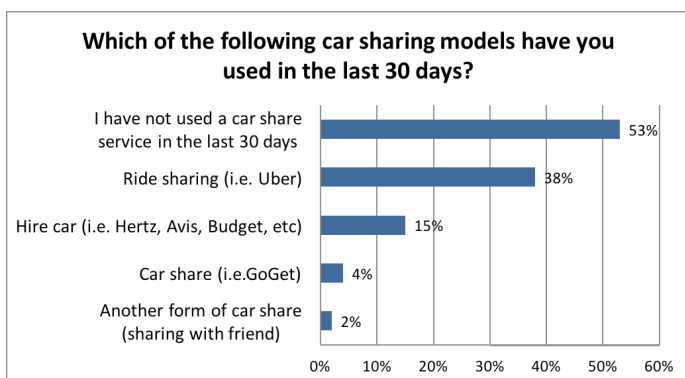


Figure 3: QUT Student survey – use of car sharing models, December 2015.

group of students had used a car share service, such as GoGet.

Uber is investing heavily in broader applications of their technology and data. For example, UberPOOL which allows drivers to pick up two or more passengers who are unknown to each other is currently being tested overseas and could potentially augment the nature of public transport from one which is largely highly structured around mass transportation to a more personalised model. Further, Uber's higher order vision is using driverless vehicles to dramatically cut costs associated with the service. In August 2015, Arizona's state government announced its support for the trial of the world's first driverless taxis (operated by Uber) on public roads (Harris, 2015). They will initially trial the vehicles at the Arizona State University campus.

QUT researchers in the Connected Communities team (School of Information Systems) are currently investigating car sharing, including the psychological motivations for sharing. They have conducted a survey that seeks to understand the characteristics of car sharers and non-car sharers. Results from this research are yet to be published, however discussions with the researchers suggest that car sharing behaviour is more likely to be defined by personality/psychological characteristics, rather than demographic characteristics, such as relative income or gender. There are further insights that are identified that may assist policy officers devise strategies to increase car sharing.

It is expected that car sharing and ride sharing will increase into the future. However, there is some uncertainty surrounding the speed in which these trends will progress, particularly in the short term. As driverless vehicles are likely to dramatically reduce labour costs associated with taxi style ride services, the alternate forms of transportation will be more attractive to users and potentially a trigger them to forego private vehicle ownership.

It is important to note that car and ride sharing are less accessible for lower income households and not appropriate for people who are heavy users of private vehicles who rely on their vehicles to transport family members (particularly young children), luggage, sporting equipment etc. Also, residents in rural and regional areas are unlikely to benefit from car and ride sharing given the very low residential density in these regions and again, the need for people to transport a variety of chattels and/or work equipment.

2.2.3 PEER-TO-PEER INSURANCE

Peer-to-peer insurance is generally described as a group of people organising an insurance scheme where they agree that small claims are paid out of collective pool of funds, rather than claim from the insurance provider which would attract an excess fee and see future premium prices increase. The objective of the group is to be rewarded for being low risk and not making claims. Overtime, as a pool of funds increases, the group can choose to reduce premium payments by reallocating some of the funds. Peer-to-peer insurance firms, such as Friendsurance based in Germany, broker insurance coverage between consumers and underwriters based on the peer-to-peer model. An important feature of this insurance is that there is an underwriter that will pay out a compensation claim that is much greater than the peer-to-peer funds pool available.

Peer-to-peer insurance is applicable to a few insurance requirements, particularly for property and motor vehicle property purposes. There is much higher scrutiny of individuals participating in the group, as other members would need to be sure that each member has a low risk profile. Also for underwriters, using a range of digital applications, they can access several streams of information and data from a range of sources that provide accurate and possibly predictive assessment of a group's risk profile.

Since CTP is also a social policy, the purpose of government intervention is to ensure the scheme is affordable and equitable for all parties. Individual risk is not considered, hence the peer-to-peer model described here is not currently applicable. As the CTP scheme transitions in the future, particularly if road trauma is dramatically reduced, it could be possible and plausible that the scheme would be opened up to a range of different insurance models.

2.3. ECONOMY OF THINGS

Economy of things, the third cycle of digital economy, focuses on the emergence of solutions and economic activity where 'things' (devices, robots, buildings etc.) become participants in the markets where they can proactively offer their services, trade capacity, and access goods and services from other 'things'.

Increasing numbers of vendors, large organisations and startups are focusing on the potential that the economy of things brings. The focus is particularly visible in the Internet of Things (IoT) space, with McKinsey estimating the economic impact of IoT at \$11.1 trillion per year in 2025 (McKinsey, 2015b).

While driverless vehicles are discussed earlier in section 2.1.2, in the business economy, they equally fit within the economy of things as well.

2.3.1 THINGS AS CUSTOMERS OR SERVICE PROVIDERS

Objects and buildings are increasingly becoming market participants. Buildings will be able to trade surplus electricity generated by photovoltaic cells. Computers will be able to trade unused computing power to form a distributed computing cloud. Trucks will be able to dynamically trade spare capacity without human intervention.

Driverless cars will provide services without human involvement. An example would be a driverless vehicle or drone that delivers packages to car boots

or other objects - with the ordering and invoicing being generated autonomously by these devices.

Another example is the incorporation of a credit card within the vehicle that allows the vehicle to pay for services on behalf of the vehicle owner or driver. Visa has partnered with other organisations to allow connected cars to pay for services such as parking tickets (e.g. ParkWhiz).

As mentioned earlier in section 2.1, the transportation industry and motor insurance will be dramatically impacted by vehicle connectivity and driverless vehicles (all part of the Internet of Things phenomenon). We anticipate increased asset utilisation, new ways of delivering services and more dynamic pricing scenarios.

2.3.2 AFFECTIVE COMPUTING

Computers and algorithms are considered "emotionless". This becomes a challenge in the economy of things. Focusing on affective computing, understanding how algorithms can generate and show emotions will help address numerous challenges related to user experience (for instance, efficient communication between a human and an algorithm) as well as create opportunities for new ways of interacting with machines. Affective computing is a field exploring this space.

In transportation industries, affective computing will be crucial, enabling efficient communication between cars (especially autonomous ones) and humans. This will be a prerequisite for safety of partially autonomous vehicles where human interaction is required.

2.3.3 BRAIN COMPUTER INTERFACE

Currently computer interfaces are often not appropriate for some applications, as the high reliance on manual interaction may be not practical. Removing the intermediary, and allowing individuals to express their needs directly – without a need for a keyboard or touchscreen, or even voice recognition, has potential to improve the interaction. Brain computer interface research is exploring such technologies.

An example where this technology has been developed is where patients or disabled people in wheelchairs move a wheelchair in a desired direction by using thoughts. We expect that this technology, among other similar ones will impact trauma care. It may also help in rehabilitation of patients, with ongoing research into exoskeletons activated by brain signals (Lebedev & Nicolelis, 2006).

DIGITAL TRENDS CRITICAL MASS TIMELINE

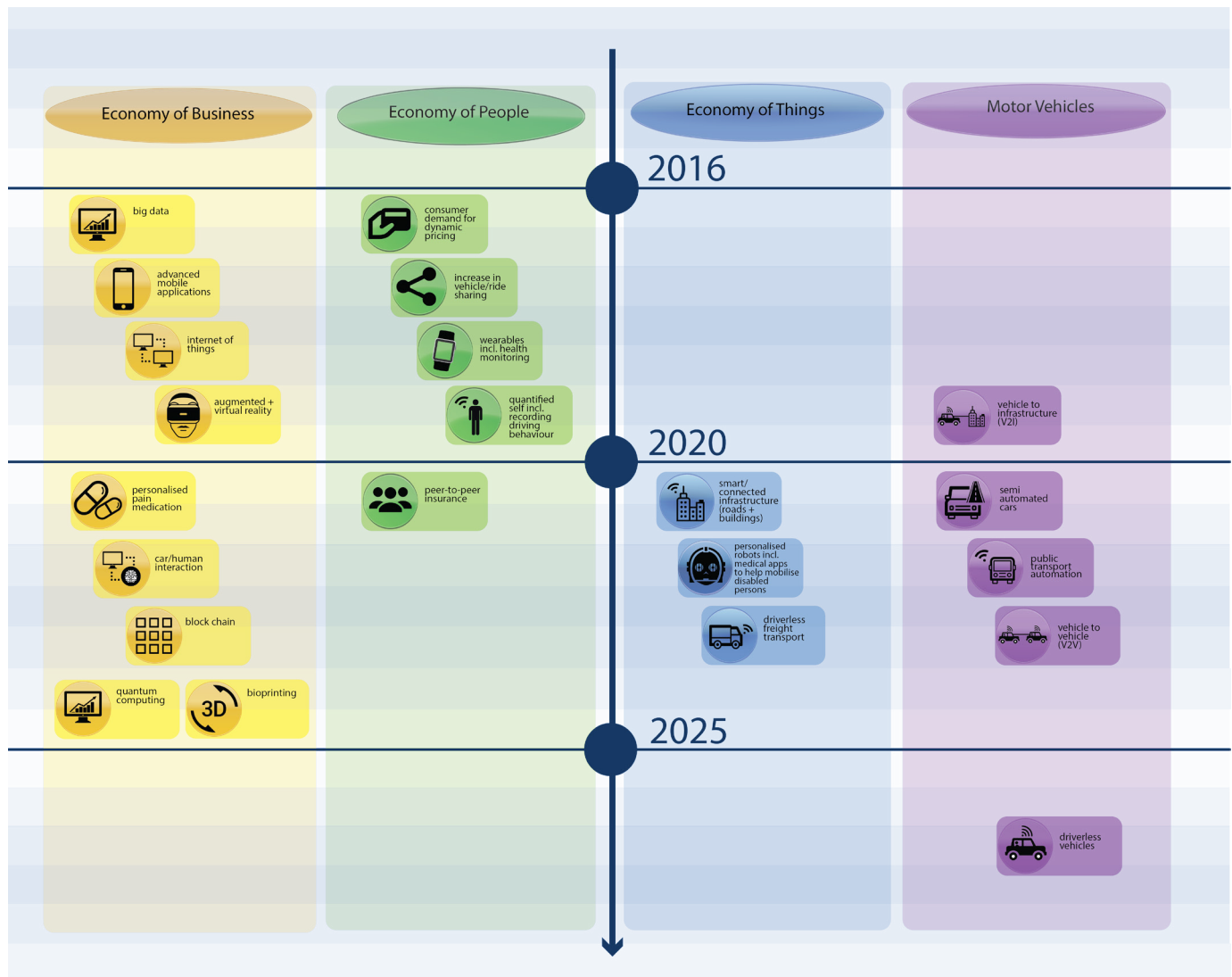


Figure 4 Timeline – when key trends reach critical mass.

3. EXTERNAL ENVIRONMENT TRENDS

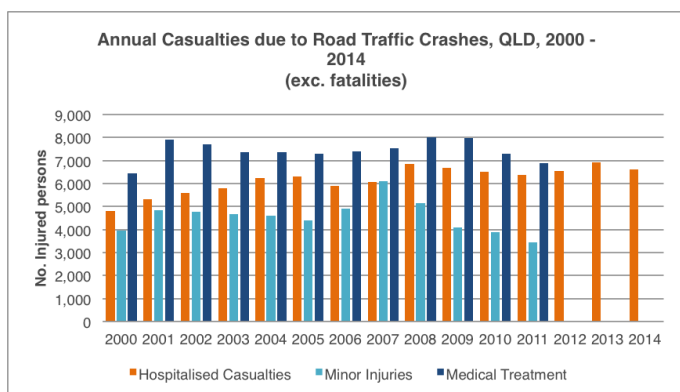
In this section, an overview of key external trends that impact the current CTP scheme is presented. The topics discussed include: driver behaviour, car ownership, perceptions of vehicle automation, demographic and geographic considerations. A summary of relevant medical advances and health costs is also included. Before looking at these external trends, a brief review of road trauma statistics in Queensland is provided below to indicate recent trends.

