

Case Study 2: Bringing ELSI Principles and Creative Methods to National Highways

Joe Deville & Luke Moffat

A key part of the work of the TAS-S RS3 team involved a collaboration with National Highways (NH) (formerly Highways England), to explore their potential futures with autonomous systems. This collaboration took place over the course of a year and focused in particular on engaging NH colleagues in discussions around the challenges of delivering ethically responsive and more secure futures with autonomous systems.

Changing futures with autonomous systems

For NH, autonomous systems present a range of potential future uncertainties. With a responsibility for large parts of the UK's road network, one question the organization is having to consider how it should respond to a future that could include an increasing number of Connected and Autonomous Vehicles (CAVs) on the roads. But there are other uncertainties linked to NH's possible futures with autonomous systems. For example, could road building and maintenance benefit from the increased deployment of yet-to-be-developed autonomous systems? How could autonomous systems change the way in which traffic flows is managed?

Such uncertainties open up potential ethical and security challenges. As ever more autonomous systems are deployed in and around a large and complex road network, what new vulnerabilities emerge from the combination of an increasing range of connected digital systems? How might the actual and perceived safety and security of new autonomous technologies affect confidence in the range of organizations responsible for UK's roads? Who might benefit from these changes? Who might be harmed? What unintended consequences could there be associated with such systems?

Unpacking autonomous systems with creative, ELSI methods

Members of the TAS-S RS3 team used a range of methods – combining insights from sociology and socio-legal studies – to collaboratively engage NH colleagues in such questions. One aim was to provide NH with new frameworks for discussing such questions internally, as well as to support NH in being better able to anticipate and prepare for these possible new futures with autonomous systems. This work included three workshops with NH colleagues, 1:1 in depth interviews with 8 NH colleagues with particular responsibility for considering the place of autonomous systems within NH's future, and wider scoping work with members of the public who might be affected by autonomous systems operating in and around the UK's road network. This included a survey (400+ responses) and 4 focus groups.

The team's work was underpinned by an 'ELSI' or 'Ethical, Legal and Social Issues' approach. This approach is often used by social scientific researchers interested in understanding how technologies interact with their contexts in diverse ways. RS3 researchers used it to unpack the Ethical, Legal and Social Issues connected to predicted, anticipated, and imagined changes with autonomous systems on many of the UK's roads and the consequences of this for AS security.

A distinctive element of the team's work was the combination of an ELSI approach with creative methods. In the first workshop, the research team involved NH colleagues in

visioning exercises, supported by online collaboration tools, to shed light on the diverse spaces where autonomous systems could have impacts on NH's current and future areas of responsibility, and where new security challenges might arise. This was followed by a workshop focused on ethics, supported by a virtual card game which invited members of the team to collaborate on establishing agreed, priority ethical principles to potentially inform their work. A final workshop used the results from the first two workshops to inform a 'backcasting' exercise. The workshop involved NH colleagues in not just predicting possible futures for NH alongside autonomous systems, but also in establishing what NH's desired futures with autonomous systems could be, and what steps would be required to begin to practically accomplish such futures.



Figure 1: Example cards from game used in workshop with NH colleagues.

Feedback from NH colleagues underscored the value of such approaches (see below), with one colleague also noting during the course of a workshop how the methods being used had provided an opportunity to think through questions that usually are inhibited by organizational silos. The workshops also highlighted to participants how NH's role might change, with an increasing dependence on autonomous systems: from a road builder and maintainer to a data manager. This, colleagues suggested, could pose new legal, ethical and security challenges in need of further attention.

“Good session. Was not expecting to play a virtual card game at the end (!) but it was a great way to stimulate discussion”

“Thought provoking - it's always good to run out of time, it means valuable conversations are taking place!”

Feedback from NH colleagues on RS3 workshops

The work with wider publics, meanwhile, revealed some of the issues at stake in the context of such uncertain, technologically-mediated futures. The survey indicated just how low confidence in CAVs on UK roads is, with only around one in five of respondents in support. Around two thirds of respondents also expressed concerns about the potential for autonomous road building and maintenance technologies to be used on the UK's roads. Another revealing finding was that by far the largest range of concerns were not about specific technologies, but about the use and impact of these technologies – concerns we

group together as 'socially motivated threats'. These include worries about how others might use such technologies (28%), worries about loss of attention (12%) and worries about how autonomous systems might impact job security (9%). Such evidence points to the need – not just for NH, but for many stakeholders – to recognise that discussions about autonomous systems security should include a wider understanding of threat, when considering what consequences could stem from their development and deployment.

Diverse outputs

Over the course of the project, the team have delivered a wide range of outputs, aimed a diverse audience. Alongside conventional academic outputs, this includes short [reports](#), a [magazine piece](#) and a [video](#). The team are also in the process of finalising a toolkit, aimed at enabling organisations to use similar methods to those trialled with NH, to creatively explore both the opportunities and challenges for ethics and security posed by a wide range of new, autonomous systems.