Attitudes and Opinions towards Intelligent Speed Adaptation

Wall, John¹; Cuenca, Vanessa¹; Creef, Kim¹; Barnes, Ben¹

¹Centre for Road Safety, Transport for NSW, Wollongong, Australia

Abstract - This paper presents the results of the attitudinal and behavioural research undertaken as part of the NSW Intelligent Speed Adaptation (ISA) Trial. Over 110 light vehicles from private and company fleets were fitted with an Advisory ISA device. In addition to the collection of speed records to measure compliance, drivers were asked to participate in quantitative and qualitative attitudinal research through focus groups, surveys and in-vehicle observations before, during and after their use of the device.

Results from the attitudinal research indicated that a majority of participants reported a reduction in the margin by which they exceeded the speed limit. Some drivers reported speeding less frequently either because the ISA device made them more aware of the speed limit, or because they wanted to avoid the audible warnings. There were no widespread concerns about the technology being distracting. Participants also reported being more aware of exceeding the speed limit, therefore speeding became a conscious choice rather than an inadvertent action. The acceptability of the ISA technology was generally high, but most participants felt that there should be an element of choice for the driver on whether to install the ISA technology.

Keywords - Intelligent Speed Adaptation; Road Safety; Speeding; Driver Assistance Systems; Active and Passive Safety; Intelligent Transport Systems.

I. INTRODUCTION

Speeding is a significant road safety issue in Australia and worldwide (1). In the state of New South Wales (NSW), almost 39% of all fatal crashes and 16% of injury crashes have speed as a contributing factor. On average, approximately 177 people die each year in NSW as a result of being involved in a speeding related crash. Aside from the tragic cost in human lives and suffering, it is estimated that the cost to the community of speed related crashes is around $1.5 billion a year (2). There has been extensive international research to indicate that the use of Intelligent Speed Adaptation (ISA) technology is an effective tool to reduce speeding and could bring substantial road safety benefits (3). Modelling based on the NSW ISA trial by the Centre for Automotive Safety Research at the University of Adelaide suggests that the use of Advisory ISA across the road network could result in a fatal crash risk reduction of almost 19% (4).

The Centre for Road Safety conducted the largest trial of Advisory ISA technology in Australia to assess the benefits of ISA technology for NSW. Over 110 vehicles including a mix of non-government private company fleets and privately owned vehicles participated in the trial. All vehicles were fitted with a data recorder which tracked their speed and location to generate speed compliance records. In addition to analysis of these speed compliance records, attitudinal and behavioural studies were conducted. The objectives of the attitudinal research were to: assess the acceptability, benefits and concerns about ISA technology. Quantitative and qualitative research was conducted at various stages of the trial.

II. METHOD

Participants in the trial included drivers from a mix of non-government private company fleets and privately owned vehicles. An analysis of the fleet drivers’ characteristics showed that drivers under the age of 25 years and over the age of 60 years were under-represented in the trial. Most drivers who had agreed to participate in the trial also had a good driving record with only a few carrying demerit points for a speeding offence. Recruitment was expanded to include private drivers, with a booster which targeted drivers specifically under the age of 25 years and over the age of 60 years, and drivers who reported that they were repeat speeding offenders. A total of 114 participants commenced the trial. Data from participants’ vehicles was collected over a five month period. The ISA device was active for the three middle months of the trial period.

The Advisory ISA devices selected for the trial were supplied by Smart Car Technologies Pty Ltd (SCT P/L) of Sydney, Australia. The Dreevo2 model was manufactured by Mobile Devices in France and was a combined personal navigation and telematics device. Each device was customised for the project by SCT P/L to run the java based Speed Alert™ ISA application and included an in built GPS receiver (SirF Star 111) and mobile phone modem (Quad Band GSM/GPRS), which allowed the devices to calculate their position using GPS, as well as receive and transmit speed zone information.

All drivers and fleet managers completed both quantitative and qualitative research. When first joining the trial all participants completed a ‘Driver Commencement Questionnaire’ which collected their demographic
information and attitudinal responses. Prior to the ISA technology being installed in vehicles, an online pre-trial survey or ‘Stage 1’ survey was conducted with both drivers and fleet managers. This information quantified their attitudes before they experienced the technology. The Stage 1 questionnaire with fleet managers was in the form of a short telephone interview. Interviews were conducted with eight out of the nine organisations in the trial. The Stage 1 questionnaire for fleet and private drivers was administered online and completed by 103 participants out of a possible 112.