3.1. ROAD TRAUMA STATISTICS

Road trauma deaths have been steadily declining in Queensland since the late 1960s, from around 32 deaths per 100,000 people to 5 deaths per 100,000

people in 2014 (Department of Transport and Main Roads, 2015b, p. 6).

In 2014, 223 people lost their lives due to a road vehicle incident, which is around 30 per cent fewer deaths compared to the 318 deaths registered in 2000 (DTMR, 2015b, p.7). However, over the same period, the number of hospitalised casualties increased by nearly 40 per cent - from 4,791 in 2000 to 6,612 in 2014. No explanation is provided for the increased number of hospitalisations in the *Safer Roads, Safer Queensland Road Safety strategy, 2015–21*, which reports this increase. Personal communication with an officer at the Data Analysis Unit at DTMR suggests that better reporting of hospitalisations may partly explain the increase. A relevant trend that can be observed from around 2007/2008 to 2011 is a decreasing number of casualties requiring medical treatment or experiencing minor injuries (see figure 5). Again, it is unclear why there is a reported decline in these types of casualties, so further investigation may be worthwhile.



Source: Queensland Government, Department of Transport and Main Roads, data analysis unit, supplied 7 March 2016.

Figure 5 Annual casualties due to road traffic crashes (exc. fatalities), 2000 - 2014

The decreasing trend in medical treatments and minor injuries may also correlate with the reducing frequency of claims which has been observed by MAIC (MAIC, 2015b, p. 5). Over the last decade, around 6,500 CTP claims have been lodged each year in Queensland. As the number of claims has been reasonably steady while registrations have steadily increased, the number of claims per 1000 vehicles registered has been slowly decreasing from 2.2 claims per 1000 registered vehicles in 2005-6 to 1.8 claims per 1000 registered vehicles in 2012-13 (MAIC, 2015b, p.5). While there may be various reasons for reduced frequency, it may be worthwhile to explore this data analysis at a later stage.

One explanation for the reduction in some casualty types is the increasing diffusion of car safety technologies such as air bags, crumple zones, electronic stability control (ESC), seat belts, anti-lock braking systems (ABS) (Transport Accident Commission, 2015). For a small number of people instead of dying immediately or soon after a crash, they suffer severe, debilitating injuries (Goodwin as cited in Dowling, 2015). In general, advances in car technology has been focused on protecting occupants in the event of a crash or to a lesser extent minimised the likelihood of an accident by improving the performance of the vehicle (e.g. ESC).

In recent years, motor vehicle technology, particularly vehicle automation, is increasingly aimed at crash prevention. This is where automation will have the greatest impact of the CTP scheme. We anticipate a gradual reduction in the frequency and severity of accidents with increasing levels of semi-automation. However, until driverless vehicles are commonplace, which may more than 10 years away, the human element including poor driver behaviour is main reason behind road trauma.

We note that reducing road trauma involves a broad range of factors beyond just better car technology. A range of other initiatives have contributed to a reduction in the road toll, such as: mandatory seat belt wearing, improvements to road infrastructure, lower blood alcohol limits, ANCAP vehicle crash test programs, and higher requirements for licensing.

3.2. DRIVER BEHAVIOUR

The 'fatal five' behaviours linked to road trauma are: speeding, driver distraction (e.g. using mobile phones), not wearing a seatbelt, driving under the influence of drugs and alcohol and fatigue (Salmon & Read, 2015). Figure 6 below shows the approximate contribution of four of these factors to road crashes.



Sources: 1. Klauer et al. (2006) as cited in QPS, https://www.police.qld.gov.au/EventsandAlerts/campaigns/Documents/mobile_phone_and_distraction_factsheet.pdf; 2. RTTRF 2014; 3. ibid; 4. Australian Transport Council (2011); 5. Contribution to

Figure 6 Four of the main behaviours that contribute to road trauma

From 2010 to 2014, 63 per cent of hospitalisations in Queensland were due to drivers disobeying road rules (DTMR, 2015a, p.2). Note: there are other human factors that contribute to accidents that are not necessarily road rule violations, for example, some forms of distraction or fatigue cannot be proven by police when decisions regarding fault are made. There has been improvement in some poor behaviours in recent years, for example, there has been a decrease in both fatalities and hospitalisations in Queensland due to drink driving and speeding. However, the contribution of distraction/inattention and fatigue to hospitalisations has increased over the same time period. We anticipate that digital distraction could increase if digital dashboard and windscreens demand more attention from drivers. This is a real possibility given that digital businesses generally rely on advertising and app developer fees. Governments

will need to review this trend and ensure regulations are created to ensure vehicle safety is prioritised.

To address poor driver behaviour, governments change or create legislation and enforce compliance through policing and the judicial system. Educational and marketing campaigns are also employed to influence behaviour. These initiatives are important in reducing the burden of road trauma. A recent example of policy change was the introduction of graduated provisional licences for young drivers which has been effective in reducing crashes (Scott-Parker, 2014).

While some reduction in road trauma could be achieved through more effective behaviour management strategies (including interlocks and new approaches to behaviour modification discussed in section 2.1), the purpose of the CTP scheme remains important - at least until driverless vehicles are commonplace.

3.3. CAR OWNERSHIP

Australia has a high rate of car ownership with approximately 764 cars per 1000 people in 2015 (ABS, 2015b). Further, the passenger vehicle dominates mobility in Australia, with approximately 7 in 10 Australians travelling to work or full-time study by car (ABS 2014b).

The level of car ownership is also increasing. Since 2010, the number of motor vehicle registrations per 1000 Estimated Resident Population has increased by 33 vehicle registrations per 1000 population (ABS, 2015c – figure 7). Factors behind this trend may include, but not limited to: rising wealth across population, more older people choosing to drive for longer and insufficient investment in public transport. With regard to the type of vehicles people own, transportation experts believe that the mix of vehicles driven on Australian roads is not expected to change dramatically in the next 15 years (Washington, S., Page, L., Perrons, R., Zheng, Z., Whitehead, J., Hew, A., Zhou, F., McGrath, J. & Aminimansour, S., 2016, p. 5). It is interesting to note that in 2015, the average age of a registered vehicle in Australia is 10.1 years (ABS, 2015c). Government policy targeted towards a faster rate of replacement may be required to hasten the uptake of highly automated vehicles.

There are signs that present car ownership rates may change due to young people delaying private car ownership. For example, in Victoria, over the past 10 years, there has been a drop of 12 percentage points in the number of driver licenses issued to people under 25 years (Clay, 2014). The reasons suggested for this trend are that young people are opting for



2010 – 2015

increased rates of car ownership
33 additional vehicles per 1000 persons
(AUS)

Data source: ABS (2015c) Cat. No. 9309.0 - Motor Vehicle Census, Australia, 31 Jan 2015

Figure 7 Car ownership rates are increasing in Australia

AVERAGE VEHICLE AGE (AUS)



10.1

years old (2015)

Data source: ABS (2015c) Cat. No. 9309.0 - Motor Vehicle Census, Australia, 31 Jan 2015

Figure 8 Average Vehicle Age (Aus) - 2015

study and part-time work, delaying cohabitation and having families, thus reducing the need for private car ownership (Delbosc & Currie, 2014, p. 539). Delbosc suggests that while there is a trend in young people to delay their car purchase, most are likely to buy a car by their late 20s or early 30s (Clay, 2015).

The QUT student survey (n=49) that was conducted for this study in December 2015 revealed that 90 per cent of the students surveyed had a driver's license (See Appendix B). Of the remaining 10 per cent, all but one planned to obtain a license in the future.

63 per cent of the respondents owned a car. Many of those who do not own a car intend on purchasing a vehicle when their life circumstances change:

For example:

"I will buy a car when I have a family"

"I may get a job and look for a motor vehicle"

The survey contained a question that asked students how important is car ownership is to them. Corresponding to the proportion of respondents who owned a car, 64 per cent of students consider car ownership important or very important (figure 9). A much smaller proportion (10 per cent) of the respondents considered car ownership of low importance to them.

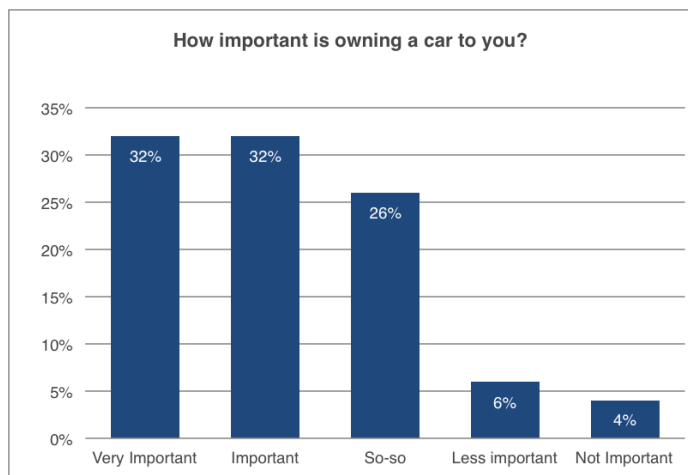


Figure 9 QUT Student survey – how important is owning a car to you? Dec 2015.

With regard to day-to-day transportation, 26 per cent students rely on a private vehicle during weekdays (either as a driver or passenger). On the weekends, use of a private vehicle is much more popular with 67 per cent of students choosing to drive or be passengers in a car.

This research shows that Australians are still heavily reliant on private transportation, particularly in the form of a car. Other variables, such as fuel prices, improved and cheaper public transportation, will influence these ownership rates in the medium term. It is anticipated that driverless vehicles may disrupt the personal car ownership model, shifting people towards a car or ride share model.

3.3.1 PERCEPTIONS OF AUTOMATED MOTOR VEHICLES

Consumer uptake of driverless vehicles was raised by workshop participants as an area of uncertainty. The student survey, coupled with examples from other research studies, show that while the majority of people have positive views regarding vehicle automation, there are some who have reservations.

Across the globe, there are varying levels of positive consumer sentiment surrounding car automation. Schoettle & Sivak (2014) surveyed consumers in China, India, Japan, the US, the UK and Australia

in 2013 and 2014 about their views on driverless vehicles. They found that more than 80 per cent of consumers in China and India had positive views on driverless vehicles (2014, p.6). *In Australia, 62 per cent of consumers had positive views regarding automation and driverless vehicles* (2014, p.6). 27 per cent of the Australians surveyed were neutral in their views regarding driverless vehicles, around 11 per cent had negative opinions on the introduction of highly automated vehicles. This suggests that just under 40 per cent of Australians may require further information or persuasion to overcome concerns surrounding driverless vehicles.

Similar sentiments are also reflected the student survey. 60 per cent of students, mostly aged 18 to 25 years, suggested they would be happy to travel in a driverless car. However, 19 per cent of those surveyed would not be happy to travel in a driverless car and 21 per cent were unsure (figure 10).

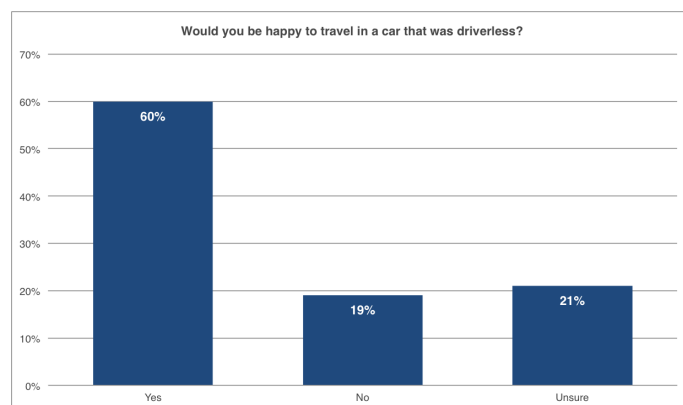


Figure 10 QUT Student Survey – happy in a driverless vehicle? Dec 2015.

