One size does not fit all-the New South Wales experience in running a Road Safety Technology Field Operational Test (FOT).

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Abstract
In Europe, Japan and the United States a number of Field Operational Tests (FOTs) have been used recently to evaluate new in-vehicle technologies in real-world situations. The New South Wales Centre for Road Safety (NSWCRS) is currently conducting its first FOT on Intelligent Speed Adaptation (ISA) technology. This is the largest ISA trial conducted in Australia, involving over 100 light vehicles from private fleets in the Illawarra Region of NSW. The objectives of the ISA Trial are to quantify and compare the road safety benefits of advisory and supportive ISA systems, to measure the economic benefits ISA technology and to assess the acceptability of ISA technology by drivers and corporate fleet managers.

This paper explores the challenges faced in conducting a complex FOT of this kind and outlines some of the key lessons learned. Some of these challenges being addressed include the importance of developing a sound project management system, participant recruitment strategies, risk management, project-specific legal and insurance constraints, and the optimal collection, storage and interpretation of high volumes of field data and media and communications strategies.

Introduction
Field Operational Tests (FOT) are large-scale test programmes aiming at a comprehensive assessment of the efficiency, quality, robustness and acceptance of ICT solutions used for smarter, safer and cleaner and more comfortable transport solutions (FOT-Net 2009).

FOTs require that:
- the study is done under normal traffic conditions
- the effect of the technology needs to be compared with a baseline condition during which the technology is not operating.

The New South Wales Centre for Road Safety (NSW CRS) is currently conducting its first FOT on Intelligent Speed Adaptation (ISA) technology.

This paper explores the challenges faced in conducting a complex FOT of this kind and outlines some of the key lessons learned. Some of these challenges being addressed include the importance of developing a sound project management system, participant recruitment strategies, risk management, project-specific legal and insurance constraints, and the optimal collection, storage and interpretation of high volumes of field data and media and communications strategies.

Method
The NSW ISA trial is the largest road safety technology trial conducted in Australia by a Government agency. The trial involves over 100 light vehicles from both private and business fleets in the Illawarra Region of NSW. The objectives of the ISA Trial are to quantify and compare the road safety benefits of ISA systems, to
measure the economic benefits ISA technology and to assess the acceptability of ISA technology by drivers and corporate fleet managers. There were two types of systems identified for the trial. Advisory ISA systems warn the driver if they are travelling over the speed limit. Supportive ISA systems also warn drivers when they are travelling over the speed limit but will also gradually slow the vehicle down to the legal speed if the driver ignores the warnings. Both systems can be overridden by the driver at any time.

The project team has faced a number of significant challenges in developing and running such a large trial of new technology in private vehicles under real world conditions. This paper will describe many of the challenges faced by the team and importantly outline some of the lessons learned from our experiences which may assist others developing and conducting large road safety field operational trials.

The challenges facing the team have been classified into a number of areas for this paper including:

- Choosing a project management and research methodology
- Procurement
- Insurance
- Participant Recruitment and Privacy
- Media and communications
- Collecting, storing and analysing data

Results

Choosing a project management methodology

Initially a project plan was developed for the trial using a standard project management software package. However, it soon became apparent that the project management software whilst excellent for developing timelines and assisting with budgeting was not a comprehensive project management system. In the early stages of the trial an experienced auditor and project manager was appointed to the team to develop management systems and conduct audits specifically focused on speed zone mapping and data. It was soon recognised that auditable systems needed to be developed for many aspects of the project and this was beyond the functionality of the project management software. The RTA standard project management system is based on the Project Management Body of Knowledge (PMBOK) originally developed by the Project Management Institute in 1987 (Wikipedia 2009). The team has included many of the aspects of PMBOK system into its project management system for the trial. In addition to this the project team has also undertaken training in the PRINCE2 project management system developed by the UK Government (OCG 2009). The team has also included PRINCE2 principles into the project management system for the trial, resulting in a system that uses aspects of both these recognised systems.

The major lesson learned from the ISA trial in this area is to choose and settle on a recognised and documented project management methodology for the duration of the FOT and not rely solely on a project management software package. The benefits and limitations of different types of systems should also be considered. The European Commission’s FOT Implementation Plan may be a useful tool and starting point but the project team found it is not sufficient as a stand-alone comprehensive project management system. It is beneficial in providing ‘food for thought’ (FESTA 2009).

