

1 **.Telematics and Vehicle Safety**

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9 10 **Key Findings**

- 11
- 12 • Pay-how-you-drive (PHYD) technology is available and is easily retro-fitted to vehicles
- 13 • The system typically monitors speed, deceleration, acceleration and cornering
- 14 • Drivers receive insurance premium discounts for complying with speed limits and minimising
- 15 high acceleration/deceleration events
- 16 • Substantial reductions in crashes are being reported

17 **Abstract**

18
19 Recent developments in telematics technology provide the opportunity to improve driver behaviour
20 by rewarding good driving. Vehicle insurance companies in Europe and North America have
21 successfully introduced pay-how-you-drive (PHYD) insurance policies where the driver agrees to
22 have a telematics device installed in their vehicle in return for substantial reductions in insurance
23 premiums. This paper describes recent developments with in-vehicle telematics, including
24 incentives to encourage drivers to reduce risky driving behaviour. The potential road safety benefits
25 are examined and some implementation issues are addressed. In-vehicle telematics is considered to
26 be a promising vehicle safety technology, which can be easily retrofitted to existing vehicles.
27

28 **Keywords**

29
30 Telematics, driver behaviour, insurance, speeding

31 32 **Introduction**

33
34 In-vehicle recording of vehicle parameters such as location and speed, and transmitting this
35 information to a remote monitoring system have been in use for decades. It is an essential
36 component of Intelligent Transport Systems (ITS). This has mainly been used for commercial
37 vehicle operations such as logistics, efficiency monitoring and incident tracking.

38
39 In recent years the data collected have been enhanced to include longitudinal acceleration
40 (acceleration and braking) and lateral acceleration (cornering). Improvements to global positioning
41 systems (GPS) have also brought greater accuracy in measuring vehicle speed (better than 1km/h
42 accuracy). Digital mapping of roads has provided information on posted speed limits including
43 differentiation of time activated speed zones (e.g. school zones). For example, in 2016 Transport
44 NSW released the free "Speed Advisor" app for smartphones, giving drivers speed limit assistance
45 throughout New South Wales (TNSW, 2016). In Europe mapping of speed limits is well-advanced,
46 due partly to safety ratings by Euro NCAP which reward vehicles with speed limit advisory systems
47 (Global NCAP, 2017).

48

49 Furthermore, data can now be readily transmitted through the mobile phone network in real time.
50 With these developments it is now possible to detect and record the following events, which might
51 be associated with risk-taking:

52

- 53 • Excessive heavy braking events (distracted driver, inappropriate speed, following too
54 closely, aggressive driving)
- 55 • Excessive high acceleration events (aggressive driving)
- 56 • Excessive cornering forces (inappropriate speed, aggressive driving)
- 57 • Time-of-day and geographic location (driving at high-risk times and/or locations)
- 58 • Exceeding the speed limit (inappropriate or dangerous speed, distracted, fatigued or
59 inattentive driver)

60

61 There are various ways in which telematics can be applied to improve road safety. The initial use
62 has mainly been for vehicle fleets, with one UK fleet (Andrew Page: <http://www.andrewpage.com>)
63 reporting a 97% reduction in speeding and a 47% reduction in crashes (ETSC, 2016: Masternaut,
64 2016). That fleet also reported reduced maintenance costs and improved fuel economy. Some
65 systems in the USA are promoted to parents as a way of monitoring teenage drivers.

66

67 **Pay-How-You-Drive Insurance**

68

69 Car insurance companies are continually trying to improve their assessment of customer risk so that
70 premiums can better match the likelihood of an insurance claim. A promising new use of telematics
71 is by car insurance companies that wish to give incentives for less risky driving, particularly by
72 young drivers. In recent years several telematics trials have been conducted. Initially these looked at
73 distance travelled and other simple parameters. More recently the availability of advanced
74 telematics means that the manner in which a person drives can be recorded and analysed. One
75 successful trial by the University of Sydney reported the following (Greaves and Fifer, 2011):

76

77 *"Pay-How-You-Drive (PHYD) products are being increasingly offered through the commercial*
78 *insurance sector. While undoubted challenges remain, GPS technology opens up the possibility*
79 *for developing greater equity in charging systems that reflect not just the kilometres driven but*
80 *when, where and how they are driven...it has been demonstrated that it appears possible to*
81 *significantly change aggregate behaviours (particularly speeding) of a segment of the motoring*
82 *public through financial leverages based on incentivising positive changes in driving*
83 *behaviour."*

84

85 That project used an on-board recording system that included a digital map of Metropolitan Sydney
86 speed limits and a GPS to determine vehicle position, speed and direction of travel. The system
87 recorded incidents where the speed limit was exceeded. The driving characteristics of participants
88 were recorded before they were told about the purpose of the trial in order to set a baseline of driver
89 behaviour for the purposes of comparison. Participants were then offered moderate financial
90 incentives to reduce the kilometres driven, reduce night-time driving and reduce episodes of
91 exceeding the speed limit. As indicated above, the outcomes in reducing targeted areas of 'risky'
92 behaviour were positive, particularly with regards to speeding.

