Field Operational Test for Cooperative Intelligent Transport Systems (C-ITS)

Andry Rakotonirainy[a], Andy Bond[a], Miranda Blogg[b], Katharine Mosley[b], Ronald Schroeter[a], Gregoire Larue, [a] Sebastien Demmel[a], Ioni Lewis[a] , Narelle Haworth[a], Mark Miska[a]

[a]Queensland University of Technology, [b]Queensland Department of Transport and Main Roads

Abstract

This paper reports on the progress of a large on-road field operational test (FOT) of eight Cooperative Intelligent Transport Systems (C-ITS) safety applications on about 500 public and fleet vehicles, and road infrastructure, in the City of Ipswich, Queensland, Australia. The FOT is conducted by the Queensland Department of Transport and Main Roads (TMR), Queensland University of Technology (QUT) and is financially supported by the iMOVE Cooperative Research Centre (CRC). It adheres to the European standard FESTA methodology. This paper describes progress related to the study design covering use case description, research questions, hypotheses formulation and identification of surrogate safety measures.

Introduction

This FOT – currently the largest planned in Australia – will provide a core data set to build a standardised analysis methodology and evaluate safety benefits of C-ITS. The FOT is now at the design and preparation phase and follows the FESTA (2017) methodology which comprises international best practice guidelines, and lessons learned for conducting FOTs for in-vehicle technologies that deliver safety, mobility and environmental benefits. The main research question we are addressing is: what are the safety benefits of deploying C-ITS? Safety benefits will take into account exposure, risk of crash, injury, incidents, near crashes, crashes and other safety performance indicators.

The focus of the paper is on use case description, research questions and hypotheses and safety measures as described in Figure 1. Such information helped to specify the experimental design and to define boundary conditions. By following the FESTA guidelines, the experiment will warrant solid and consistent data analyses. A literature review has revealed a range of previous FOT and related projects which provide insight into challenges and opportunities likely to be encountered in this trial. A key aspect to the study outcome is the sanctity of the data accumulated during the trial, and availability to support hypotheses testing. Accuracy, consistency, and transparency are qualities that must be maintained throughout the chain of data collection and analysis to ensure scientific validity of results.

Some aspects of C-ITS equipment capabilities are still under discussion. This paper will discuss constraints and issues linking data collection equipment and hypotheses through the eight use cases. Each use-case has been selected as part of a business case conducted by TMR and are: Emergency brake warning (V2V), Stopped or slow vehicle warning (V2V), Turning warning for bicycle riders and pedestrians (V2I), Red light warning (V2I), Road works warning (V2I), In-vehicle speed warning (V2I), Back-of-queue warning (motorways) (V2I), and Hazard warning (V2I).

Methodology

The overall hypothesis is that C-ITS applications will trigger a driver's safe reaction/behaviour upon reception of warning messages across the eight use-cases. This observational study is a before-and-after within-subject design. Each driver (N=500) will be assigned to the baseline (control) or

intervention (treatment) group after all before measurements of the exposure or risk factor variables are recorded.

The surrogate measure of safety performance attributes available for analysis is GPS (speed location) data related to vehicles and infrastructure (for example, traffic light location or Work Zone). This implies that analysis driver behaviour and risk evaluation and interpretation are constructed from GPS data which could feature errors and inaccuracies.

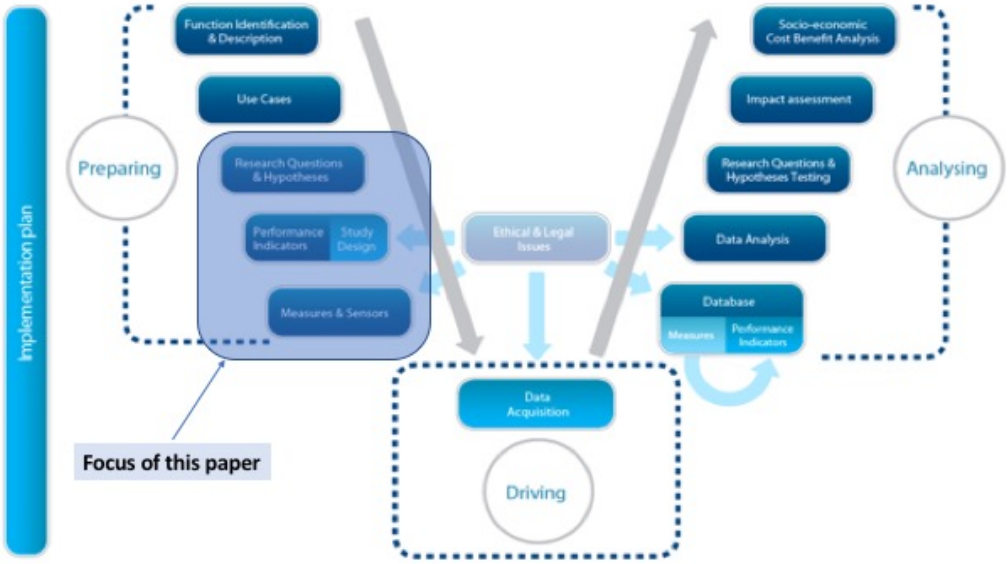

Figure 1: FESTA methodology

Conclusion

The evaluation findings will be used by transport agencies (local, state and federal) to support infrastructure investment, both digital and physical, that supports the emerging C-ITS need. Specifically, this C-ITS Pilot will (i) validate the impacts and benefits, and user perceptions; (ii) demonstrate technologies and build public awareness and uptake; (iii) grow government's technical and organisational readiness and (iv) encourage partnerships and build capability in private and public sectors.

References

FESTA (2017) FESTA Handbook version 6 (wiki.fot-net.eu)