Procurement of ISA devices

The procurement of new road safety technologies such as ISA presented the team with a significant number of challenges including:

(a) Absence of model procurement documentation

As the ISA Trial was the first complex and large-scale FOT of its kind in Australia, the existing RTA procurement documentation could not accommodate the broad range of project-specific requirements and risks associated with this new technology. Procurement documentation from previous trials (including those by other Australian states) also proved inadequate. Special contract agreements had to be developed, after
working very closely with RTA probity experts, insurance advisers and both internal and external legal experts. The final Request for Proposal (RFP) document was the result of numerous revisions, meetings, telephone calls and emails with all of the relevant stakeholders. As each new risk emerged, the RFP document had to be amended accordingly. The formal Agreement (SIMRA) within the RFP document was also revised many times before its final issue. It too required regular and intensive liaison with all stakeholders. This process of continuously revising draft documents took several months and incurred significant legal costs. Fortunately however, these final revisions can now serve as model RTA procurement contract documents, thereby expediting the preparation of future documentation for the procurement of non-generic goods and services.

The major lessons learned in this area included: The need to develop a strong understanding of the products and services required (prepare mandatory and non-mandatory lists) well prior to engaging legal advisers. Don't assume existing procurement documents and processes can be applied to non-standard goods and services, especially FOTS. With all of the competing priorities in the early stages of the trial, ensure the preparation of procurement documentation is given a high priority. Don't under-estimate the benefits of a sound document control management system.

(b) Limited ISA Supplier market

Prior to advertising for a supplier of 100 ISA devices the project team was aware that there was only one known Australian supplier of Supportive ISA technology and two known Australian suppliers of Advisory ISA technology. It was anticipated however, that other automotive telematic companies would emerge, and provide the RTA with a broader choice of ISA suppliers.

The RFP process produced only one suitable supplier of Advisory ISA devices, but no providers of Supportive ISA devices. The only supportive ISA system proposal was found to be non-conforming with the RFP documentation. This meant that a Supportive ISA device supplier could not be engaged at the same time as an Advisory ISA supplier, thereby delaying the planned fit out of Supportive ISA devices. The only conforming Advisory ISA device supplier was accepted and approval sort from probity advisors to commence direct negotiations outside of the RFP process with other telematics companies to develop a Supportive ISA device.

Negotiations continued with the two prospective supportive ISA suppliers until mid-September 2009 when both companies advised the RTA that they could not provide a supportive ISA system in time for the trial. At this stage it was decided to install only advisory ISA systems in trial vehicles.

The major lessons learned in this area included:

- To anticipate a limited number of suppliers who will be capable of developing and supplying products and services which rely on newly developed technologies.
- The need to follow established procurement and probity policies, but approach and network with other potential suppliers prior to advertising the RFP, to attract a broader number of RFP submissions.
- The importance of keeping informed of potential suppliers of other related technologies for possible engagement for future projects, by reviewing industry magazines and literature and networking with other technology stakeholders.
- The advantage of developing a technology supplier database to facilitate future procurement for field operational tests.

(c) The absence of existing ISA technical standards

Special care was required with the preparation of the RFP documents when articulating the technical specifications for the ISA devices, as no existing national or international standards for this technology were available as a reference criterion. The development of these specifications required a thorough examination and review of existing telematic standards, motor vehicle regulations and Australian Design Rules. Close and
lengthy liaison was also required with RTA vehicle safety experts, RTA legal advisers, motor vehicle industry practitioners and inter-state government colleagues, to develop technical specifications that were unambiguous, realistic and yet capable of addressing all of the perceived safety risks for participating drivers and passengers.

The major lessons learned in this area included:

- To anticipate the absence of recognised national and international technical standards for new technologies.
- The importance of consulting and working closely with internal and external experts when sourcing and interpreting relevant technical standards.
- The need to assign a high priority to the preparation of such standards, as the progress of this activity may depend on others who are outside of your sphere of control and who are also juggling their own work priorities.