93

94 **Examples of PHYD insurance**

95

96 In recent years several European car insurance companies have introduced PHYD insurance, and
97 Australian car insurance companies have made similar initiatives. Some of these examples are

98 described below. Note that inclusion here does not imply endorsement of these commercial
99 products.

101 **Ingenie**

102
103 The UK insurance firm Ingenie (<http://www.ingenie.com>) offers PHYD insurance, mainly for
104 young drivers. Ingenie won the 2013 Prince Michael Awards for Road Safety for Young Drivers
105 (RoadSafe, 2013).

106
107 The steps described in the promotional material are:

- 108 1. An Ingenie telematics box is fitted out of sight in the car, collecting data on how the car is
109 driven;
- 110 2. Data are transmitted from the box to secure servers via the EE network, allowing us to
111 access your driving style;
- 112 3. We send you feedback on your driving which is available via the Ingenie app or online;
- 113 4. We give discounts to our best and most improved drivers, so drive well and you could pay
114 less.

115
116 The website states: "We assess how you drive in 4 key areas: speed, braking, acceleration and
117 cornering. On average our customers save over £500 when they insure with us." The Ingenie
118 smartphone app gives the driver a driving score for the month and an indication of the premium
119 discount ("Well done! You're on track for a £62 discount at your next price review."). The app also
120 gives feedback on the assessed parameters ("Speed - Good. You're keeping to the speed limits -
121 Ingenie rewards good driving. Keep it up!").

122 **Insure-the-box**

123 Insure-the-box (<https://www.insurethebox.com/>) is a UK insurance product that is similar to
124 Ingenie. The website promotes an Accident Alert feature described as follows:

125
126 "The in-tele-box fitted to your car can sense a strong impact on the car. When this happens, an
127 alarm is activated in our Service Centre. If your car is stationary, we will try to call you to
128 check you are OK and try to help you get going. If your car is moving we will assume you do
129 not require urgent assistance. If we can't get in contact and your car is not moving we will
130 assess all the circumstances relating to the incident. If appropriate, we will attempt to contact
131 the emergency services."
132
133

134 **QBE Insurance Box for Young Drivers**

135
136 The Australian insurer QBE recently introduced Insurance Box PHYD insurance
137 (<https://www.qbe.com.au/insurance-box>) described as follows:

138
139 "When you take out a policy we'll send you an Insurance Box, a small device that plugs in
140 under your dashboard. It transmits data such as speed, distance travelled and heavy braking.
141 This helps us understand what kind of driver you are and your likelihood of having a collision.
142 We then price your insurance based on the data."
143
144

145 According to QBE, they are the only Australian vehicle insurer currently offering PHYD insurance,
146 although several have "pay-as-you-drive" policies that are based on vehicle odometer readings
147 (distance travelled) but do not monitor the way in which the vehicle is driven.
148

149 **NRMA Connected-Car**

150
151 The motorist organisation NRMA in New South Wales recently introduced a telematics tracking
152 system called Connected-Car (NRMA, 2017). It is targeted at commercial fleets and helps to
153 monitor vehicle usage. It can produce driver score reports to encourage safer more efficient driving
154 and has a smartphone app. It can also provide accident alerts.
155

156 At this stage the system does not appear to be used for the purpose of PHYD insurance but it is
157 evident that the system has the same functionality as successful PHYD schemes.
158

159 **Potential road safety benefits**

160
161 There are numerous ways in which telematics can result in a reduction in road trauma. The
162 following three areas are considered to have the highest potential benefits, when compared with
163 other countermeasures.
164

165 **Speeding**

166
167 PHYD insurance is generally set to discourage speeding by several km/h over the speed limit. There
168 is widespread misunderstanding of the proportion of road trauma associated with "low range"
169 speeding (Paine, 2009; Doecke, 2011; ETSC, 2017).
170

171 In 2012, Prof. Holman from the School of Population Health, University of Western Australia,
172 conducted research for the Road Safety Council of Western Australia (Holman, 2012). It was
173 concluded that "52% of total killed and seriously injured (KSI) in [Perth] metropolitan 60km/h
174 zones are attributable to illegal speeding". Furthermore, he analysed the contribution from each
175 speeding range. In brief, it was estimated that about 15% of KSI would have been avoided if
176 vehicles travelling between 1km/h and 10km/h over the speed limit had not been speeding. Four
177 percent of preventable KSI were estimated to be in the range of 1km/h and 5 km/h over the speed
178 limit. This is a range where most drivers feel they are driving safely and will not get fined for
179 speeding. However, based on Holman's estimates, more than 800 KSI would be prevented each year
180 across Australia if this group were not speeding.
181

