

Future highway systems target better use of digital innovation

UK Roads Liaison Group member and chair of industry association ADEPT's engineering board Parvis Khansari writes about a recently published report looking at digital innovation and highways.

Britain's highway systems could be revolutionised with the use of digital innovation – helping to improve road condition, network and asset management and user experience.

This is my belief after working on a research project carried out by ADEPT, intended to gain a better understanding how to accelerate the uptake of technology in highways.

Digitally enabled highway systems of the future would operate very differently to how they do now and could become a major contributor to the UK's future success in the global economy, as mentioned by the Government's recently published Industrial Strategy.

Technologies to drive this transition already exist and some are already deployed in increasingly 'smart motorways' and through the availability of real time user information. Government's recent plans and strategies want these rolled out on both the Strategic Road Network – and the impending Major Road Network – from 2019.

However the SRN and MRN together amount for less than 13,000km (4%) of the 290,000km highways network in England. What Government strategies do not do is set out how digital innovation will be delivered outside the SRN and MRN.

So, the question is: how will digital and technology innovation be delivered across the overwhelming majority of the highways system? How can performance be improved for the 290Bn plus vehicle kilometres per year it carries currently and enable the forecast increase in demand to 2040 and beyond?

ADEPT collaborated with Ringway, professional services firm EY, technology company O2 and King's College London



↑ Street lighting in Hounslow now features LED luminaires RINGWAY HOUNSLOW HIGHWAYS



↑ Parvis Khansari

to establish a project team that set out in 2017 to answer the question: 'How can adoption of innovative technology be accelerated for the construction, maintenance, operation and use of highway assets in the context of increasing demand, greater financial pressures and deteriorating highway assets?'

We tackled this digital innovation research project in five work streams. Each work stream sought intelligence and insight from different stakeholders. The theme leads undertook a range of desk research, survey and stakeholder workshop activity. The themes were:

- **Vehicle manufacturers (ADEPT)** – focused on demands and opportunities that advances in vehicle technology could have on highways infrastructure and transport management, including electric, hydrogen, connected and autonomous vehicles.

- **Professional Services (EY)** – looking at how connectivity and big data applications can improve road and traffic management, user experience, construction and maintenance, environment and social development.
- **Academia (King's College London)** – a horizon spanning piece identifying the major technology trends that will accelerate delivery of Mobility as a Service and smart transport locally over the next five to 10 years.
- **Digital infrastructure / Internet of Things (O2)** – considered the implications of IoT, data management apps and analytics on digital infrastructure and services.
- **Highways Infrastructure (Ringway)** – reviewed the development of new and smarter materials with higher performance for network and asset management.

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We also considered a handful of case studies. The first was LED / CMS lighting incorporating electric vehicle charging points.

The London Borough of Hounslow has implemented highways projects that have provided significant early investment, digital innovation and substantial cost efficiencies.

Ringway Hounslow Highways converted over 14,000 existing street lighting lanterns to LED and introduced a new Central Management System that allows Hounslow to implement flexible lighting strategies across the borough, controlled remotely from the operations centre.

As a result, energy consumption for street lighting has been reduced by over 55% and will be likely to deliver increased savings with further dimming and trimming measures. In a further development scheme, 40 electric vehicle charging points providing 230V of power in a single phase were installed in street lighting columns, in partnership with German company Ubitercity.

Initial findings have shown that over 50% of the charging points are being used daily. Incorporating electric vehicle charging points into new lighting columns within LED/CMS invest-to-save strategies makes the best use of the available power sources without increasing the proliferation of street furniture.

Hounslow Highways' director Rob Gillespie, a former TAG President and TAG representative on the UKRLG, said: "With the infrastructure and control systems already provided through the LED street lighting this has provided a



flexible approach to providing easy to use charging facilities in the urban areas, exactly where they are needed. There has also been careful consideration by the council as to the parking requirements and in ensuring that space is dedicated to this important infrastructure, now and for the future."

Our second case study was Staffordshire Connected Roadworks. It was led by Amey with partners Staffordshire County Council, Staffordshire University, Tenshi Partners, Elgin and Future Cities Catapult.

This project established a smart city platform to identify collaborative works opportunities between works promoters (such as water and gas utility providers, telephone companies and highways maintenance firms) who perform maintenance, repair or construction activities on the road network.

The programme reduced roadworks occupation on the Staffordshire network by 52 weeks across 31 joint initiatives and produced a social return on investment of £58 for every £1 invested. In Staffordshire

alone it is predicted there could be 2000 fewer days where roadworks occupy the network if this approach was fully deployed.

This could generate £4.5M worth of travel time savings to the economy of the county through reduced congestion. Improved roadworks planning using a technology assisted collaborative approach can, it was found, save significant amounts of time, resources and cost to the local authority, private and public interests.

Amey is currently looking at wider implementation of this approach; it could be applied with great effect in local authorities nationally.

Staffordshire County Council assistant director and chair of the UK Roads Board James Bailey said: "Using digital special planning has enabled greater collaboration among the various roadwork promoters, providing a far simpler means to share and coordinate their planned works. The project has not only helped to quantify the benefits we knew existed, but in doing so also helped to make the case for further behaviour and regulatory changes required within the sector."

ADEPT's report into digital innovation, which covers both these case studies, was launched at the House of Commons on 30 October and is available to view at adeptnet.org.uk

It's worth mentioning that we have just published a related piece of work, entitled 'Planning SMART Places'. The outcomes of that piece of work indicate a lot of crossover between disciplines, which is not that surprising given this is all about what connects a 'place'. The report is also available on the ADEPT website.

Special projects carried out by the World Road Association

Two special projects are due to be published soon by the World Road Association, providing unique perspectives on topics of widespread interest.

The first covers unexpected infrastructure failure and the second is on the use of Unmanned Aerial Vehicles (UAVs) or drones for managing transport infrastructure.

The UK National Committee of the World Road Association (WRA UK) gave an insight into these projects at the Highways UK event in November.

It was said that unexpected failure of key elements of the highway network can have a devastating impact. The first special project draws on experience from across the world to

suggest how such failures might be predicted, avoided and where they do occur, dealt with effectively.

At the show Transport Scotland's Hugh Gillies reflected on the sudden closure of the Forth Road Bridge in 2015 and was followed by Anthony Concannon from Atkins who led the consultancy for the project.

Drones are being used for an increasing range of activities in recent years. The second of the Association's special projects considers how they are being used – and planned to be used – by transport authorities across the world. Department for Transport director Steve Berry, who is leading this work, gave a summary.



↑ Drones are featured in an upcoming publication

In addition, Atkins director Lila Tachtsi gave an overview of the World Road Association online Asset Management Manual. To listen to audio recordings from the sessions, visit piarc.co.uk