Insurance

Insurance plays a critical role in managing the risks that running a large field operational test entails, especially the risks associated with fitting a supportive ISA device in vehicles owned by volunteers from the community. Normally, the RTA’s insurance needs are met through a number of arrangements. The first is the Treasury Managed Fund which is a whole of government self insurance arrangement for the activities the RTA carries out itself. The Treasury Managed Fund does not provide coverage for any activities carried out on behalf of an agency by a contractor. For the activities the RTA carries out through external contractors, Principal Arranged Insurance or Contractor Arranged Insurance option is employed.

For the NSW trial, insurance went beyond these normal arrangements. Three separate levels of insurance were employed. The first was to apply the standard contractor insurance provisions for our ISA device supplier. This included Product Liability, Professional Indemnity and Workers Compensation.

We also employed comprehensive motor vehicle insurance on all vehicles participating in the trial. Most participants, and almost certainly all fleets, would already have their own comprehensive motor vehicle insurance. However this existing insurance is for a vehicle that does not have an ISA device installed. If a crash or vehicle breakdown were to occur the participant may face difficulties when making a claim. This could occur even if the crash or breakdown is unrelated to the ISA device, or the case may be disputed. The RTA considered the option of contacting each of the existing insurers to notify them of the presence of the ISA device, but decided against it for several reasons. It may have resulted in a higher premium or a refusal to continue the insurance. Logistically this option would involve entering negotiations with up to fifteen different insurance companies. Negotiations would involve not only the insurer, the driver and the participating company but in some cases also the vehicle leasing company; making it a complex five-way negotiation. Hence it was decided that the RTA would make our own arrangements to take out comprehensive insurance for all our participants with full and accurate disclosure to the insurer ensuring the greatest level of protection for our participants. We still required all participating companies to have their own compulsory third party insurance.

The final form of insurance employed by the RTA was to obtain over-arching trial-specific Professional Indemnity Insurance and Public and Product Liability Insurance. This ensured that the RTA is covered above and beyond the ISA Supplier's insurance policy, to offer better protection for the trial overall. If there is an ISA device product issue this policy would respond first to protect the interest of both the RTA and our participants against a third party claim. This policy would then recover costs, if applicable, against the ISA supplier's Professional Indemnity or Product Liability Policy. This minimises the chance of claims and counter claims being shifted back and forth between different parties.

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The major lessons learned in this area included:

- To organise extensive trial-specific insurance, in addition to the standard contractor arranged insurances as this provides a higher level of protection.
- Consider offering comprehensive motor vehicle insurance to participants to avoid the risk of their current insurer rejecting claims. This may also act as an incentive for volunteers to participate in the trial.
- Organise to take insurance company actuaries out in a demonstration vehicles so that they can make an informed assessment of the risks involved with the FOT.
- Be aware that there will only be a limited number of insurers who are willing to insure a trial and that it takes some time for insurers to understand how the technology works and to calculate their potential risk exposure.

Participant Recruitment

Originally, the trial planned to install ISA devices in fleet vehicles owned by private businesses operating in the three Local Government Areas in which the trial was to be conducted. Despite contacting a large number of businesses it became apparent that it would be difficult to find 100 vehicles with dedicated drivers to join the trial. A major factor cited by businesses for not joining the trial was the onset of the global economic crisis and the associated plunge in business confidence. Businesses were being forced to concentrate on their bottom line and were not in a position to give freely of their time to the project. It was then decided that the project team would need to change and broaden our recruitment strategy to include non-exclusive as well as private drivers.

At the time of writing 100 vehicles 116 drivers have been recruited for the ISA Trial. Participants fall into one of three categories; exclusive fleet drivers, shared fleet drivers or private drivers. Each of these was targeted in a different way.

(a) Recruitment of company fleets

The first category, exclusive fleet drivers, was made up of vehicles/participants who met the following criteria:

- The vehicle must have one dedicated driver at least 80% of the time
- The vehicle is predominantly driven in the trial area of the Illawarra Region.
- The vehicle will not be replaced or retired during the trial period.
- The vehicle is owned by a company and used predominantly for work purposes.

