Testing times: developing a new concept through to delivery

In last month's edition of Highways Magazine, Andrew Page-Dove of the Highways Agency introduced readers to the all-lanes running design for managed motorways. Here he explains how the Agency arrived at the new design by using innovative technology and software

Andrew Page-Dove is programme manager for all-lanes running at the Highways Agency

Managed motorways all-lanes running schemes will tackle the most congested sections (top 10%) of the motorway network in England.

To support the country's economy and growth, the Agency was set the challenge to deliver managed motorways more efficiently and more quickly, while at the same time maintaining safety for all who use or work on our roads. The projects the agency had already delivered and had under construction were doing this, but now they needed to understand what more could be done in order to tackle the congestion hot spots.

Page-Dove explained: ***"We have considerable experience within the Agency of opening the hard shoulder to traffic at peak times and of operating it permanently through junctions.***

However, we had never opened up the hard shoulder to traffic on a permanent basis between junctions along a whole scheme length. From evidence and research we developed the concept, but then needed to test this on real people. Over a two-year period using desktop modelling, questionnaires, and the Transport Research Laboratory's (TRL) 'DigiCar' – a full-mission driving simulator - we were able to test how drivers responded to the new design in a safe environment."

Test scenarios

DigiCar at TRL had already been used to test scenarios such as drink-driving, texting and driving, and driver fatigue, so it was an established and validated method of assessing driver responses to road conditions.

DigiCar uses a pre-designed motorway route for participants to drive, starting with a traditional motorway, to acclimatise them to the simulator; for participants it soon feels 'real'. The route then moves onto an all-lanes running managed motorway section which was designed to test specific aspects of the design. Everything required to implement a managed motorway are included and simulated traffic provides a realistic context for the driver.

"We had no preconceived ideas of how drivers would react," said Page-Dove. ***"It did provide a valid sense check for us, for example, we tested the spacing of the large matrix signs (MS4s), and the results from these studies helped to define the standard. Allowing us to experiment with elements of the design, based on road users' experiences boosted our confidence.***

"We were able to identify that it took longer for drivers to comprehend instructions and directions on gantry signs, than on a single MS4 on the verge containing the same information."

This, Page-Dove explained, validated the use of more single overhead verge-mounted signs, rather than overhead gantries. The move away from overhead gantries also reduces the impact on road users when maintenance has to be carried out, as to maintain these gantries, full closures are often required.

Results

As the trials progressed simulator results for those driving on all-lanes running sections were positive, showing participants understood the new layout. However, as the hard shoulder itself is something that drivers have always been used to on motorways, it was important to understand how they might behave once it was removed.

Page-Dove said: ***"We therefore tested the removal of the hard shoulder and asked if drivers recognised its absence. I found it surprising that some of the sample drivers hadn't noticed there wasn't a hard shoulder until it was pointed out to them.***

"We know that having to stop in a live lane is a real concern for people," explained Andrew, ***"so we included simulated breakdowns where the test subjects were not given any specific instructions. We found that the majority of drivers pulled to the near-side lane and left at the next exit, or used the nearest emergency refuge area. This was exactly what we wanted to see and showed that drivers automatically move towards the near-side, although they might not have always made it to an emergency refuge area, largely because they did not know how far the next one was. This helped reinforce our decision to incorporate clear 'count-down' signing for the distance to the next refuge area into the design."***

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Challenges

The Agency knows there are different challenges ahead for them. Page-Dove explained: ***"We need to help people and organisations understand managed motorways and the all-lanes running design, including what road users will see and need to do. We know that currently eight or nine out of 10 stops on the hard shoulder are unnecessary or illegal, but we still have work to do in addressing the fears about a genuine breakdown where there is no hard shoulder. We are working with a range of our stakeholders to promote the safe use of our whole network, encouraging good driver behaviours not just on sections of managed motorway.***

"Many of the road users we work with had never driven on a managed motorway before. Using TRL's DigiCar to test the all-lanes running concept and develop the design added to the Agency's confidence in it. Using a virtual motorway environment was the best, safest and quickest way to test without building a full scheme on our live network." ⛔

Digicar simulator

Dr Nick Reed, principal human factors researcher at TRL, said: ***"The DigiCar simulator provides a very realistic experience for participants and we are confident that the behaviours we observe in the simulator are genuinely representative of those observed in an equivalent real world situation. The studies completed using DigiCar to investigate driver behaviour on managed motorways and in all-lanes running situations have successfully provided the Highways Agency with an evidence base upon which design decisions could be made that would be hard to achieve by any other means."***