Institution: University of Leeds		
Unit of Assessment: 12		
Title of case study: Intelligent Speed Assistance required as a mandatory safety feature on all new vehicles sold across Europe		
Period when the underpinning research was undertaken: 2000–2011		
Details of staff conducting the underpinning research from the submitting unit:		
Name(s):	**Role(s) (e.g. job title):**	**Period(s) employed by submitting HEI:**
Oliver Carsten	Principal Research Fellow, Professor	10/11/1987 – date
Samantha Jamson, née Comte	Research Officer, Research Fellow, Professor	01/07/1994 – date
Frank Lai	Demonstrator, Research Assistant, Research Fellow, Lecturer	01/01/1999 – 01/11/2017
Kathryn Chorlton	Research Officer, Research Fellow	01/10/2001 – 31/10/2015
Paul Goodman	Research Officer, Research Fellow	01/10/1998 – 31/07/2010
David Carslaw	University Research Fellow	01/10/2004 – 01/01/2010
Stephane Hess	Principal Research Fellow, Reader, Professor	01/05/2008 – date
Mark Wardman	Principal Research Fellow, Reader, Professor	01/08/1998 – 01/02/2016
Period when the claimed impact occurred: 2013–2019		
Is this case study continued from a case study submitted in 2014? Yes		

1. Summary of the impact (indicative maximum 100 words)

Speeding is a major factor in road deaths and serious injuries. Intelligent Speed Assistance (ISA) is the vehicle safety technology that discourages and curtails speeding by limiting vehicles to the speed limit, unless overridden by the driver. University of Leeds research on the behavioural and safety benefits of ISA played a major role in informing, and delivering, European Union legislation in 2019 that mandates all new motor vehicles sold in the EU from 2022 to be equipped with ISA. According to the European Transport Safety Council, the package of mandated vehicle safety measures in this legislation, which includes ISA, is forecasted to save 25,000 fatalities and 140,000 serious injuries over 15 years.

2. Underpinning research (indicative maximum 500 words)

From 2001 to 2011, researchers in the Institute for Transport Studies at the University of Leeds (ITS Leeds) studied the benefits of Intelligent Speed Assistance[1] (ISA) systems through conducting large-scale trials and analysing the resulting data. ISA systems allow a vehicle to monitor the permitted or recommended maximum speed for the road by coding speed limits into an in-vehicle digital road map that is combined with a positioning system (e.g. GPS). This can be supplemented by on-vehicle cameras that read the roadside speed limit signs. For a given section of road the system can: advise speeding drivers to slow down (Advisory ISA, also termed 'Speed Limit Information'); curtail the ability to speed (Overridable or Assisting ISA); or prevent acceleration beyond the legal maximum (Non-overridable ISA).

[1] ISA was formerly termed 'Intelligent Speed Adaptation', but that name has fallen into disuse.

Real-world trials on driver behaviour and assessment of wider impacts

The outcomes of a wide-ranging three-year UK government-funded study—the EVSC project, carried out by ITS Leeds and the Motor Industry Research Association (MIRA)—were delivered in 2000. This included on-road studies of driver behaviour in a car fitted with an ISA system. MIRA researchers integrated sensor and actuator technologies into the vehicle and created digital maps for test routes. ITS Leeds researchers carried out the on-road tests and analysed the vehicle data to determine the effects of ISA on behaviour and accident risk [1]. Using microsimulation techniques, they also examined the subsequent impacts of ISA-equipped vehicles on other traffic, and found that the effects of ISA would be cumulative if more than 60% of vehicles were equipped with the technology. Given the observed changes in speed, ISA would have a substantial impact on injuries and fatalities and was highly favourable in cost-benefit terms [2].

In 2003, the growing evidence on the benefits of ISA led to a large-scale trial ('Field Operational Test') named 'ISA-UK' funded by the Department for Transport (DfT). The system, unique at the time (and now emulated in the ISA specification adopted in European Union legislation), was an Overridable/Assisting ISA automatically-enabled at ignition-on, with electronic control to curtail speed to the speed limit, combined with a visual interface to the driver. The trial involved adaptation of 20 cars by MIRA, and collected data on 79 drivers living and working in urban and rural settings (previous studies only covered urban roads). The project logged more than 400,000 miles of driving, with over 200,000 miles using an ISA linked to mapping data and technology provided by Navigation Technologies (NAVTEQ, now HERE).