A number of in-depth interviews and vehicle based observations were conducted almost a month after the ISA devices had been installed to gauge any initial impressions. In-vehicle observations were conducted with five private drivers who had been driving with an active ISA device for periods of time ranging from one to three weeks. An independent contracted researcher travelled as a passenger in each participant’s vehicle, observed the participant driving and interacting with the ISA device, and recorded any comments made by the driver. Cameras situated within the car were used to record footage of the journey. In addition to this, twelve in-depth interviews were conducted with fleet and private drivers.

Just prior to the ISA technology being removed, another online survey (Stage 2) was conducted with drivers and fleet managers to quantify their attitudes after they had experienced the technology. Qualitative research in the form of group discussions also took place to complement the quantitative results and allow in-depth and flexible exploration of some key topics. Four mini group discussions were conducted with private drivers, divided by age and gender. Two mini group discussions were conducted with fleet drivers and a final mini group discussion was held with fleet managers.

In order to capture any learning effects from the ISA technology and to assess changes in attitudes and behaviour once participants were no longer using the technology, a further stage of research was conducted. Fleet and private participants completed an online survey (Stage 3) around two months after the ISA technology had been de-activated.

A repeated measures design was used, with some unique questions appearing in each of the Stage 1, 2 and 3 online surveys. Results were analysed separately for drivers and fleet managers in order to capture the different roles they played in the trial and the different experience they had with the ISA technology. This paper will only report on the driver component of the study.

Significance testing has been applied throughout to the results at the 95% confidence level. On charts, arrows have been used to illustrate statistically significant increases or decreases in either mean rating (for continuous variables) or proportions (nominal or ordinal variables) between survey waves.

III. RESULTS

A. Demographic profile

Of the participants who completed the surveys and therefore form the research sample, 36% were fleet drivers and 64% were private drivers. Sixty per cent of the participants were male. Figure 1 shows the age profile of the fleet drivers compared with private drivers and the gender breakdown within each age category. As the figure illustrates, the fleet driver sample had an older age profile and was male-skewed. Targeted recruitment ensured that private drivers were roughly normally distributed in terms of age and gender but with a boost in the under 25 age category. The research sample included a total of 16 provisional licence holders. Newly licensed drivers hold a provisional licence for a period of three years in NSW. Provisional licences include restrictions on the maximum speed a vehicle can travel as well as night time curfew on the number of vehicle occupants. Provisional licence holders are also not legally allowed to driver certain types of performance vehicles.

![Figure 1: Participant profile – gender by age by driver type](image)

B. In-vehicle observations

The in-vehicle observations revealed some commonalities in the way drivers interact with the ISA device. The drivers participating in this component of the research tended to only infrequently look at the ISA device. The device seemed not to garner the full attention of the driver when the speed indicator first turned red. Normally drivers could see the display out of the corner of their eye which eliminated the necessity for large head movements.

The device beeping tended to heighten the drivers’ inclination to look at the device and to drop their speed. On these occasions, the observer reported that the drivers tended to glance quickly at the ISA device before returning their eyes to the road, that is, dwell time tended to be very short. Dwell time appears more likely to be longer when the device is malfunctioning (or is perceived to be malfunctioning), for example when a question mark appears on the display.
The typical reaction to the audio warning was to lighten the foot on (rather than lift it off) the accelerator pedal to slow the vehicle. Some dabbing of the brake pedal occurred in built up areas and down hills, although this was a less common reaction on highways. Drivers often checked their rear vision mirror and speedometer during the slowdown process.

Several of the participants, at least on occasion, expressed mild to moderate annoyance at the beeping. This annoyance was ‘given away’ through facial expressions although some vocalised their frustration and expressed their reactions verbally to the researcher filming them. Comments reinforced the findings of the depth interviews that annoyance or frustration is regarded by many as a ‘necessary evil’ given the aim of the technology to reduce speeding behaviour. Some mentioned that they had started to become used to having the device in their vehicle. Several reported that they would normally, prior to having the device in their vehicle, sit either right on or else a couple of kilometres per hour over the speed limit, and that having the device in their vehicle had generally made them ‘pull their head in’ a bit. Interestingly, drivers were less likely to take immediate action if the device beeped when they were conversing with the researcher filming than when they were not talking to him. This suggests both that the tone is such that drivers can temporarily ignore it, and that reactions are slow when the driver is distracted by something happening within the vehicle.

C. Perceived benefits of the ISA technology

With the ISA technology active in their vehicles, almost two in three (65%) participants agreed with the notion that the technology was ‘of great use’ to them. The mean level of agreement with this notion was lower than it had been at Stage 1 (dropping from a mean rating of 7.0 to 6.4) suggesting that although ISA was seen as useful, it was not as useful as they had anticipated when signing up for the trial.