About half of respondents said own right they would miss driving in a ‘driverless car world’. However, around 40 per cent wouldn’t miss driving (figure 11).

When students were asked to provide their thoughts on the topic of driverless cars, around half of the students noted that there were issues surrounding the technology that needed to be addressed before they would use a driverless vehicle. A few of the respondents were not keen on the idea of driverless vehicles.

For example:

“Fantastic technology, but not for me”

“The technology would need to be totally perfected and widespread before I would trust it to, say, merge on Coronation Drive!”

“Driverless cars seem to take the enjoyment out

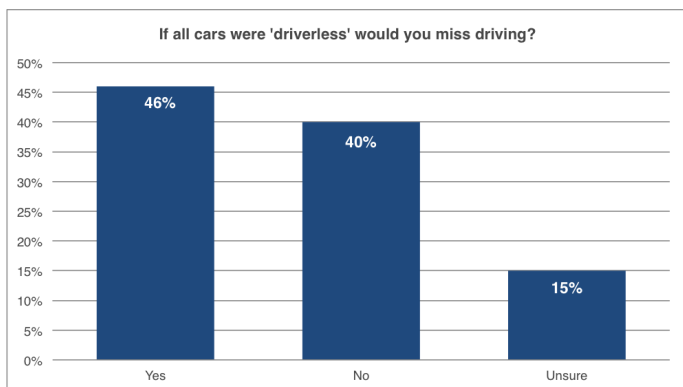


Figure 11 QUT Student Survey, would you miss driving in a driverless world? Dec 2015.

of driving, and it would be hard to ensure that it is safe in every circumstance.”

3.4. DEMOGRAPHIC TRENDS

In this section, the changing age profile of Queensland is presented with a focus on an anticipated increase in older drivers. We also provide examples of how low income and disadvantaged households may be affected by some of the trends discussed in this report.

Ageing Population

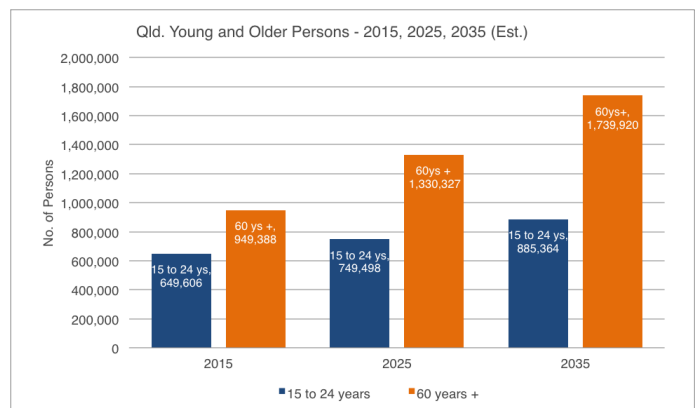
Based on a medium growth projection, the Queensland government expects the population to grow to approximately 5.9 million people in 2025 and 7 million in 2035 (Queensland Government Statistician Office, 2013). The latest estimate for Queensland’s population is 4.78 million persons (ABS, 2015d).

Australia is on an ‘ageing’ trajectory. The median age of Australians increased by 4 years between 1994 (33.4 years) and 2014 (37.9 years) (ABS, 2014). This trend is likely to continue due to better health care and lower birth rates.

As a proportion of Queensland’s estimated population, the size of the 60+ age group will increase from approximately 19 per cent in 2015 to 23 per cent in 2025. This is an additional 381,000 people in this older age cohort. By 2035, approximately a quarter of Queensland’s population will be 60 years and over.

For comparative purposes, the number of people aged between 15 and 24 years will also increase, however it is at a much slower rate (figure 12).

It should be noted that there are different age references for older drivers. For example VicRoad refers to older drivers as being aged 75 years and over (VicRoads, 2015). However, Queensland Department of Transport and Main Roads (DTMR)



Source: Queensland Government Statistician Office, Medium Projection, 2013.

Figure 12 Comparison of young persons and older persons in QLD, 2015, 2025 and 2035.

identify drivers aged 60+ years as a risk characteristic in road deaths and hospitalisations statistics (DTMR, 2015a). BITRE (2014, p. 13) refers to older drivers as people aged over 55 years.

While it is acknowledged that an individual’s physical and mental health deteriorates at different rates, it is recognised that older drivers:

- are more likely to have a medical condition that impairs their driving;
- take longer to respond to traffic signals and events; and,
- are more likely to have accidents at intersections or when merging on multi-lane roads (VicRoads, 2015).

Despite the inconsistent age criteria across these definitions, the consensus is that fatalities and injuries for older drivers are rising (BITRE, 2014, p. 13). In 2014, one in five road fatalities in Queensland involved a driver aged 60 years or older (DTMR, 2015a, p.4 – figure 13). Further, 22 per cent of fatalities were linked to senior adult road users (i.e. pedestrians, cyclists).

The most recent cohort of older drivers is mostly comprised of baby boomers which have different lifestyles, transportation preferences and higher wealth than their parents. They are more likely to drive for longer and are typically reliant on private vehicle transportation, particularly in areas with poor public transportation (L.Buys, personal communication, October 6, 2015). Zeitler & Buys (2015) discuss the importance of access to private vehicles for older people in maintaining social connections and preferred travel patterns. For older people (and possibly most private car users), “the ability to transport goods and other people is a significant advantage of the private car over other



Source: DTMR, 2015a

Figure 13 Older drivers and road fatalities, QLD

transport options” (Zeitler & Buys, 2015, p. 1). It will be important to follow research that investigates how alternatives to private car ownership, such as public transportation and car sharing models can be developed so they are more accessible, convenient and affordable for older people (Zeitler & Buys, 2015, p. 5). The authors continue in concluding: “it is critical to establish age-friendly means of transportation to enhance older people’s engagement in all types of activities within their community” (Zeitler & Buys, 2015, p. 20).

Disadvantaged households

All of the trends discussed in this report should be considered from the perspective of low and middle income households, as well as people who are disadvantaged and/or vulnerable. The following points were raised by domain experts during the study:

- The ability to upgrade to new vehicles or access adequate public transportation is relatively more difficult for lower income households, people living in outer suburbs, regional towns or in rural/remote areas.
- Imposing costs, such as higher CTP premiums for less safe vehicles (the inverse of cheaper CTP for new, safe vehicles) could also be perceived as inequitable.
- Lower income households “have less access to medical services, their chances of recovery after crashes are also relatively lower” (Australian Transport Safety Bureau, 2004, p 6).
- People with care responsibilities, such as parents, aged and disability carers are heavily reliant on private car use (Turner and Niemeier 1997; Currie and Delbosc 2011 as cited in Kamruzzaman et al., 2014, p. 2134). The likelihood of carers being unable to use alternate transportation or upgrade to new vehicles will be lower than the general population as a majority of carers earn less than \$40,000 per annum (Anon. ABC News, 2015).
- Shift workers and people working in areas with

inadequate public transportation are highly dependent on private vehicles.

3.4.1 GEOGRAPHIC DISTRIBUTION

The majority of Queensland’s residents live in a metropolitan or regional town setting. They are more likely to benefit from transport orientated urban design, car sharing and other infrastructure aimed at reducing dependency on cars.

Residents in rural and remote areas are not as fortunate and are likely to maintain a high reliance on traditional private vehicle transportation. The difference between geographic settings will need to be accounted for when evaluating how the other trends will impact upon the CTP scheme.

The following questions were raised by workshop participants during the study:

- **Will driverless vehicles be able to navigate dirt roads or roads that are affected by flooding?** This is an area of uncertainty and a challenge for car manufacturers and developers of automation technology. It is understood, for example, that driverless cars rely on scans of roads, kerbs and other road features to assist with navigation. However, some vehicles may have a higher reliance on built-in scanners, ultrasound, lasers, etc. to navigate any terrain.
- **Will there be sufficient Internet access and funds for Intelligent Transportation Systems (ITS) in remote areas to support automated and connected vehicle usage?** Currently there are large swathes of Queensland which may not have adequate internet infrastructure and there is uncertainty surrounding the provision of this infrastructure in the near future.
- **Will remote areas have access to maintenance for newer, computerised vehicles?** This potential issue, while seemingly new, is an extension of the existing issue – with most new car being only serviceable by experts, due to high level of automation and electronics.
- **Will telehealth be effective in managing rehabilitation for injured people who reside in regional, rural or remote areas?** Access to advanced medical treatments may or may not be more accessible to residents in remote and regional areas. Further, while telehealth may assist patients with some aspects of

their rehabilitation such as receiving timely advice from medical specialists, access to medical services such as physiotherapy will still remain more difficult to obtain for rural/remote residents.

3.5. MEDICAL TRENDS

There are hundreds of promising advances in medical care that are currently under development or recently introduced into practice that will improve health outcomes for road trauma victims. The following medical advances are a small selection of these advances which are likely to improve both physical and mental health outcomes for injured persons. Note: 3D bio fabrication is discussed in section 2.1.10 as it is a part-digital technology that is a significant innovation for medical care.

Personalised pain medication and management

Pain management is a critical area for medical research generally, but for the CTP scheme it is important as pain may influence many elements within a claim, not just general damages. For example, chronic pain may be a lifetime burden that may indefinitely prevent people from working.

New discoveries in genome studies are helping clinicians to identify how individuals respond to particular medical treatments. Further, personalised medication can be prepared based on individual metabolic responses (President's Council of Advisors on Science and Technology, 2008 as cited in NHMRC, 2011, p. 2). In the US, there are studies currently underway where complex genetic and molecular tests are being used to test if COX-inhibitors and neurotrophins can relieve pain (National Institute of Health, 2015).

Tissue regeneration

Scientific endeavours in the fields of stem cells and biologics are promising areas that will help patients with a range of injuries, including spinal injuries.

Tissue regeneration using stem cells is likely to lead to better outcomes as patients are less likely to reject stem cell therapy (Goodrich, 2014). Researchers at University of Queensland are currently looking into how stem cells and biomaterials can heal a range of common ailments, including "intervertebral disc and joint degeneration... and how we can repair heart tissue post a heart attack" (Prof Justin Cooper-White as cited in University of Queensland, 2015).

Robotics

There are numerous applications of robotics in the medical field including: robot-assisted surgery, robotic limb replacement and robotic exoskeletons. Robot-

assisted surgery has been available in Australia for more than a decade, however the technology is mostly applied in limited specialised fields, such as urology (Hospital Healthcare News, 2014). For trauma patients, robotic limb replacement and robotic exoskeletons are also available in Australia (Making Strides, 2016; Brisbane Prosthetics, 2016). These devices are expected to improve significantly as researchers hone the technology surrounding of brain – machine interface (neural interface). For example, in 2017 researchers at University of Melbourne will be trialling a minimally invasive neural interface device that will be implanted into a blood vessel next to the brain (University of Melbourne, 2016). The device will detect neural activity that can move a bionic limb or exoskeleton.

At QUT, a research project will commence in June 2016 that will investigate if robots can be deployed to retrieve and/or treat people who have sustained a traumatic injury (Roberts & Crawford, 2016, 2016). The focus will be on providing this service in an inaccessible/dangerous location with medical oversight and diagnostics provided remotely.

Psychological benefits

Apart from the functional improvement and physical wellbeing that can be achieved through medical advances, it is worth considering the psychological benefits that patients experience from having personalised or tailored medical care (C. Aitken, personal communication, November 10, 2015). It is not uncommon for trauma patients to experience depression and anxiety after injury and the above advances may reduce the mental health impact by promoting faster recovery and better functional outcomes. Any reduction to psychological stress or contributors to an injured person may reduce the cost of medical treatment and loss of income.