This trial showed that all categories of drivers, including those who admitted a tendency to speed, improved their speeding behaviour when driving with Overridable/Assisting ISA across a variety of road categories. Indeed, the effects tended to be larger for speed-intenders, with for example a 27% reduction in motorway speeding and a 10% reduction in urban speeding accompanied by a very substantial overall reduction in high-speed driving. The ITS Leeds team also predicted the likely safety impacts, which were found to be substantial, particularly regarding serious injuries and fatalities. The research analysed alternative paths to implementation and showed that ISA was highly positive in cost-benefit terms over the 60 year period required by DfT appraisal guidance, and especially for the 'stronger' forms of the technology that directly curtail or limit speeds to the legal maximum [3].

Environmental studies and further analysis of impacts

In 2007, **Carsten** and his team received funding from the Commission for Integrated Transport and the Motorists' Forum to remodel the data generated by the large-scale trial, using up-to-date national fuel models to analyse the impact of ISA on emissions and fuel economy. **Goodman** carried out a detailed assessment of the effect of ISA on CO_2 emissions and fuel economy, finding that speed limitation generated an immediate 5% fuel saving for motorway driving. A national survey of around 18,000 households devised by **Chorlton** and **Hess** revealed substantial support for ISA implementation and indicated that drivers were generally willing to pay up to £100 for an ISA system [4, 5]. A revised safety prediction and cost-benefit analysis, carried out by **Carsten** with **Lai** and **Tate**, was an additional element of the project [4, 6].

Prior to leaving the University, **Carslaw**, **Chorlton**, **Goodman**, **Lai** and **Wardman** contributed to the original research as part of the ITS Leeds research team.

3. References to the research (indicative maximum of six references)

[1] Comte SL. New systems: new behaviour? *Transportation Research Part F: Traffic Psychology and Behaviour*, 3(2) 95–111 (2000). https://doi.org/10.1016/S1369-8478(00)00019-X

[2] Carsten OMJ and Tate FN. Intelligent speed adaptation: accident savings and cost–benefit analysis. *Accident Analysis and Prevention* 37(3), 407–416 (2005). https://doi.org/10.1016/j.aap.2004.02.007

[3] Carsten O, Fowkes M, Lai F, Chorlton K, Jamson S, Tate F, and Simpkin B. Final Report of the Intelligent Speed Adaptation Project (2008). http://webarchive.nationalarchives.gov.uk/20101007153833/http://www.dft.gov.uk/pgr/roads/vehicles/intelligentspeedadaptation/fullreport.pdf

[4] Carsten O, Lai F, Chorlton K, Goodman P, Carslaw D, and Hess S. *Speed Limit Adherence and its Effect on Road Safety and Climate Change*. Report for the Commission for Integrated Transport and the Motorists' Forum (2008). http://webarchive.nationalarchives.gov.uk/20110304132839/http:/cfit.independent.gov.uk/pubs/2008/isa/pdf/isa-report.pdf

[5] Chorlton K, Hess S, Jamson S, and Wardman M. Deal or no deal: can incentives encourage widespread adoption of intelligent speed adaptation devices? *Accident Analysis and Prevention* 48, 73–82 (2012). https://doi.org/10.1016/j.aap.2011.02.019

[6] Lai FCH, Carsten OMJ, and Tate FN. How much benefit does Intelligent Speed Adaptation deliver? An analysis of its potential contribution to safety and environment. *Accident Analysis and Prevention* 48, 63–72 (2012). https://doi.org/10.1016/j.aap.2011.04.011

References [1], [2], [5] and [6] are published in internationally recognised journals with rigorous review processes and international editorial boards. The quality of the underpinning research being at least 2* is demonstrated by these four references.