182 Holman further found that the sensitivity to speeding is not as high in rural areas but low-range
183 speeding (1km/h-10 km/h over the speed limit) still accounted for one third of speeding-related
184 crashes, or 7% of all KSI on rural roads in Western Australia.
185

186 Traditional speed enforcement is not particularly effective for low-range speeding and PHYD
187 insurance (or another telematics solution) may be particularly effective for discouraging low range
188 speeding (Paine, 2013).
189

190 **Forward collision avoidance**

191
192 PHYD insurance may also discourage other risk taking such as following too closely and
193 inattention. Crashes involving these behaviours are typically those for which forward collision
194 avoidance technology can be expected to be effective. A 2012 study by the Centre for Automotive
195 Safety Research (Anderson, 2012) concluded that "between 20 and 40 per cent of all fatal crashes

196 and between 30 and 50 per cent of all injury crashes might be prevented with forward collision
197 avoidance technology (FCAT) systems."

198

199 **Crash alerts**

200

201 As described above, the telematics used for PHYD insurance also has the capability to be used for
202 crash alerts ("maydays"), where the monitoring organisation/insurer might call emergency services
203 if a vehicle is involved in a high-severity crash in a rural area and there is no response from the
204 driver to a mobile phone call. Prompt emergency services response to a road crash in unpopulated
205 areas is known to reduce the risk of a fatality. For example, it has been estimated that an effective
206 mayday system could reduce vehicle occupant fatalities by 5 to 10% in Finland (ITF, 2016).

207

208 **Discussion**

209

210 The effectiveness of telematics-based PHYD insurance on each of the above scenarios (speeding,
211 forward collision avoidance and mayday assistance) is uncertain at this stage. The individual
212 savings from the three scenarios are not cumulative and so the combined effect is unknown. As
213 mentioned above, the Andrew Page fleet in the UK reported a 47% reduction in crashes after
214 introducing telematics. In effect, this is similar to insurance company statements that PHYD
215 insurance typically halves customer's premiums, since premiums are partly based on crash risk. It is
216 therefore considered that 50% reduction in crashes is feasible through effective PHYD insurance.

217

218 PHYD telematics systems can be retrofitted to any vehicle and so can be introduced swiftly, without
219 needing to wait for new vehicles (with desirable safety features) to replace older vehicles. The
220 integration of smart phones with vehicle technology is expected to further enhance the introduction
221 of PHYD insurance.

222

223 At this time, most Australian vehicle insurers appear to be reluctant to offer PHYD insurance
224 despite the success of these systems demonstrated in the UK and USA. Since each Australian state
225 usually has an over-seeing organisation for third-party injury insurance it might be worthwhile for
226 these organisations to encourage PHYD insurance.

227

228 In the USA, according to the National Association of Insurance Commissioners, it is expected that
229 70% of vehicle insurers will use telematics by 2020 (NAIC 2017). Telematics-based insurance is
230 already available in 42 US states, although not all safety-related risks such as speeding are currently
231 covered.

232

233 It is anticipated that there may be a vocal group that opposes a "big brother" approach and denies
234 that low-range speeding is a road safety problem. Under voluntary PHYD insurance schemes,
235 people may miss out on the possible large insurance premium discounts that apply to those who are
236 prepared to demonstrate that they are a low insurance risk. Greaves (2011) points out that
237 eventually insurers will need to raise the premiums for drivers who do not elect to have PHYD
238 insurance because, in many cases, less risky drivers are effectively subsidising those drivers. In any
239 case, it should be possible for fleets with PHYD telematics to negotiate with their insurers for
240 premium discounts.

241

242 Influencing insurance products is not an area where governments have traditionally focussed
243 attention but they could encourage uptake of the technology, including through government fleet
244 operations. The support/encouragement of digital mapping of speed limits (already being
245 undertaken for intelligent speed assistance - ISA) would also assist in the introduction of PHYD
246 insurance in Australia.

247

248 **Conclusion**

249

250 Remarkable reductions in risky driver behaviour have been observed in trials of telematics-based
251 incentives. PHYD insurance products have been successfully implemented in Europe and are
252 evidently leading to substantial crash savings, reflected in insurance premiums being halved.
253 Australia and other countries may gain road safety benefits by including PHYD insurance and
254 associated telematics in their national road safety strategies.

255

256 Consumer demand for PHYD insurance should be encouraged - particularly now that at least one
257 PHYD insurance product is available in Australia.

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314 organisation. The author has no commercial association with vehicle insurance. The examples given
315 in this report are from publicly available information and are not intended to be endorsement of
316 these products.