In the group discussions held with drivers, the most commonly mentioned benefit of the ISA technology was that they were always aware of the speed limit that applies to any given stretch of road. Other commonly articulated perceived benefits included that the ISA technology:

- alerted them when they had accidentally drifted over the speed limit
- increased their awareness of how often they exceed the speed limit, and how often other motorists exceeded it
- made them aware of speed zones which they had not previously been aware of
- made speeding a conscious decision to take that risk (a benefit only articulated by some male drivers)
- provided reassurance that they would not unwittingly get caught for speeding, and it helped them to relax by encouraging them not to be in a rush and worry about their speed.

Having driven with ISA technology, almost three in four research participants (73%) agreed at Stage 2 with the notion that the use of this device in all vehicles would lead to a reduction in the number of crashes, with just under two in three (64%) thinking it would reduce the severity of road crashes. A clear majority (61%) also agreed that, with the technology in their vehicle, they had always been aware of the speed limit that applied to the roads that they had been on, as a strong ‘personal’ benefit. Just over half felt the technology had allowed them to spend more time attending to traffic demands - either because they had not needed to look at their speedometer as frequently (54%), or they had not needed to look for speed signs as often (52%).

Participants were divided on whether or not they had felt safer driving with the technology. This result was explored in the group discussions. Most felt that they didn’t feel any different with the technology active. Most participants maintained they were already good, safe drivers, and there was a fair amount of resistance to the idea that having the technology in their vehicle would make them personally better drivers.

![Graph](image)

Figure 2: Extent of agreement with statements relating to benefits of the ISA technology – Stage 2 Question: Based on your experience with ISA technology in the ISA Trial, to what extent do you agree or disagree with each of the following statements about ISA technology and the ISA devices? [11-point scale from 0 (strongly disagree) to 10 (strongly agree), plus ‘don’t know’]

D. Concerns about the ISA Technology

The main concern expressed in the group discussions was that the ISA technology was ‘unforgiving’, i.e. not allowing the driver leeway to travel a few kilometres per hour over the speed limit. Several participants found the device ‘beeping’ as soon as the speed limit was reached irritating and frustrating. Concerns about drivers reacting to the ISA warnings (and keeping to the speed limit) and therefore being the victim of tailgating were not very pronounced. While some expressed this as a concern in the group discussions, most seemed to consider it a hypothetical
problem (having been tail-gated but being unperturbed). Other concerns included that the ISA technology was:

- disconcerting / distracting when first installed and not yet familiar, or when it was not functioning properly
- unreliable at times – for example not starting up immediately and not detecting side streets
- intrusive when there were passengers in the vehicle
- a potential target for thieves
- not positioned optimally in their vehicle - such that they had to turn their head to look at the device and hence take their eyes off the road.

In the Stage 2 online survey, just over half (54%) of the participants indicated that they agreed with the idea that driving with the ISA device had increased their frustration levels while driving.

When comparing Stage 1 and 2 surveys there was a reduction in the mean level of agreement that: the ISA technology had distracted them from their driving; they had relied too heavily on the ISA technology; and that the ISA technology issues too many false warnings and errors. Arrows on the graph indicate a statistically significant change between surveys. These changes in attitudes suggest that some of the concerns that participants had prior to the technology being activated in their vehicles did not come to fruition.

The average level of agreement with the statement ‘the ISA technology would be wasted on drivers who speed intentionally because these drivers would ignore or override the warnings’ increased significantly between surveys. Indicatively from feedback in the group discussions, this response is likely influenced by the fact that in its current form the ISA device could be turned off if the driver so wished.

![Graph showing changes in level of agreement with statements about ISA technology between Stage 1 and Stage 2 surveys.](image)

**Figure 3:** Changes in extent of agreement with statements relating to concerns about the ISA technology, with experience with the technology. Question: (Based on your experience with ISA technology in the ISA Trial.)

E. Potential for distraction

Despite the decrease in agreement with the idea that the technology has distracted them from their driving, around one quarter of trial participants (27%) still agreed with this statement when it was included in the Stage 2 Questionnaire. The most common reasons given for the technology being at least to some extent distracting were that the warning tones were too persistent (58%) and too loud (52%).

F. Reliability on the technology and workload issues

The group discussions suggest that some participants relied heavily on the ISA technology to advise them of the prevailing speed limit, by accelerating, without looking at their speedometer, until the ISA device beeped. However, more commonly, participants explained that they had used the device as a ‘back-up’ to advise them if they unwittingly exceeded the speed limit - either by accident, or they had been unaware of the prevailing speed limit.

G. Reactions to audio warnings

Just under half (45%) felt that the audio warnings were not appropriate, in terms of their volume, pitch and persistency. In the group discussions a strong preference was expressed for the audio warnings to increase in frequency and volume as a driver persisted in exceeding the speed limit. While acknowledging that the audio warnings were important as a deterrent to speeding, they felt that ‘nudging’ the limit should not result in such loud and persistent beeps.