4. Details of the impact (indicative maximum 750 words)

Vehicles currently fitted with ISA. As documented in our REF2014 Impact Case Study and corroborated by Euro NCAP, ITS Leeds research strongly influenced Euro NCAP to incorporate ISA in its safety rating scheme via its 'Safety Assist' protocol, and in that protocol to give extra credit to Overridable/Assisting ISA as opposed to a purely advisory ISA system. The Euro NCAP decision in January 2013 stimulated leading manufacturers such as Ford and Volvo to offer such ISA on many of their models. Ford offers Overridable/Assisting ISA on almost all of its cars and vans and has stated that 95% of purchasers, for whom the system is an option, take it up (Thomas Lukaszewicz, Ford Research & Advanced Engineering Centre, Germany: https://vimeo.com/172579013 at 7 minutes, 48 seconds). Consequently, hundreds of thousands of vehicles are already on the road with Overridable/Assisting ISA.

Mandatory fitting. In parallel with this voluntary take-up, there has been swift progress on moving towards mandatory incorporation of ISA into new vehicles across Europe, with ITS Leeds research playing a prominent role on providing the evidence to justify the decision.

In 2014, the responsible authority for European vehicle regulation (DG GROW of the European Commission) began a series of studies into enhancing the safety of road users through compulsory use of a variety of crash-avoidance systems. Until then, vehicle standards, as embodied in the 'General Safety Regulation' and 'Pedestrian Safety Regulation', which set the minimum standards for new vehicles sold across Europe, had focused primarily on occupant protection in the event of a crash, as well as on prevention of serious injury to pedestrians in the event of a frontal collision. The Commission was now investigating what would be the benefits and costs of fitting a variety of new crash avoidance and crash mitigation technologies, so-called 'Active Safety' systems. This initial study was based on information in the open literature, and the study report issued in March 2015 rated ISA as one of the most promising Active Safety

systems (reference [A], page 39). In the detailed assessment of the research evidence on the impact of ISA (pages 104 to 107),16 out of 30 citations in the text, covering virtually every aspect of the evidence on ISA, are to ITS Leeds research.

In December 2016, the Commission issued a Communication to Parliament, Council and other EU bodies indicating that it was minded to propose regulation, including fitting ISA to all new passenger and goods vehicles (M and N vehicle types) [B]. ITS Leeds research was cited in support, and the discussion of the safety impact and costs and benefits also cited ITS research (footnotes 12, 14 and 15). The Communication also strongly specified, on page 10, that the favoured system was an overridable/assisting one (here termed 'voluntary'), i.e. the configuration trialled in the ISA-UK project.

In May 2017, the Commission published its detailed cost-effectiveness study on the choices to be made in revising the General Safety Regulation and Pedestrian Safety Regulation [C]. This cited input from ITS Leeds (page 98), and reported that values from ITS Leeds studies (pages 100 and 101) could provide the required information on the safety effectiveness of ISA for cars (vehicle category M1) and light trucks (vehicle category N1).

Finally, in May 2018, the European Commission announced its package of measures for safe, clean and connected mobility, termed 'Europe on the Move III' (https://tinyurl.com/ybzj8j9d). For safe mobility, a central policy was that new vehicles be fitted with advanced safety features. The justification for the vehicle proposals can be found in Section 2 'Safe Mobility' of the Commission's Communication [D]. The package of vehicle safety measures that was introduced in this proposed legislation included fitting ISA to all passenger vehicles and light, medium and heavy trucks. The detailed text (reference [E], page 24) defines the minimum requirement for ISA as follows: "*(a) it shall be possible for the driver to feel through the accelerator pedal that the applicable speed limit is reached or exceeded; (b) it shall not be possible to switch off or supress the system*." In other words, what was to be legislated was not merely Overridable/Assisting ISA, but an ISA that defaults to being enabled, i.e. the system trialled and reported in the 2000s in the ITS Leeds ISA-UK project.