3.5.1 APPLICATION OF DIGITAL TECHNOLOGIES IN HEALTH

Electronic Health Records

Electronic health records aim to improve efficiencies and quality of care. For injured persons there would be several advantages of electronic health records such as enabling emergency medical care personnel to quickly access vital medical history information in an emergency and maintaining a record of procedures across various medical and allied health treatments. At present, access to health records are restricted to medical professionals, however patients are able to view their record. Perhaps a possible extension of e-health records would be the ability of patients to share data with other agencies, such as insurance companies for claims purposes.

Australia introduced opt-in, personal control, e-health records in July 2012. As of mid-2015, fewer than 10% of residents had an e-health record – undoubtedly a slow take up. More recently, the Commonwealth government passed new legislation that switches the scheme to opt out. Cowan (2015) reports a big data opportunity for a newly expanded database of medical records as the Commonwealth government seeks advice on how to de-identify the data.

3.6. HEALTH COSTS

Assessing health costs alongside medical advances is relevant in this report, as it directly relates to increases in compensation costs. Also, research indicates that the rise in health expenditure can be attributed to “development of new technologies, pharmaceuticals and diagnostic and treatment techniques” (AIHW, 2014, p.56).

Health costs, as recorded in the September 2015 Consumer Price Index, increased by 4.8 per cent since September 2014 (ABS, 2015, Cat. 6401.0). Compared with the cost of the entire basket of goods (Consumer Price Index), which increased by 1.5 per cent, health costs are rising relatively fast. The ABS (2015) identifies the subcategory: ‘medical and hospital services’ as one of the main contributors to overall rise in health costs. This subcategory saw prices increase by 6.6 per cent over the year to September 2015.

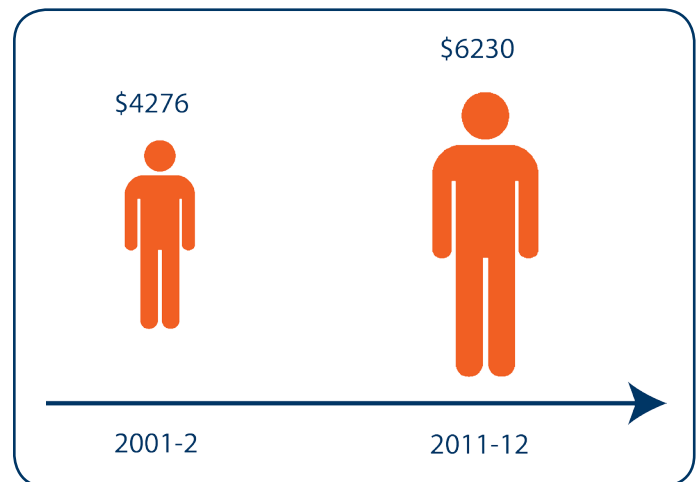
Looking at broad trends in health expenditure, the growth in spending has increased faster than GDP growth and population growth (AIHW, 2014, p.47). Per person, expenditure (adjusted for inflation) has increased from \$4,276 in 2001-02 to \$6,230 in 2011-12 (Figure 14).

Injuries are the fifth largest ‘disease’ with regard to total medical expenditure (AIHQ, 2014, p. 51). In 2008-09, just over \$5 billion was spent dealing with all injuries. Further, around 80 per cent of the injuries expenditure was related to in-hospital services.

The Australian Government anticipates that real health expenditure per person is projected to “more than double over the next 40 years” (Commonwealth Government, 2015, p. xvi). The 2015 Intergenerational Report also anticipates that State government health expenditure will also be significantly higher.

For the CTP scheme, in the short term, rising medical costs are important to note. However, rising costs may be offset by improving motor vehicle automation technology which is expected to reduce the frequency and severity of crashes.

HEALTH EXPENDITURE (AUS) PER PERSON (ADJUSTED)



Source: AIHW 2014, p. 47

Figure 14 Increase in health expenditure, Aus, 2001/02 to 2011/12

Any medical advances that result in better, quicker rehabilitation for injured persons so they don't suffer significant future economic loss is highly desirable for the CTP scheme.

4. CONCLUSION

The need for a universal, road trauma insurance scheme is confirmed for at least the next 10-15 years, particularly with the continuing use of conventional vehicles. As automation technology advances, the costs associated with road trauma are expected to decrease at a corresponding rate. Medical advances and better assistive technologies will also effectively help injured people recover quicker. Ultimately, the CTP scheme in its current form will become redundant.

In the short term, we argue that the CTP scheme will need to be adjusted and modernised. In the medium to long term, the function of the CTP scheme could be absorbed into another scheme.

With regards to adjusting and modernising the CTP scheme, the research undertaken during this study has revealed that:

- better assessment and pricing of risk is possible with real-time tracking and big data analytics;
- innovations in administrative processes can improve efficiency;
- new insurance models are emerging; and
- a shift away from private vehicle ownership in favour of more vehicle sharing will accelerate.

With regard to the current CTP scheme being absorbed into another scheme, we reached this conclusion based on three main considerations:

1. In the long term, the costs associated with road trauma are likely to be significantly lower due to vehicle automation.
2. Mandatory CTP premiums are effectively a levy paid by registered vehicle owners to ensure road trauma is adequately covered. As such, we believe governments can explore the feasibility of including all injured persons in the scheme, regardless of fault, or even injuries that may arise from other forms of mobility. The levy may need to be distributed across all households, not just registered vehicle owners.
3. The Queensland or Commonwealth governments may look to cover all citizens with transport/mobility injuries by allowing the National Disability Insurance Scheme or the National Injury Insurance Scheme to absorb all injured persons who require compensation for medical treatment, rehabilitation services and/or economic loss if they are unable to return to productive lives due to road trauma

The study recommendations are contained in Executive Report (Part A).

REFERENCES

- Anderson, M. & Auffhammer, M. (2014). Pounds that Kill, *ACCESS Magazine*, Fall, retrieved from: <http://escholarship.org/uc/item/0s47p33c> accessed 14 December 2015.
- Anon. (2015, December 10). Carers struggle with technology demands, low incomes: survey. *ABC News*. Retrieved from: <http://www.abc.net.au/news/2015-10-12/carers-struggle-with-technology-demands-low-incomes-survey-finds/6845752> accessed 8 December 2015.
- Atfield, C. (2015, June 21). Driving 'cheaper than public transport', say Queenslanders. *Brisbane Times*. Retrieved from: <http://www.brisbanetimes.com.au/queensland/driving-cheaper-than-public-transport-say-queenslanders-20150621-ghtse2.html> accessed 15 December 2015.
- Australian Bureau of Statistics. (2014a). 3101.0 - Australian demographic Statistics, June 2014. Retrieved from: <http://www.abs.gov.au/ausstats/abs@.nsf/mf/3101.0>, accessed 24 August 2015.
- Australian Bureau of Statistics. (2014b). 4102.0 - Australian Social Trends, July 2013. Retrieved from: <http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/4102.0Main+Features40July+2013#use> accessed 2 September 2015.
- Australian Bureau of Statistics. (2015a). 5206.0 - Australian National Accounts: National Income, Expenditure and Product, Sep 2015. Retrieved from: <http://www.abs.gov.au/ausstats/abs@.nsf/mf/5206.0> accessed 8 December 2015
- Australian Bureau of Statistics. (2015b). Media release: Strong growth trend in Australia's employment continues, 10 December. Retrieved from: http://www.wds.worldbank.org/external/default/WDSPContentServer/WDSP/IB/2015/02/03/000477144_20150203144330/Rendered/PDF/940370BRI0Box385423B0QN14100PUBLIC0.pdf accessed 14 December 2015.
- Australian Bureau of Statistics. (2015c). 9309.0 - Motor Vehicle Census, Australia, 31 Jan 2015 <http://www.abs.gov.au/AUSSTATS/abs@.nsf/allpri marymainfeatures/06D0E28CD6E66B8ACA2568A900139408?opendocument> accessed 8 December 2015.
- Australian Bureau of Statistics. (2015d). 3101.0 - Australian demographic Statistics, June 2015. Retrieved from <http://www.abs.gov.au/ausstats/abs@.nsf/mf/3101.0>, accessed 8 December 2015.
- Australian Government, Department of Broadband, Communications and the Digital Economy, (2009), *Australia's Digital Economy: Future Directions*, <http://www.ict-industry-reports.com/wp-content/uploads/sites/4/2012/08/2009-Digital-Economy-Future-Directions-Report-DBCDE-2009.pdf>, accessed 3 Feb 2015.
- Australian Government. (2015). *2015 Intergenerational Report*. Retrieved from: http://d3v4mnyz9ontea.cloudfront.net/2015_IGR.pdf accessed 22 December 2015.
- Australian Institute of Health and Welfare. (2014). *Australia's health 2014*. Retrieved from: <http://www.aihw.gov.au/WorkArea/DownloadAsset.aspx?id=60129548150> accessed 22 October 2015.
- Barrett, R., & Bennett, S. (2015). *Digital Economy: Our Perspective*, PwC Chair in Digital Economy, unpublished.
- Bender, A. (2014). Oculus Rift shows (virtual) reality of car crashes. *Computer World*. Retrieved from: http://www.computerworld.com.au/article/540645/oculus_rift_shows_virtual_reality_car_crashes/ accessed: 8 March 2016.
- Bonnefon, J-F., Shariff, A. & Rahwan, I. (2015). Autonomous vehicles need experimental ethics: Are we ready for utilitarian cars? Cornell University Library, Computers and Society. arXiv:1510.03346
- Barton, G., Khavul, S., Siegel, D. & Wright, M. (2014). New Financial Alternatives in Seeding Entrepreneurship: Microfinance, Crowdfunding, and Peer-to-Peer Innovations. *Entrepreneurship Theory and Practice*, January, 2015. DOI: 10.1111/etap.12143
- Bureau of Infrastructure, Transport and Regional Economics (2014). Impact of road trauma and measures to improve outcomes, report 140. Retrieved from: https://bitre.gov.au/publications/2014/files/report_140.pdf accessed 22 October 2015.
- Carey, A. (2015, November 2). Breath testing: could alcohol interlocks be fitted to all Australian vehicles? *Sydney Morning Herald*. Retrieved from: <http://www.smh.com.au/national/breath-testing-could-alcohol-interlocks-be-fitted-to-all-australian-vehicles-20151102-gkow5j.html> accessed 8 December 2015.

City of Sydney. (2011). Car Sharing Policy. Retrieved from: http://www.cityofsydney.nsw.gov.au/__data/assets/pdf_file/0010/109099/CarSharingPolicy.pdf accessed 8 December 2015.

Clay, M. (2014, November 20). How Millennials are driving the shift away from cars, *The Drum*. Retrieved from: <http://www.abc.net.au/news/2014-11-20/clay-millennials-are-driving-the-shift-away-from-cars/5906406> accessed 25 August 2015.

Clean Energy Ministerial. (2015). *Global Electric Vehicle Outlook*. Retrieved from: <http://www.cleanenergyministerial.org/Portals/2/pdfs/EVI-GlobalEVO Outlook2015-v14-landscape.pdf> accessed 8 December 2015.

Cohen, B. & Kietzmann, J. (2014). Ride On! Mobility Business Models for the Sharing Economy, *Organization & Environment* 27(3), p. 279 – 296.

Cowan, P. (2015). Health dept once advice on de identifying My Health Record data, IT news, November 30, 2015. Retrieved from: <http://www.itnews.com.au/news/health-dept-wants-advice-on-de-identifying-my-health-record-data-412391> accessed 14 March 2016.

Delbosc, A & Currie, G. (2012). Using online discussion forums to study attitudes toward cars and transit among young people in Victoria, *Australasian Transport Research Forum 2012 Proceedings 26 - 28 September 2012*, Perth, Australia.

Deloitte. (2015). 2015 Global health care sector outlook. Retrieved from: <http://www2.deloitte.com/global/en/pages/life-sciences-and-healthcare/articles/global-health-care-sector-outlook.html> accessed 8 December 2015

Department of Transport and Main Roads (2015a). 2014 Summary Road Crash Report, Queensland Road Fatalities, November, 2015. Retrieved from: <http://www.tmr.qld.gov.au/Safety/Transport-and-road-statistics/Road-safety-statistics.aspx>, accessed: 6 November 2015.