We sought to find participants who fit these four criteria by approaching private businesses that operated in the trial area. Most businesses were known to the researchers through the RTA’s network of contacts. Finding a sufficient number of drivers who satisfied all four criteria proved to be more difficult than expected. For example, the first criterion specified that each vehicle must have one dedicated driver. However, many company fleets are made up of vehicles which are shared as part of a pool. Also problematic was the third criteria which specifies that the vehicle will not be replaced or retired during the trial. This also proved to be difficult criteria to satisfy because fleet vehicles tend to be replaced frequently, sometimes every few months. The researchers therefore modified the first criteria to also include vehicles which were shared and driven by more than one staff member. This resulted in two distinct categories of fleet vehicles: ‘Exclusive’ and ‘Shared’. Overall, we recruited 50 fleet vehicles which were composed of 40 exclusive and 10 shared vehicles.

Our approach for recruiting these fleet vehicles consisted of two stages: Firstly, discussions were held with the management of each company to generate interest and secure their agreement. Once this agreement was received, discussions were held with staff members. On a few occasions we found that senior managers were keen to participate but then experienced some resistance from the drivers themselves. It was anticipated that there may be some resistance from drivers to trialling a supportive ISA device in their vehicle but the project team found that the greatest concern was in regards to the data recorder which tracked the vehicles and monitored the vehicle’s speed and location. Some drivers were worried about the perceived ‘big brother’
aspect of this (as portrayed in some recent media stories on ISA), particularly about what the information would be used for. In order to allay the fears of potential participants privacy became a key aspect addressed in all our presentations and communication materials. This highlighted the importance in continuously refining and updating communications materials and the FOT communication strategy.

(b) Recruitment of private drivers

There are more than 50 private drivers participating in the NSW ISA Trial. The recruitment criteria used to select these private drivers was similar to that used to select fleet drivers, except that drivers also had to meet an additional criterion of owning their own vehicle.

The approach for recruiting these participants differed from that used for private businesses. Two information evenings were held for private vehicle drivers who were interested in participating in the trial. The information evenings provided potential participants with detailed information about the ISA Trial. In order to find people who were interested in the trial to attend the information evenings, the researchers could not rely solely on the RTA's own network of contacts. A market research agency was contracted to perform this function. The role of the market research agency was to recruit the potential private vehicle drivers from a combination of the market research agency’s own sources as well as from several RTA sources.

The use of a market research agency to find these private participants had several benefits, including greatly speeding up the process in order to meet tight timeframes, the ability to access a large pool of people, and ensuring only people who were already pre-disposed to participate in the trial attended the information evening. The use of the market research agency also assisted greatly in securing a broad profile of participants, as their recruitment strategy was very targeted in terms of gender, ages and driving history profiles. Anecdotal evidence based on feedback received from potential participants at the information evenings indicates that private drivers were less concerned than fleet drivers about the presence of the data recorder and how that information would be used. These private drivers appeared more interested in trying to understand how the advisory or supportive ISA device would impact on them if they drove above the speed limit.

(c) Incentives

Small incentives were offered to participants for participating in the trial. This included providing their motor vehicle insurance, supplying fuel vouchers and a first aid kit and offering roadside assistance. The roadside assistance service, comprehensive insurance and first aid kits acted both as incentives for the trial and risk countermeasures.

(d) Legal Agreements

The researchers worked closely with RTA legal advisers to prepare the appropriate documentation for the trial. A legally binding agreement termed a Deed was prepared, which outlined the responsibilities of participating companies as well as the RTA. It was more difficult than expected to execute these agreements in a timely manner, due to their complex nature and the large number of parties with an interest in the content. The need to customise the agreement for multiple companies was time consuming and frustrating at times. For example, some of the larger fleet businesses had up to five people reviewing the document, including fleet managers, solicitors, the executive and the vehicle lease company.

The major lessons learned in this area included:

- The need to target communication materials to different type of participants.
- Reviewing legal agreements, particularly with large businesses, who were often engaged in complex vehicle lease arrangements, takes a lot longer than expected and substantial time, should be set aside in the project plan to accommodate this.
- If possible conduct some research during the planning stages of the trial in order to ascertain with reasonable certainty the number of willing participants who will meet the desired criteria.
The use of a market research agency for the recruitment can save a significant amount of time and enable researchers to carefully select different classes of participants for inclusion into the trial such as recidivist traffic offenders and younger drivers.