The speed limit display and the red annulus around the speed limit value which appears just before the audio warnings were seen to be beneficial to those drivers whose device was installed where it could be seen out of the corner of their eye. The school zone audio warnings were particularly well received, as most recognised the importance of slowing down in these zones. The curve advisory warnings received mixed reviews. Some participants felt the ‘voice’ was startling and that the warnings were excessive on very windy roads.

H. Overall acceptability and personal interest in keeping the technology

Trial participants were asked to rate the overall acceptability of the ISA technology. The majority of participants (61%) gave it a positive rating. Participants were more likely to have a positive view of the technology (in terms of overall performance, usability, functionality and acceptability) than be inclined to recommend the technology to others, or be interested in using the technology themselves. Those participants who had experienced a greater number of
technical issues with their devices tended to rate the overall acceptability of the technology lower.

Participants were divided on whether or not they would be interested in continuing to use the technology, with comparatively large proportions feeling very strongly one way or the other. As illustrated in below, one in five rated their interest at zero, indicating they would not be interested at all in keeping the technology, but almost exactly the same proportion (21%) rated their interest at 10, indicating they would be very interested in keeping the technology. Indicatively, it appears that those who had incurred speeding offences in recent years were more likely to be interested in having the technology in the future. Overall, interest in keeping the technology declined with actual experience with the technology. On scale of 1 to 10, the average interest rating was 7.2 at Stage 1. This rating dropped to 5.3 at Stage 2.

There was far more interest in the ISA technology being integrated with a GPS navigation device (61% indicated that this would be their first preference) rather than as a separate ISA device (such as that which was used in the trial (28%)) or as an application on a mobile phone (13%).

J. Willingness to pay

Among those interested in keeping the technology (rating their interest at between 6 and 10 out of 10), almost half (47%) would be willing to pay between $100 and $249 to have the device. The qualitative research results suggested that although most participants recognised that the ISA technology was useful, they would have limited interest in purchasing this technology as a stand-alone device for themselves. Most would feel comfortable acquiring the technology if it was made standard in a new vehicle - although they would want a choice of using it or not. The idea of all drivers having the technology made it more appealing to some.

IV. DISCUSSION AND CONCLUSIONS

Speeding is the major contributing behavioural factor to road related fatalities in Australia (1). Advisory ISA systems have been shown to dramatically reduce the period of time drivers engage in travelling over the legal speed limit.

The quantitative survey results suggested that there would be more interest in a device that constantly displayed the prevailing speed limit (84%) rather than only displaying the speed limit when the vehicle exceeded it (16%). More (88%) would prefer an Advisory device than one that physically prevented the vehicle from exceeding the speed limit (12%). Almost three quarters (72%) would prefer a device that could be turned on or off depending on the driving conditions, rather than a device that could not be turned off (28%). While many recognised that the ISA technology would be most effective if it could not be switched off, under these circumstances the technology was also less appealing. It is likely that including volume control or a tolerance in exceeding the speed limit before the audio warnings take effect would lower the 72% of participants who would prefer a device that could be turned off.

The technology was seen, overall, to have merit. The technology was seen as acceptable, even if participants wouldn’t necessarily recommend the technology to others or be interested in using the technology themselves. Many perceive the technology to be more useful for those who are the ‘real problem’ on the roads. After experiencing the technology, participants appeared to be less convinced of some of its benefits, but also had fewer concerns about its use. This is similar to results from other trials (5).

In a quantitative study of NSW drivers’ attitudes towards speeding in New South Wales conducted by the NSW Centre for Road Safety in 2009, it was found that low-level speeding had high levels of social acceptability and that there was a perception that tolerance bands exist in speed enforcement (6). It is likely that these attitudes contribute to participants’ frustrations with not being able to exceed the speed limit by a small margin without setting off the audible warnings. Many would either favour the technology incorporating some leeway or tolerance, such that the audio warnings only commenced a few kilometres per hour above the prevailing speed limit, or else, more commonly, the initial warnings being subtle and increasing in intensity as the vehicle exceeded the speed limit.

While many would not mind having the technology in their vehicle, it seems unlikely that many would seek the product out, although it would be more marketable combined with
Intelligent Speed Adaptation is a valuable road safety technology that uses persistent audible warnings to reduce the frequency of speeding by drivers. However, ISA developers tread a thin line between making an effective device and annoying drivers to the extent that they reduce their use of the ISA system. Haptic feedback may offer a solution to this issue by providing an effective silent reminder to the driver when they engage in speeding, the most common contributing factor to fatal crashes in Australia.

REFERENCES


2. Graham A 2010, email, 10 June 2010, Andrew.graham@transport.nsw.gov.au