Department of Transport and Main Roads. (2015b). Safer Roads, Safer Queensland: Queensland's Road Safety Strategy 2015 – 21, retrieved from: <http://www.tmr.qld.gov.au/Safety/Road-safety/Strategy-and-action-plans.aspx>. accessed 16 December 2015.

Doecke, S., Grant, A. & Anderson, R.W.G. (2015). The Real World Safety Potential of Connected Vehicle Technology. *Traffic Injury Prevention*, 16,

Dowling, J. (2015). Australian road toll hits 69-year low but serious injuries from car crashes are rising, *News*. Retrieved from: <http://www.news.com.au/technology/innovation/motoring/australian-road-toll-hits-69year-low-but-serious-injuries-from-car-crashes-are-rising/news-story/24a1ad61b2cbccea58af36384ee15ecb> accessed 7 December 2015.

Electrical engineering and Computer Science School. (2016). Remote patient robotic assessment and retrieval, student projects and topics. Retrieved from: <https://www.qut.edu.au/research/our-research/student-topics/remote-patient-robotic-assessment-and-retrieval> accessed: 14 March 2016.

Fildes, B. Keall, M., Bos, N., Lie, A., Page, Y., Pastor, C., Rizzi, M. Thomas, P. & Tingvall, C. (2015). Effectiveness of low speed autonomous emergency braking in real-world rear-end crashes, *Accident Analysis and Prevention*, August, 81:24-9.

Fitzharris, M., Liu, S., Peiris, S., Devlin, A., Young, K., & Lenne, M. (2015). *Options to Extend Coverage of Alcohol Interlock Programs*. Austroads Research Report AP-R495-15. September. Retrieved from www.austroads.com.au accessed 16 December 2015.

Fu, W. T., Gasper, J., & Kim, S. W. (2013, October). Effects of an in-car augmented reality system on improving safety of younger and older drivers. In *Mixed and Augmented Reality (ISMAR), 2013 IEEE International Symposium on* (pp. 59–66). IEEE.

Goodrich, M. (2014). Arteries in Aisle 9, *Michigan Tech Research Magazine*. Retrieved from: <http://www.mtu.edu/research/archives/magazine/2014/stories/future-human/> accessed 17 December 2015.

Greenough, J. (2015). The 'connected car' is creating a massive new business opportunity for auto, tech, and telecom companies. *Business Insider*. Retrieved from: <http://www.businessinsider.com.au/connected-car-forecasts-top-manufacturers-2015-2> accessed 22 December 2015.

Griffith, C (2015). Human issues that dog the driverless future, *The Australian*.

Harris, M. (2015) Uber could be first to test completely driverless cars in public, *Spectrum IEEE*. Retrieved from: <http://spectrum.ieee.org/cars-that-think/transportation/self-driving/uber-could->

be-first-to-test-completely-driverless-cars-in-public accessed 7 December 2015.

Hern, A. (2015, December 8). Florida woman arrested for hit-and-run after he car calls police. The Guardian, 8 December. Retrieved from: <http://www.theguardian.com/technology/2015/dec/07/florida-woman-arrested-hit-and-run-car-calls-police> accessed 9 December 2015.

Hospital Healthcare News. (2014). Latest Robotic Surgical System Arrives at Brisbane's Wesley Hospital. Retrieved from: <http://www.hospitalhealth.com.au/news/latest-robotic-surgical-system-arrives-brisbanes-wesley-hospital/> accessed: 14 March 2016.

Insurance Institute for Highway Safety. (2015, September 11). Media Release: U.S. DOT and IIHS announce historic commitment from 10 automakers to include automatic emergency braking on all new vehicles, retrieved from: <http://www.iihs.org/iihs/news/desktopnews/u-s-dot-and-iihs-announce-historic-commitment-from-10-automakers-to-include-automatic-emergency-braking-on-all-new-vehicles> accessed 14 October, 2015.

International Association for Public Transport (2013). Observatory of automated metros world atlas report, 2013. Retrieved from: <http://www.uitp.org/sites/default/files/cck-focus-papers-files/Annual-World-Report-2013.pdf> accessed: 9 December 2015.

Johns, M., Miller, D.B., Sun, C.S., Baughman, S., Zhang, T., Ju, W. (2015). The driver has control: exploring driving performance with varying automation capabilities. *Proceedings of the Eight International Driving Symposium on Human Factors in Driver Assessment, Training and Vehicle Design*.

Kamrazzaman, Md., Yigitcanlar, T., Washington, S., Currie, G. & Turrell, G. (2014). Australian baby boomer switched to more environment friendly modes of transport during the global financial crisis, *International Journal of Environmental Science Technology*, 11, 2133 – 2144. DOI 10.1007/s13762-014-0564-5

Kenny, M. & Massola, J. (2015). MYEFO budget update: Budget deficit projected to reach \$37.4 billion in 2015-16, *Sydney Morning Herald*, December 15. Retrieved from: <http://www.smh.com.au/federal-politics/political-news/myefo-budget-update-budget-deficit-projected-to-reach-374-billion-in-201516-20151214-glnl4k.html#ixzz3uT6opRGV> accessed 15 December 2015.

Kearns, J.(2015, July 9). Satellite images show

economy is growing and shrinking in real time. *Bloomberg Business*. Retrieved from: <http://www.bloomberg.com/news/features/2015-07-08/satellite-images-show-economies-growing-and-shrinking-in-real-time> accessed 8 March 2015.

Lebedev, M. A., & Nicolelis, M. A. (2006). Brain-machine interfaces: past, present and future. *TRENDS in Neurosciences*, 29(9), 536-546.

MAIC. (2015a). Retrieved From: <http://www.maic.qld.gov.au/forms-publications-stats/pdfs/MAIC-Annual-Report-2014-15.pdf> accessed 9 December 2015.

MAIC. (2015b). MAIC Statistical Information, Jan to June 2015. Retrieved from: <http://www.maic.qld.gov.au/forms-publications-stats/pdfs/MAIC-statistical-information-report-june-2015.pdf> accessed 16 February 2015

McKinsey. (2015a). Ten ways autonomous driving could redefine the automotive world. Retrieved from: http://www.mckinsey.com/insights/automotive_and_assembly/ten_ways_autonomous_driving_could_redefine_the_automotive_world accessed 8 December 2015.

McKinsey. (2015b). The Internet of Things: Mapping the Value beyond the Hype. June. Retrieved from: file:///C:/Users/bennets7/Downloads/Unlocking_the_potential_of_the_Internet_of_Things_Full_report.pdf accessed 16 March 2016.

Moss, S. (2015, April 28). End of the car age: how cities are outgrowing the automobile, *The Guardian*. Retrieved from: <http://www.theguardian.com/cities/2015/apr/28/end-of-the-car-age-how-cities-outgrew-the-automobile> accessed October 5, 2015.

Mottaghi, L. (2015). MENA Quarterly Economic Brief: Plunging Oil Prices, *MENA Knowledge and Learning, Quick Notes Series, No. 141*, February. Retrieved from: http://www.wds.worldbank.org/external/default/WDSPContentServer/WDSP/IB/2015/02/03/000477144_20150203144330/Rendered/PDF/940370BRI0Box385423B0QN14100PUBLIC0.pdf accessed 9 December 2015.

Murphy, M. (2015). Final decision: eCall will be fitted into all new cars and vans made in Europe, *Techworld*. Retrieved from: <http://www.techworld.com/news/personal-tech/europe-confirms-ecall-car-technology-will-be-mandatory-by-march-2018-3609870/> accessed 6 December 2015

Naughton, K. (2015). Humans Are Slamming Into Driverless Cars and Exposing a Key Flaw.

Bloomberg. Retrieved from: <http://www.bloomberg.com/news/articles/2015-12-18/humans-are-slamming-into-driverless-cars-and-exposing-a-key-flaw> accessed 23 December 2015.

Ng, I. C. (2014). New business and economic models in the connected digital economy. *Journal of Revenue and Pricing Management*, 13(2), 149-155. doi:<http://dx.doi.org/10.1057/rpm.2013.27>

O'Connor, A. (2016). French made driverless electric bus to be trialled in Perth by RAC, ABC News, retrieved from: <http://www.abc.net.au/news/2016-02-09/driverless-electric-bus-to-be-trialled-wa-rac/7152650> accessed 10 February, 2016.

OECD. (2015). Australia – Economic forecast summary (November 2015). Retrieved from: <http://www.oecd.org/eco/outlook/Australia-economic-forecast-summary.htm> accessed 8 December 2015

Queensland Government Statisticians Office. (2013). Population Projections – Medium projection. Retrieved from: (<http://www.qgso.qld.gov.au/subjects/demography/population-projections/>) accessed 24 September 2015.

Renault-Nissan Alliance. (2016, January 7). RE-NAULT-NISSAN TO LAUNCH MORE THAN 10 VEHICLES WITH AUTONOMOUS DRIVE TECHNOLOGY OVER THE NEXT FOUR YEARS Retrieved from: <http://www.media.blog.alliance-renault-nissan.com/news/renault-nissan-to-launch-more-than-10-vehicles-with-autonomous-drive-technology-over-the-next-four-years/#sthash.bzzfS8Rw.dpuf> accessed 9 February 2016.

Rusch, M. L., Schall Jr, M. C., Lee, J. D., Dawson, J. D., & Rizzo, M. (2014). Augmented reality cues to assist older drivers with gap estimation for left-turns. *Accident Analysis & Prevention*, 71, 210-221.

Scott-Parker, B. (2014, April 24). A new approach to cut death toll of young people in road accidents, *The Conversation*. Retrieved from: <http://theconversation.com/a-new-approach-to-cut-death-toll-of-young-people-in-road-accidents-25372> accessed 21 December 2015.

Schoettle, B. & Sivak, M. (2014). A survey of public opinion about autonomous and self – driving vehicles in the US, the UK, and Australia. University of Michigan transport research Institute. UMTRI – 21. July. Retrieved from: <https://deepblue.lib.umich.edu/bitstream/handle/2027.42/108384/103024.pdf?sequence=1&isAllowed=y> accessed: 21 October 2015.

Somers, A. & Weeratunga, K. (2015). Automated vehicles: are we ready? Internal report on poten-

tial implications for Main Roads WA. Retrieved from: <https://www.mainroads.wa.gov.au/Documents/Automated%20Vehicle%20Report.RCN-D15%5E2381741.PDF> accessed October, 2015.

Steinberger F., Schroeter, R., Lindner, V., Fitz-Walter, Z. Hall, J. & Johnson, D., (2015). Zombies on the road: A holistic design approach to balancing gamification and safe driving. In *Proceedings of the 7th International Conference on Automotive User Interfaces and Interactive Vehicular Applications*, Association for Computing Machinery, Nottingham, UK, pp. 320-327.

Transport Accident Commission. (2015). Air bags and ESC reduce road deaths. Retrieved from: <http://www.howsafeisyourcar.com.au/News/2015/Airbags-and-ESC-reduce-road-deaths/> accessed 19 November 2015.

Tucker, H. (2015). Volvo will be the first car company with a driverless car on Aussie roads, *News* retrieved from: <http://www.news.com.au/technology/innovation/volvo-will-be-the-first-car-company-with-a-driverless-car-on-aussie-roads/story-fn-jwucvh-1227450866566> accessed 26 August 2015

University of Queensland. (2015). Press Release: UQ receives regenerative medicine award. Retrieved from <https://www.uq.edu.au/news/article/2015/10/uq-receives-regenerative-medicine-award> accessed 8 December 2015.

VicRoads. (2015). The ageing driver. Retrieved from: <https://www.vicroads.vic.gov.au/safety-and-road-rules/driver-safety/older-drivers/the-ageing-driver> accessed: November 12, 2016.