Drivers with a good driving record are more likely to volunteer for trials when recruited informally.

The use of incentives facilitated recruitment by offering a small reward in exchange for the inconveniences associated with participating in the trial.

Media and communications

(a) Developing a demonstration vehicle

During the planning stages of the trial and vehicle was obtained and fitted with a supportive ISA system for demonstration purposes. High profile signage featuring the NSW Centre for Road Safety logo, colours and lettering were designed for the vehicle.

The vehicle chosen to become the flagship for the trial had to meet the following minimum requirements:

- Existing vehicle on the NSW Government's State Fleet list
- Five star Australian New Car Assessment Rating (ANCAP) and high pedestrian safety rating
- Side curtain air bags
- Electronic Stability Control
- Good Environmental Protection Score

The Centre’s Safety Car also became a draw card for the media wanting to report not only on the NSW but also on other road safety issues involving technology. The Safety Car has been featured on all major television networks as well as in the print media and on the internet including you-tube. The Nine Network’s 60 Minutes program also requested permission to use the vehicle in a story on young drivers. The demonstration vehicle served multiple purposes- to promote the NSW Centre for Road Safety and the ISA Trial, to promote vehicles with a high safety rating and good safety features, and, importantly for the FOT, to test the useability, robustness and suitability of ISA devices for inclusion in the trial.

(b) Launching the trial

The trial was launched by the Minister for Roads in association with a National Forum on Intelligent Speed Adaptation. An animation explaining how the technology worked and a short documentary video on the trial were developed for the launch. Every national television network covered the launch. Radio interviews were also conducted on most major afternoon drive shows on the afternoon of the launch. Written articles also appeared in most major newspapers of the next few weeks. The launch benefited members of the project team as many businesses were aware of the project when they were approached to provide volunteers for the trial over the subsequent weeks.
(c) Videos and animations

An animation was commissioned for the Ministerial Launch to explain how the technology operated. It was based on a similar resource produced by the Lavia ISA Trial conducted in France a number of years before the NSW ISA trial. The use of an animation to explain a new technology is recommended for those undertaking similar new technology FOTs in the future. The animation has been used continuously since it was commissioned in presentations to potential participants as well as at National exhibitions, forums and conferences.

A short documentary video was also developed for the launch of the trial explaining the aims and the objectives of the trial. The video has also been used extensively to promote the trial to potential participants as well as the wider community. Both the video and the animation have been used by media organisations reporting on the trial, with one organisation posting it on You-Tube. The animation and video are both available on the RTA’s web site.

A second short documentary is also in the final stages of production at the time of writing this paper. This will be used as a training resource to explain the safe operation of the ISA device for trial participants and their families.

(d) Written materials

Whilst extensive legal documentation was developed for the trial only a small number of written promotional materials were developed for the trial. A Frequently Asked Questions (FAQ) sheet was developed to accompany the participant recruitment presentation. Power point presentations for participant and fleet recruitment meetings were created and updated on a regular basis. A configuration library was developed to manage the version control of all documents as well as electronic copies of videos and animations produced throughout the trial.

The major lessons learned in this area included:

- There is a significant advantage in installing even a prototype device into a vehicle that can be used for demonstrations with the media as well as potential participants.
- A demonstration vehicle can also be used to demonstrate the device to insurance companies that you may negotiate with to cover aspects of your FOT.
- Customised animations can be very effective in explaining to potential volunteers as well as the media, complex concepts associated with new technologies.
- A configuration library should be established to manage versions of documents as well as electronic resources such as videos and animations.

Collecting, storing and analysing data

The NSW ISA Trial has involved the collection of an extremely large number of data records. The location of every regulatory speed and curve advisory speed sign was collected for the 2,500 km of road network within the trial area. Speed data collected from vehicles as part of the trial includes millions of records from GPS speed data recorders. In addition to this, fuel records for all vehicles were obtained from exclusively driven vehicles. A number of drivers also provided researchers with permission to access their driving records from the RTA’s driver licensing database for the five year period leading up to the trial. Data on attitudes and self reported behaviours were also collected from exclusive drivers participating in the trial through on-line and telephone surveys conducted by an independent research company.