Overcoming industry pressure. The Association of European Vehicle Manufacturers (ACEA) campaigned to persuade the European Parliament to replace Overridable/Assisting ISA with a less effective warning system, i.e. Speed Limit Information or Advisory ISA. **Carsten** spoke at a workshop organised by the Committee on the Internal Market and Consumer Protection (IMCO) of the European Parliament on 29 November 2018, confirming the high acceptance for the overridable/assisting system found in the UK trials, and wrote to the IMCO members stating that the predicted impact of Overridable/Assisting ISA on serious injuries and fatalities was more than four times that of Advisory ISA (Speed Limit Information). On 21 February 2019, the committee voted overwhelmingly to retain Overridable/Assisting ISA in the vehicle safety package, and Overridable/Assisting ISA is specifically written into the final legislation, which passed in April 2019 [F, G]. In November 2019, the legislation was formally approved by Council and thus became law [H].

The Director of the TRL Academy corroborates that '*the ITS outputs on ISA were the most influential independent set of studies and helped us to come to our recommendation to the European Commission to require mandatory fitment of ISA to all passenger and freight vehicles*' [I].

In summary, evidence from ITS Leeds research played a 'crucial role' and a 'crucial body of evidence' [I] in the decision-making process leading to European Union legislation in 2019 that mandates all new motor vehicles sold in the EU from 2022 to be equipped with ISA, and also prevented the legislation from being weakened under pressure from manufacturers. The safety benefits are core to the decision to adopt the package of vehicle safety measures that include

the ISA system; the underlying prediction is 25,000 prevented fatalities and 140,000 prevented serious injuries across the EU Member States in the period 2021 to 2037 [J].

5. Sources to corroborate the impact (indicative maximum of 10 references)

[A] European Commission, 'Benefit and Feasibility of a Range of New Technologies and Unregulated Measures in the Fields of Vehicle Occupant Safety and Protection of Vulnerable Road Users', DG GROW, Brussels (2015). https://doi.org/10.2769/497485
Describes the benefits and costs of ISA (Appendix A.3, pages 104–107); 16 out of 30 citations in the text are to ITS Leeds research.

[B] European Commission, Commission Staff Working Document Accompanying the document Report from the Commission to the European Parliament and the Council 'Saving Lives: Boosting Car Safety in the EU', SWD(2016) 431 final, DG GROW, Brussels (2016). https://tinyurl.com/ycv97tde
Discussion of the safety impact of ISA cites ITS Leeds research. References 12, 14 and 15 are to ITS Leeds research. Reference 13 (https://ec.europa.eu/transport/road_safety/sites/roadsafety/files/newspdf/speed_limitation_evaluation_en.pdf) cites ITS Leeds work on pages 34, 38–40, 57, 95, 185, 189, and 190.

[C] European Commission, 'In depth cost-effectiveness analysis of the identified measures and features regarding the way forward for EU vehicle safety: final report' DG GROW, Brussels (2017). https://doi.org/10.2873/748910
ITS Leeds research on the safety impacts of ISA for cars (vehicle category M1) and light trucks (vehicle category N1) is cited on pages 98, 100 and 101.

[D] European Commission, 'Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions—Europe on the Move, Sustainable Mobility for Europe: safe, connected, and clean' (2018).
https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52018DC0293

[E] European Commission, Proposal for a Regulation of the European Parliament and of the Council on type-approval requirements for motor vehicles (2018).
https://eur-lex.europa.eu/resource.html?uri=cellar:f7e29905-59b7-11e8-ab41-01aa75ed71a1.0003.02/DOC_1&format=PDF

[F] European Commission, Press Release, 26 March 2019. Road safety: Commission welcomes agreement on new EU rules to help save lives.
https://ec.europa.eu/commission/presscorner/detail/en/ip_19_1793

[G] European Transport Safety Council, Press Release, 16 April 2019. European Parliament backs new vehicle safety standards.
https://etsc.eu/european-parliament-backs-new-vehicle-safety-standards/

[H] European Council, Press Release, 8 November 2019. Safer cars in the EU.
https://www.consilium.europa.eu/en/press/press-releases/2019/11/08/safer-cars-in-the-eu/

[I] Letter from the Director of the TRL Academy, Wokingham, RG40 3GA, UK, 14 January 2021.

[J] Presentation by the Director of the TRL Academy, 6 June 2018. The importance of the GSR for the future of vehicle safety: Results of the Impact Assessment study.
https://etsc.eu/wp-content/uploads/Richard_Cuerden_06062018.pdf