Visser, J., Melchels, FP., Jeon, JE., van Bussel, EM., Kimpton, LS., Byrne, HM., Dhert, HM., Dalton, PD., Huttmacher, DW. & Malda, J. (2015). Reinforcement of hydrogels using three-dimensional printed microfibers. *Nature Communications* (6). April. DOI: 10.1038/ncomms7933

Washington, S., Page, L., Perrons, R., Zheng, Z., Whitehead, J., Hew, A., Zhou, F., McGrath, J. and Aminmansour, S. (2016). Emerging trends in the vehicle and mobility markets of the Asia – Pacific region: what the experts think, Version 2.0.

Weeratunga, K. & Somers, A. (2015). Connected vehicles: are we ready? Internal report on potential implications for Main Roads WA. Retrieved from: <https://www.mainroads.wa.gov.au/Documents/Connect%20Vehicles%20Web.RCN-D15%5E23413758.PDF> accessed October 2015.

Whitney, L. (2014). Apple aims to disable texting while driving. *Cnet*. Retrieved from: <http://www.cnet>.

[com/au/news/apple-aims-to-disable-texting-while-youre-driving/](http://www.abc.net.au/news/apple-aims-to-disable-texting-while-youre-driving/) accessed 20 October 2015.

Widdowson, N. (2015). QUT breakthrough in 3D printing of replacement body parts. Retrieved from: <https://www.qut.edu.au/institute-of-health-and-biomedical-innovation/about/news/news?news-id=88138> accessed 20 December 2015.

Wright, G. & Cairns, G. (2011). *Scenario Thinking: Practical Approaches to the Future*. Palgrave Macmillan UK, DOI: 10.1057/9780230306899.

Zeitler, Elisabeth & Buys, Laurie (2015). Mobility and out-of-home activities of older people living in suburban environments : 'Because I'm a driver, I don't have a problem'. *Ageing and Society*, 35(4), pp. 785-808.

GLOSSARY

Augmented Reality	Augmented reality involves enhancing physical worlds with digital information, in transportation; a common application is head up display.
Automation	The use of technology, techniques and/or computers to carry out an activity that may have once required human effort.
Semi-automated vehicles (semi-automation)	This includes a range of technologies that automate and/or improve the operation of a motor vehicle. A human driver is still required to operate or be able to take over control of the vehicle if required. Basic examples of semi-automation technology include cruise control, Anti-Lock Braking, Electronic Stability Control. More recent examples of semi-automation or driver-assist technologies include Autonomous Emergency Brakes, Lane Keeping, adaptive cruise control, autonomous parking.
Fully-automated vehicles	Commonly referred to as driverless vehicles, self-driving vehicles, or autonomous vehicles. A fully automated vehicle is able to move to a destination without human input/control.
Connected Vehicles	Connected vehicles are equipped with computers and wireless technology that allow communication between other vehicles (V2V), infrastructure (V2I) or other devices via the internet, local network or the cloud (Weeratunga & Sommers, 2015, p iii).
Intelligent Transportation Systems	Intelligent Transport Systems (ITS) describe technology applied to transport and infrastructure to transfer information between systems for improved safety, productivity and environmental performance. This includes stand-alone applications such as traffic management systems, information and warning systems installed in individual vehicles, as well as cooperative ITS (C-ITS) applications involving vehicle to infrastructure and vehicle-to-vehicle communications (Source: Australian Government, Department of Infrastructure and Regional Development, 2016)
Virtual reality	Virtual reality on the other hand, involves delivering a digital simulation experience for the user.

APPENDIX A: SCENARIOS

Introduction to the Scenarios

Early in the “CTP Scheme in the Digital Economy Project” a list of issues that are likely to impact the current CTP Scheme in Queensland was prepared with representatives from the Motor Accident Insurance Commission (MAIC). After further interviews and workshops with QUT academics and a literature review, an expanded list of factors was created (See Box 1).

For the purpose of preparing future scenarios, we have prioritized some of the issues that are perceived to have the highest impact on the current CTP scheme. These are:

1. *The rate of change in car automation technology*
2. *Consumer attitudes towards car automation*
3. *Ability to modify driver behaviour*
4. *Changing attitudes towards car sharing*
5. *Public transportation policy*
6. *Changes to medical treatments and outcomes*

Other influencing factors that are highly relevant to these scenarios are the PESTLE factors: Political, Economic, Social, Technology, Legal and Ecological.

The following pages present four scenarios. Two of the scenarios are ‘extreme cases’ either the best outcomes desired are achieved or the worst possible scenario eventuates. In between, there are two other scenarios that capture different aspects – finding a middle ground.

We ask that you read each of the scenario storylines carefully and consider the following:

- Is each of the scenarios possible² and plausible³? – our research indicates yes, but we need your responses
- If so, what are the key decisions and actions in the immediate future that may influence the likelihood of each scenario? Who will need to be involved in making these decisions and following through with the actions?
- What are the decisions and actions that are not taken that could have averted a worst case outcome?

2 Possible: “It may happen, but it is not certain”

3 Plausible: “Reasonable, believable, probable”

Box 1: List of factors that may impact the current CTP Scheme:

1. *Car automation*
2. *Driver behavior*
3. *Car ownership*
4. *Car sharing*
5. *Demography*
6. *Geographic distribution*
7. *Medical costs and advances*
8. *Road infrastructure*
9. *Enforcement*
10. *Insurance companies*
11. *Road policies*
12. *Transportation policy*
13. *Political*
14. *Economic*
15. *Social*
16. *Technology*
17. *Legal*
18. *Ecological*

- What must you – individually and in your organisation – do in the very near future to maximise the chances of a best case scenario future?

We ask you to come to the workshop prepared to engage in open, critical, constructive debate on these issues.

SCENARIO 1: “THE GLASS IS FULL” (HI TECH/HI DEMAND) - 2025

Over the past decade, Queenslanders have been fortunate on several fronts. There has been near-full employment and strong economic growth. The ‘food boom’ has been continuing for seven years with demand from Asia rising more than anticipated. Following the Paris climate summit in 2015, Australia agreed to radical energy and transportation policy changes which led to heavy investment in electric car recharge stations, public transport, solar powered vehicles and Intelligent Transport Systems (ITS).

In 2025 all new cars in Queensland feature autonomous emergency braking (AEB) and lane keeping technology. Progressive car replacement incentives, along with strong consumer sentiment have seen the rapid renewal of Queensland’s vehicle fleet. Cars manufactured pre-2010 are a miniscule proportion of the car fleet and mostly confined to enthusiasts of vintage cars who require special permits. Car manufacturers from new smaller emerging markets supply low cost, safe, highly automated vehicles that are affordable for low income

households.

In metropolitan areas and regional towns, public transport and shared vehicles are popular, including high demand for electric, highly automated minipod cars that are stationed at hundreds of locations across the Brisbane, the Gold and Sunshine Coasts and other larger regional cities.

New cars manufactured by Google, Apple and Tesla are highly infused with communication and entertainment services. These cars connect drivers and passengers to virtual communities and some people admit that reaching a destination is a secondary goal. Fortunately, the overall objective of software firms and traditional car manufacturers has been to improve driver behaviour and connect vehicles to an ITS to reduce accidents and road congestion. Back in 2017, through coordinated efforts by mobile phone manufacturers and carriers, car manufacturers and authorities, distraction from mobile phone use was eliminated. Also, by 2018, vehicles would shut down if alcohol and drug affected drivers tried to drive and speeding was also halted. Young drivers in particular have been able to afford safe, new vehicles and are now more skilled and attentive drivers.

Another benefit of these cars has been the uptake of car sharing that is made so easy with connected cars. As such, private vehicle sales have fallen more significantly since 2020.

In 2025, around 50% of all trips to work or place of study are in private cars. The other 50% are made using public transport or shared vehicles. Around 60% of people rely on private cars for visiting friends and family. There are also a number of close circuit driverless vehicle taxi systems at locations such as: airports, hospital and university precincts and importantly, in new residential areas.

The number of road accidents has been steadily declining, particularly since 2018 when AEB and lane keeping technology became standard for all new vehicles. Since 2020, the number of accidents has fallen dramatically.

Further advances in trauma care, such as ability to grow new tissue to replace damaged tissue, 3D skeletal printing, and tailored pain medications have improved outcomes for past and future trauma victims. An important and impactful benefit from these medical advances is much better psychological outcomes for trauma patients. Compared to a decade ago, a much higher percentage of people injured in accidents now are able to return to productive work.

Since 2016 there has been a concerted and

collaborative effort between governments, motor associations, car manufacturers and insurance companies to devise new approaches to ensure universal coverage of injuries caused not only by the 'at fault' driver, but all drivers, and vulnerable road users.

SCENARIO 2: "THE GLASS IS HALF FULL" (HI TECH/LO DEMAND) - 2025

It would be true to say that the last decade has been 'business-as-usual' in Queensland. There have been three changes in government, two of which were hung parliaments. Wage growth has remained low since 2017 and unemployment has been persistently higher than the national average. The gap between rich and poor has widened. While Queenslanders aged over 70 are wealthier than their predecessors, their wealth has eroded significantly in recent years as governments reduce subsidies for aged care and medical services. Consequently, apart from high income earners, the average Queenslanders is holding onto their vehicles longer than they had in the past and are reluctant to upgrade.

In 2025, fully automated vehicles are now an accepted part of the landscape in parts of North America, Europe, China and India. However, a majority of Queenslanders are still reluctant to relinquish control over to a computerized, automated vehicle.

Automated car manufacturers have oscillated between accepting and not accepting full liability for harm to persons and property, with even Volvo abandoning its global policy of acceptance of all liabilities due to the level of risk remaining in Queensland. Queensland regulators have been hesitant to take the front foot in dealing with this issue. Further, neither State nor Federal governments have worked with manufacturers to agree on a standard required for a national automated car network. Thus trials of highly automated passenger vehicles on Queensland roads didn't commence until 2019. Further, due to constrained state budgets and political pressures, politicians have 'flip flopped' on fleet renewal policies, such as providing financial incentives. In any case, low demand from Queenslanders has resulted in Queensland being considered 10 years behind the rest of the world. Only in 2023 was AEB and lane keeping technology made a required standard for all new vehicles.

Highly automated vehicles are only affordable for high and some medium income households – mostly drivers aged between 35 and 55. Premium car manufacturers who have closely guarded their patented technology still dominate the market. Other large sections of the community, such as low income

young drivers, young families and retirees have not been able to afford these cars and have delayed new car purchase. In 2025, around 65% of all trips are made by private cars, many of which were manufactured before 2015.

There has been success though with remote control and automation of 60% of urban buses and all trains in Queensland are driverless. The Turnbull government dramatically increased road and public transport infrastructure funding between 2016 and 2021. Also, towards the end of its term, the Palaszczuk government collaborated with property developers to trial driverless buses on discrete, close circuit routes in Springfield, Tannum Sands and Townsville (Oonoonba). Of the three trials that completed in 2019, the Springfield and Townsville trials were successful and led to a gradual rollout of dedicated roads/lanes for remote controlled, highly automated buses connecting commuters in outlying residential areas to nearby train stations. However, due to budget constraints and resistance from lobby groups, Queensland governments from 2015 to 2023 delayed large scale trials of driverless vehicles for non-public transport, government purposes. Only recently has the new Nguyen government launched a government fleet renewal scheme with a focus on adopting fully automated vehicles.

In Queensland, basic technologies like seat belt interlocks and alcohol ignition interlocks are still not compulsory as there was community backlash for perceived nanny state intervention. Therefore, the use of these technologies has been restricted to prior offenders.

Early in 2018, Queensland Health launched the *"Healthy and Happy Me"* app. The app connects discharged patients with health professionals who could then monitor their rehabilitation after hospital treatment. Road trauma victims who tapped into regular online support from physiotherapists, occupational therapists, counsellors and other medical staff found they were more positive about their recovery, more willing to follow their exercise program and maintain proper wound care. After a few years, studies found that this app reduced rehabilitation costs and enabled people to return to work quicker than patients that did not use the app.