(a) Protecting privacy and complying with legislation

Very early in development of the trial the project team became aware of the extent of legislation protecting the privacy of potential trial participants. Data collected from vehicles to measure speed limit compliance and...
driver licensing records are classified as personal information and are subject to the Federal Privacy Act 1988, the NSW Privacy and Personal Information Protection Act 1998, Workplace Surveillance Act 2005 and the Surveillance Devices Act 2007. The project team worked closely to with the RTA’s internal Privacy and Freedom of Information Section to establish procedures and protocols to protect the privacy of all trial participants. Measures introduced to protect privacy included the development of a password protected database with access restricted to a very limited number of staff and the development of a vehicle coding system that prevented the linking of vehicles to an individual driver with out access to the project's database. The team also developed comprehensive documentation for participants explaining how their private information would be protected during the trial. Each driver participating in the trial was also provided with an internal adhesive notice that was fixed to the vehicle’s dashboard informing all drivers that the vehicle was equipped with a GPS tracking device as part of the trial.

(b) ISA Trial knowledge base

It soon became apparent that a customised data management system needed to be developed to manage the majority of data being collected throughout the trial. The ISA Trial knowledge base (ISAT) is a Microsoft Access database that was developed specifically to manage the ISA trial in particular and road safety technology trials in general. It is hoped that the ISAT system will be used to manage a number of future in vehicle technology trials. ISAT consists of a number of modules including a contact register, device inventory, vehicle records and licence records.

ISAT enables staff working on the project to answer queries from participants as well as report on the progress of the trial even when key project officers are out of the office or on leave.

(c) Collection of Speed Signs and Zones

No spatially referenced speed zone information existed in the trial area before the beginning of the trial. Over 4,500 speed regulatory and advisory signs were collected over a three month period by RTA Engineering Scholars (Cadets) and entered into the RTA's newly developed speed zone management system. A major challenge has been to keep the speed zone information up to date when a speed zone changes. Existing traffic engineering staff have found it difficult to move from a paper based to a spatially referenced system that requires the use of GPS technology in the field and more advanced IT technology in the office.

(d) Collecting and managing speed compliance data

International research suggests that the installation of ISA device in vehicles has the potential to substantially improve speed limit compliance and therefore road safety outcomes. The NSW ISA trial is using GPS equipped speed data recorders to measure speed limit compliance. The position and speed of each vehicle in the trial is recorded in 10 second intervals and sent via the GPRS mobile phone system to a centralised computer service owned by an external data provider. The trial project team receives the data in weekly snapshots; they check its quality and then forward it weekly to the Roads and Traffic Authority's Spatial Information Systems (SIS) unit. The separation of speed data collection (which is collected by a private contractor) and the development of speed compliance reports (by the RTA) assist in protecting the privacy of the trial's participants.

(e) Secure storage and analysis of data

The RTA’s SIS unit match the speed recorder data with their data set of speed limit information to determine speed compliance. The data is then merged into a single database and transferred to a centralised spatial information server. To date each fleet vehicle involved in the trial transmits on average, 11,500 speed and location records per month. Each month the project team expects to receive on average almost 1.2 million records from each of the 100 vehicles involved in the project. This data equates to a file size of approximately 150 Mb.

Speed limit compliance reports are then produced from the matched data set. Information contained in the ISAT system is then used to match the coded data with exclusive driver information including age, gender, driving record and attitudes to speeding and experience with technology.
The major lessons learned in this area included:

- The importance of working closely with an organisation’s privacy officers to ensure that the method being used to collect and store data during a FOT complies with relevant state and federal legislation.
- Ensuring that participants in trials are informed of what data is being collected, how it is stored and what it will be used for.
- The value of developing a centralised management tool such as ISAT to coordinate and record information on the trial, especially the day to day interactions with volunteer participants.
- To allow sufficient time to develop the systems to collect, store, analyse and check the quality of data collected during the trial.

**Conclusion**

The NSW Intelligent Speed Adaptation trial has been the largest field operational test conducted by a Government Agency in Australia to date. It has provided a significant number of challenges to the project team charged with implementing the trial. However, it has also provided an excellent opportunity for researchers to develop new tools and procedures that will be used in the field testing of road safety technologies well into the future.

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