Funding for better road infrastructure, emergency services, etc. has been moderate. Road safety policy has been focused on modifying behaviour. New forms of driver behavior modification have been pioneered in QLD since 2017, such as mobile phone apps that track driving speeds and immobilize mobile phones during driving. There has been some improvement in driver behaviour amongst young drivers.

Road trauma costs associated with drivers aged over 70 has also been increasing and is now on par with costs associated with young drivers.

SCENARIO 3: "THE GLASS IS HALF EMPTY" (LO TECH/HI DEMAND) - 2025

Over the past decade, Queensland's economy has been in reasonable shape. The 2016 to 2019 construction boom generated strong growth in South East Queensland. There was also relatively strong growth in industries such as food processing, biotechnology, renewable energy and mining software design and technology manufacturing. Despite some structural unemployment arising from digital disruption in knowledge intensive industries, new employment opportunities in design, medical and personal services has kept the unemployment rate at around 7% in recent years.

Unfortunately, fast adoption of semi and fully automated cars in Queensland has been delayed by a range of factors, including:

- I. Car manufacturers were unable to reduce manufacturing costs between 2016 and 2022, particularly relating to the expensive LIDAR technology.
- II. There were ongoing problems with car programming, particularly with how autonomous systems were secured. Also, manufacturers and regulators struggled to decide on safety algorithms, particularly on the priority of saving pedestrians, drivers and automated car occupants if an unavoidable fatal accident were to occur.
- III. Despite early indications that AEB technology would be introduced across all standard vehicles in the US by 2018, this was delayed by two years and subsequently, the introduction of AEB across all new cars in Queensland was delayed until 2022.
- IV. A series of costly lawsuits around negligence and fraud brought down one manufacturer of automated vehicles in 2018 and damaged the reputation of two others.
- V. All premium automated car manufacturers, including Google, Apple and Tesla fiercely protected their IP with no exchange between them as they sought to retain premium prices.
- VI. Issues with 'jail breaking' of automated cars (unlocking autonomous features restricted by local regulations) between 2017 and 2018 resulted in some serious accidents in Queensland. Regulators imposed significant penalties and new requirements which set back the release of new models.

Car manufacturers in China and India began mass production of cars with AEB and lane keeping technology in 2022 that were affordable in their local markets. Three of these manufacturers will be exporting to Australia in 2026.

Many car owners in Queensland are delaying new car purchases in hope that manufacturers do get their act together. In the meantime, new car sales have continued to steadily decline over the decade.

Car sharing schemes in Brisbane and the Gold Coast started to grow from 2018 to match the pace of adoption experienced in Sydney and Melbourne. Use of digital technologies has been fundamental to expanding car sharing. As part of the construction boom, there was a strong commercial drive for developers to include car sharing schemes in medium and high density developments. In fact, two developers include shared vehicles as part of the buildings and body corporate fees covered the maintenance and upgrade of vehicles.

In urban areas, demand for alternative methods for mobility, such as electric bikes, scooters, skateboards has grown exponentially, however this has led to an increase in vulnerable road users. Between 2013 to 2016, authorities saw a significant increase in vulnerable road user fatalities; therefore, local and state governments invested in dedicated infrastructure for push bikes, electric bikes, skateboards, blades and scooters.

In 2017, an insurance company allowed people involved in road accidents to submit a claim to that insurer using a mobile app. The app allowed people to submit forms and invoices directly to the insurer. Claimants could track the progress of their claim and importantly, satisfaction surrounding the claim process increased significantly. People found they were relieved that their claim was handled efficiently and felt more confident that they didn't need legal representation. That insurer found that overall costs associated with claims fell by 15%. By the end of 2018, the remaining insurers introduced similar apps and processes.

In the decade to 2025, there have been some breakthroughs in medical treatments such as personalized pain medications, 3D printing and robotics. However, there have been some setbacks relating to the development of anti-rejection medications and escalating costs associated with new technologies. Medical services and equipment costs in general have continued to increase at a fast pace.

All levels of government increased spending on road improvement projects, such as the black spot program and replacing accident-prone intersections with roundabouts. In 2018, the State government launched a new speed reduction campaign and the community was convinced to allow speed limits in both urban and regional areas to be lowered. These initiatives alone reduced accidents by 15%. This result, combined with greater investment in public transport has had a positive impact on reducing road trauma compared to what occurred in 2025.

In 2021, two insurers threatened to exit the CTP Scheme as the number of car registrations had decreased to a point where CTP was purportedly no longer profitable.

SCENARIO 4: "THE GLASS IS EMPTY" (LO TECH/LO DEMAND) - 2025

Despite efforts by global financial regulators to buffer large financial institutions from economic shocks and risky banker behaviour, GFC2 decimated the global economy in 2018. Trillions of investment dollars to advance technology was stripped away and most high income countries slipped quickly into recession and then depression. Before this time, the housing bubble in Sydney, Melbourne and Brisbane had burst, which significantly damaged consumer confidence. Unemployment now remains high, with youth and long-term unemployment at record levels since 2020. Government can no longer provide adequate income support, thus large sections of the community are living below the poverty line.

As a consequence of GFC2, two global systematically important insurers failed. This invalidated around 30% of CTP policies and resulted in some insurers being unable to payout claims. There was a need for governments to cover costs for some trauma victims and to allow the remaining insurers to increase premium prices significantly.

The ice drug epidemic peaked in 2019, but by then a range of other synthetics plus high consumption of bootleg alcohol has been an ever-increasing burden. Obtaining adequate funding for effective drug testing had already been an issue a decade ago and it continued to be a problem, despite an increase in the police force. Enforcement of road rules has also been competing with a rise in other crimes across the community.

Since GFC2 the uptake car automation technology across most of the developed world has been very patchy. Even the likes of Google, Apple and Tesla were spooked by the dramatic fall in consumer demand. These firms quickly reduced investment

on their car projects and focused on other projects, including combating frequent attacks on their networks. Further, the world witnessed a spate of car hacking incidents in 2020 where connected car occupants and pedestrians were deliberately killed by rogue terrorists intent on creating harm and fear in the US and Europe.

Car sharing has seen mixed results. Older Queenslanders, who are an increasing proportion of the population are unwilling to give up their cars and even more unwilling to share. Further, since 2020 a growing number of assaults and robberies by car sharers negatively affected the uptake of car sharing.

Despite some effort to improve driver behaviour through media campaigns and reducing speed limits, the incidence of accidents caused by distraction, speeding, alcohol and drug abuse has increased steadily.

Advances in medical and rehabilitation treatments have not progressed in the poor economic climate and the level of care for trauma victims has deteriorated, particularly in public hospitals. Road trauma patients, as with all sick and injured people, from lower socio-economic areas Queensland suffer the greatest.

APPENDIX B: QUT STUDENT SURVEY, DECEMBER 2015

An online survey of 49 QUT students (anonymous) was conducted in December 2015 to identify the preferences of a younger generation on topics such as motor vehicle ownership, transportation modes as well as their views on CTP insurance and driverless vehicles.

The participants were:

- 58% male and 42% female;
- 69% aged 18-25 years; 27% aged 26-35 years; 4% aged 36 – 45.

1. On weekdays (Mon to Fri), what is your usual mode of transportation? (Choose the one that takes you the furthest)

#	Answer	Response	%
1	Public transport	28	57%
2	Car (as a driver)	11	22%
3	Car (as a passenger)	2	4%
4	Walking	2	4%
5	Cycling	6	12%
6	Scooting/Skating/ Skateboarding, etc	0	0%
7	Other, please indicate below:	0	0%
	Total	49	100%

2. On the weekend, what is your usual mode of transportation? (Choose the one that takes you the furthest)

#	Answer	Response	%
1	Public transport	14	29%
2	Car (as a driver)	21	43%
3	Car (as a passenger)	12	24%
4	Walking	1	2%
5	Cycling	1	2%
6	Scooting/Skating/Skateboard etc.	0	0%
7	Other, please indicate below	0	0%
	Total	49	100%

3. What type of vehicle/s you own?

#	Answer	Response	%
1	Car	31	63%
2	Motorbike	0	0%
3	Van	0	0%
4	Other	1	2%
5	I don't own a motor vehicle	18	37%

4. Do you know which insurance company provides your Compulsory Third Party (CTP) insurance? (In Queensland, CTP Insurance provides liability cover for 'at fault' drivers who harm other people in a motor vehicle accident. It is compulsory and is paid at the same time registration fees are paid)

#	Answer	Response	%
1	Yes	19	63%
2	No	7	23%
3	Unsure	4	13%
	Total	30	100%

5. Do you think CTP Insurance is important? (In Queensland, CTP Insurance provides liability cover for 'at fault' drivers who harm other people in a motor vehicle accident. It is compulsory and is paid at the same time registration fees are paid)

#	Answer	Response	%
1	Yes	38	90%
2	No	0	0%
3	Not sure	4	10%
	Total	42	100%

6. Can you explain why?

Text Response
protect yourself and your property
Have never been made aware of the concept
It is important that the other persons vehicle can be repaired, even if I decide that I won't insure my own
Don't know anything about it
No idea what it is
To cover from accidents
It helps to avoid extra cost or payments for the damages. And is also secure to process negotiation amongst both parties.
Its important to be able to cover others if an accident causes damage to another car/injury to another person - it's fair & right
its compulsory for vehicle registration & to cover any third party accident claim
CTP insurance is important if you are not at fault when Accident and you can be covered
Responsible to provide medical care for someone you have injured.
In a civilised society, we must be accountable to each other for our negligence.
Accident's happen, the damage may have been unavoidable for the at fault driver
Personally wouldnt want to be at fault without some kind of support, cant account for things that might happen.
it is important to have cover regardless if you feel you are a careful driver as you never know when something may go wrong
Makes the drivers more cautious while driving as well as since they are liable for the harm, they should be accounted for it.
It's fair
So that you don't go bankrupt when crashing into a very expensive car.

Text Response
so that if I own an expensive vehicle and someone crashes into me im guaranteed to be paid back for it.
No prior knowledge
Accidents are common, not always preventable, makes sense to have cover to protect all road users
Because it would save a lot of money if you injure or kill someone
not many people can afford to pay for the damage upfront.
To ensure there is cover for any incident and person
N/A
As much as you intend to drive safely, sometimes things happen on the road and insurance is important to cover these situations. Also car repairs are expensive so insurance will cover it !
Anything can happen on the road. I don't want to be responsible for serious injury for someone else by accident and not be able to provide any compensation.
The harmed person should not be left without compensation when someone else was negligent/at fault.
If someone is harmed at the fault of someone else and require compensation medical or otherwise they should have access to that persons CTP insurance.
Ensures victims of an accident are not further impacted through the offending party being unable to cover the fee for repair damage

7. Have you ever been injured in a motor accident in Queensland and was entitled to claim against another driver's Compulsory Third Party Insurance?

#	Answer	Response	%
1	Yes, I had an injury and made a CTP Insurance claim	1	2%
2	Yes, I had a injury but did not make a CTP Insurance claim	0	0%
3	No	41	98%
	Total	42	100%

8. Please describe your experience with claiming compensation?

Text Response
straightforward - easy and stress free

9. What type of driver's license do you hold?

#	Answer	Response	%
1	Full license	26	54%
2	Provisional 1 (Red P)	5	10%
3	Provisional 2 (Green P)	5	10%
4	Learner License	6	13%
5	Other, please specify	1	2%
6	I don't have a license	5	10%
	Total	48	100%

10. In the future, if you were injured in a motor accident caused by another driver/vehicle, what would your expectations be for medical care and rehabilitation?

Text Response
you could claim damages with insurance for complete recovery
I would expect cover for cost of my full mental/physical recovery
Assistance with medical care, paying for private health if required, money for trauma/loss of income
Insurance will take care of it
To be fully covered under insurance
If the Other party is responsible then they should pay for all the damages and if I myself was responsible then I should pay either through my insurance or my personal expense.
I would expect to be fully covered by the other driver - considering the injury was 100% caused by their accident
high - cover the overall medical and rehabilitation needs - no out of pocket expenses
I would expect to have full support from doctoral staff
Full medical expenses paid by driver at fault.
I would expect it to be swift and of a high quality
The damages be covered by the insurance of the at fault driver
Paid for but ctp
medical expenses are paid for and proper time off for healing
I'm honestly not sure what to expect, but I would hope to not be left to die.
i would want to be fully covered
Making sure that I no problems occurred to my body and full recovery of the body
everything covered
To meet at least the level of medical assistance required to cure the injury
I would expect full compensation from the party at fault.
It would be paid for guaranteed, since third party insurance is compulsory.
that it be paid for
payments by insurance company of the driver who caused it
Be paid
full recovery
Any out of pocket expenses to be paid for by other drivers insurance, full cover for treatment, support, ongoing rehab
payment of medical bills
That it would be covered by CTP insurance
It would be paid for by someone else
all expenses paid by the party that did the damage, or their insurer
It will be better if I have no worry about the medical fee or the arrangement of the treatment.
Pay all the fee related to hospital and work skipping
To ensure there is appropriate cover for full medical care
I would expect the expenses to be covered by the driver or driver's insurer.
N/A
To receive medical care and rehab at the other persons expense (under their insurance) or personally if they do not have insurance.

Text Response
Depends on the severity of the injury. For any form of whiplash, for example I would expect to see a chiropractor once or twice a week for the next month following the accident, and then occasional checkups after that all paid by the insurance company of the person at fault. For anything more serious that prevents me from doing my job I would expect full compensation.
I expect that my private medical insurance would pay for all costs incurred in my rehabilitation. I expect that the driver at fault to pay all insurances excesses. If damage was negligent or criminal I would expect further compensation. I trust that the medical care and rehabilitation would be world class standard and get me back on my feet quickly.
I would have high expectations. I would expect full compensation for my medical care.
To the full extent of what I needed, whether till full rehabilitation or continued care and support.
Fully covered under public health system - would expect some waiting time for non life threatening injuries

11. What type of drivers license do you hold?

#	Answer	Response	%
1	Full license	26	54%
2	Provisional 1 (Red P)	5	10%
3	Provisional 2 (Green P)	5	10%
4	Learner License	6	13%
5	Other, please specify	1	2%
6	I don't have a license	5	10%
	Total	48	100%

12. If you don't have a license, are you planning on getting one in the future?

#	Answer	Response	%
1	Yes, please indicate why?	4	80%
2	No, please indicate why?	1	20%
	Total	5	100%

Yes, please indicate why?	No, please indicate why?
So i don't have to get my mum or brother to drive me around	Too scared of causing an accident/dying
To drive a car legally	
convenient	

13. How important is owning a car/motorbike to you?

#	Answer	Response	%
1	Very Important	15	32%
2	Important	15	32%
3	So-so	12	26%
4	Less important	3	6%
5	Not Important	2	4%
	Total	47	100%

14. Please explain why owning a vehicle is important or not important?

Text Response
To get from a to b
Takes me out of the city to visit place and having other activities such as fishing, camping and others
It is important to carry out a free and unrestricted lifestyle
A vehicle is important for getting around and transporting stuff, but I only just bought a car as in Brisbane it isn't really required. It does make it a lot easier though
Convenient but I can bus if I don't have it
I don't need one living in the city
Don't need to drive much
Overall, public transport is sufficient for my needs.
Independent transport
I live in the city, so I can walk anywhere.
Having a motorvehical at hand gives you the possibility to go wherever you want whenever you want. But this does not necessarily mean you have to own one. Therefore, So-so
I t is important because it provides the individual flexible and independency to travel anywhere anytime.
I've from a large family, I can't rely on my parents for transportation like I used to
flexibility to travel, instant access to transport, being comfortable - not relying on public or other type of private transport services.
To get to where you need to be without public transport
Convenience
Liberty, and fulfilling your commitments - work/Uni/sport
I use it to get to and from work and uni, and to drive my younger siblings and grandmother to and from places
For me its not too important, I cant drive it anyways. However I like to have someone who can drive around for emergencies.
its not as important as one may think as the public transport system is very efficient
It gives flexibility to where do I want to get to
It saves travelling time as well as wait time
Very convenient owning your own motor vehicle.
It it is important to get to work, shops and sporting commitments.
i need a car to get to work
helps me get around
Travel
convenient
Important, I work 2 jobs and need a vehicle to get to each, as well as save time on other errands, etc
Easier to take u places
Primarily for ease of use when travelling for leisure or for visiting family.
Because it helps me go from A to B
I always get driven or take public transport because work has no parking so owning a car is not that important but nice to have on the weekend
Easy to travel. Convenient
Because it is convenient and at times necessary to get around

Text Response
It helps when going out, grocery shopping and occasional day trip. Without a vehicle is barely possible.
I need it as part of my job. It is also convenient to have in daily life for transport reasons to get to uni
To be able to go places on a whim, get to work late and take groups of friends on trips. Having to organise and schedule with public transport can be a nuisance, particularly further out
Having access to a vehicle is very important, but ownership isn't. I have access to two cars at my parents place which I do not own. I also live within close proximity to the train which greatly increases my mobility. If I did not have access to vehicles at home I would consider vehicle ownership extremely important. I do not like being inhibited.
Owning a vehicle is important for my own freedom and autonomy.
So I can get to places
Allows for independence and for me to work full time with less commute time out to different client sites.

15. If you don't own a motor vehicle, what are the main reasons why you haven't purchased a motor vehicle?

Text Response
Costs
Cost of service, bills for motor vehicle
I don't want or need to contribute to carbon emissions. I enjoy the communal nature of public transport.
I would need a motor vehicle only for a few occasions since public transport is sufficient. So it does not really make sense to bear the costs for purchase and maintenance of a motor vehicle given the limited used.
Too expensive and a hassle to find a parking space in the city.
possibility to use the one of others - friends and family
I dont have a self driven licence
no license or need
Expenses may be higher
Still need to be familiar with the Australian rules of driving, as well as costs associated with purchasing defers the process
No license
income
too expensive
Other people at home have a car
If the public transportation can fully cope with my travel needs that owing a vehicle will be less important
Can't drive
I'm poor :P
I use my parents and my brothers vehicle

16. Which of the following car sharing models have you used in the last 30 days?

#	Answer	Response	%
1	Car share (i.e.GoGet)	2	4%
2	Ride sharing (i.e. Uber)	18	38%
3	Hire car (i.e. Hertz, Avis, Budget, etc)	7	15%
4	I have not used a car share service in the last 30 days	25	53%
5	Another form of car share (please indicate the company/service below)	1	2%

17. Do you think the way you travel on a daily basis will change over the next 10 years?

#	Answer	Response	%
1	Yes	30	63%
2	No	7	15%
3	Unsure	11	23%
	Total	48	100%

18. Please explain why you think it will change?

Text Response
Automated driving
Because I may get a job and look for a motor vehicle
Predominantly driving a car/public transport instead of cycling
Moving out and maybe getting my own car
I will buy a car when I have a family
the changes in technology through innovation will change the medium of the transport.
Modes of transport are changing and improving each year. The more benefits provided to passengers (eg uber over taxis), the more cars off the roads - same goes for the governments interests towards investing in public transport
I will be using my own mode of transport
Traffic congestion
working in the CBD, so unable to park
Assume I will have a license
automated transport and smart cars becoming more prevalent
Hoping automatic cars will become popular
different modes of transport depending on where i might live
I will buy a car within that frame of time
It will change depending on my work and home locations and how good the local public transport is.
advances in car technology (self driven)
mainly use train as I live far from uni, when working i expect to drive to work
I'll buy a car
Driverless vehicles may have an affect on car ownership where services such as uber will become more popular ways to drive.
technological advances
Technical will change the current sys
To accomodate with requirements and financial capacity
About to own a vehicle
I will have considerably more income and I will drive or be driven everywhere.
Change from where I'm going and that will most likely require a car
I'm working on cycling more and driving less. In the future I hope to have a job with an office I spend majority of my time at which also has end of journey facilities. Currently I work at a job with a changing client every week and I can't always access showers or the distance from home is too far so I drive instead. It won't change to public transport as it's cheaper to drive and park with my partner than a return train or bus trip x 2.

19. Please explain why you don't think it will change?

Text Response
Safe car technology is not moving fast enough, nor will majority of people approve of rapid change
Cars will still be the cheapest
I love driving
no plans
Most likely still need a vehicle for work, family
Because I use a combination of public transport, ride sharing and drive my own car. I think this mix will last as over the next ten years.

20. Would you be happy to travel in a car that was 'driverless'? (Select the answer that best describes your thoughts)

#	Answer	Response	%
1	Yes	29	60%
2	No	9	19%
3	Unsure	10	21%
	Total	48	100%

21. If all cars were 'driverless', would you miss driving?

#	Answer	Response	%
1	Yes	22	46%
2	No	19	40%
3	Unsure	7	15%
	Total	48	100%

22. Do you have any comments about 'driverless' cars?

Text Response
They need to provide more assurances for using it to the public
I don't think it's necessary to make car driveless
They sound awesome, the idea that you can get the car to take you places and pick you up, no need for a designated driver, just living the dream
can't wait for them
It would take a while to really gain trust into the technique...
Decisions made in order to mitigate risks - how much is a human life worth and how are they compared. At least in the phase of transformation from today's system to some future way of moving this will be relevant.
I would definitely miss driving, though a driverless car would be surely remarkable
I think they are a really good idea for city centres but not for long distance transfers unless there are designated "driverless car lanes"
i dont think they would be safe for passengers
The technology would need to be totally perfected and widespread before I would trust it to,say, merge on Corronation drive!
I think driverless cars would be good if they minimise accidents. I'd feel much more safe in a driverless car than in a car with a distracted driver
Pretty cool

Text Response
would need to adhere to high levels of ethics, such as being able to handle decisions where both outcomes result in a death or injury
I personally would much prefer it, I trust the car a bit more than myself.
fantastic technology but not for me
None
No tensions
Sounds good and could be safer than driving. However driving is a good experience.
Driverless cars seems to take the enjoyment out of driving, and it would be hard to ensure that it safe in every circumstance.
don't trust them yet.
they are good if it's self contained ie all cars in one area are driverless, machine can't adjust to human error dynamicly
Have to be safe
no
Useful for long trips, logistics, could improve safety or reduce driver caused accidents
Working out who will be at fault in accidents may be difficult. Also programming particular decisions where crisis cannot be averted - determine what the best outcome in this case will create interesting discussion.
driverless cars must have an option where you can choose to be the driver or let the car drive you
More satiety I think
Not sure if we're there yet technologically
If it can be safe enough it is a very good option
Easy but miss out the fun on a actual drive
No.
Seems like a time-saver. There are moral implications, sure, but so were there with cars to begin with and society somehow turned that around.
It is extremely practical and offers many advantages. It will free up my travel time allowing me to be more productive. It will increase my mobility and remove barriers for travelling into densely populated areas such as the city (don't have to get a car park). Ensure regulation keeps up with technology growth so that driverless cars can be implemented swiftly.
No

23. If you have any other comments or remarks about this questionnaire or the topics mentioned, please feel free to add them below:

Text Response
Reasonably well done, no complaints.
more questions about public opinion on driverless cars
no
N/A
A prudent government would take a facilities approach to driverless cars. It is important to consult the community and recognise areas of concern, however the primary goal should be intelligrnt policy and government administration that provides for swift implementation of driverless cars. Ideas that stand in the way of this goal should be considered but shot down because the benefits that driverless car will bring to people's lifestyles and the Australian economy far outlay the negatives. It will also lay good foundation for implementation of disruptive technologies.
Change to infrastructure and pricing (I.e better bike paths, tolls, cheaper public transport) would change my answers



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