

Smart motorways research



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Introduction,
background,
objectives and
methodology

Background to the research



An in-depth study into the smart motorways experience

- Smart motorways are sections of motorway that use **Active Traffic Management** techniques to manage the traffic flow and increase capacity
- Active Traffic Management techniques include **variable speed limits**, **hard shoulder running** and **overhead variable message signs**
- According to the Department for Transport, *“smart motorways smooth traffic flow and cut congestion for millions of motorists”* and advocates of smart motorways have claimed that they maintain safety for road users and those that work on the road
- However, there are also concerns that changing the hard shoulder into an extra traffic lane is dangerous for motorists and that various aspects of smart motorway operation are not always well understood by road users
- With an ongoing debate around the effectiveness of the smart motorway network, research was required to gain a firm understanding of road users’ experiences of – and views about – smart motorways.

Research objectives

Overall aim: to gain a firm understanding of road users' experiences of – and views about – smart motorways.
In order to fulfil this aim, the following details were explored with smart motorway users:

Awareness and knowledge

- The concept:
 - Overall view and appeal
 - Comparison with conventional motorways
- Smart motorway awareness:
 - What awareness motorists have of smart motorways and their features
 - How users identify smart motorway features
- Knowledge around smart motorways:
 - How well the features of smart motorways are understood
 - How well the rules of smart motorways are understood
 - What the requirements for information are.

Experiences

- The smart motorway experience:
 - Opinions of the smart motorways driving experience
 - How the experience differs to that of a conventional motorway
 - What impact weather has on the driving experience
- Understanding reactions to specific features of the smart motorway experience:
 - How drivers experience each of the features of smart motorways
- Breakdown concerns:
 - What concerns exist regarding breakdowns on a smart motorway
 - How these concerns compare with conventional motorways
 - The levels of awareness and understanding of smart motorway breakdown procedures.

Future development

- Understanding opinions on future smart motorway developments:
 - Preferences regarding future developments
 - Existing objections regarding future developments
 - How smart motorways could be made easier to use
- Recommendations:
 - Explore how users might design or execute smart motorways differently (i.e. if they were in charge of the operation).

Research method

A large scale qualitative programme was formulated to fully deliver against the objectives. It was multi-phased, with each stage building on previous ones. Each iterative stage was refined by the findings of prior stages. There were three main stages to this research programme, as detailed below.

Stage 1

Stakeholder Interviews

Approach:

Six interviews conducted with stakeholders at public bodies and organisations that provide services on the SRN

Rationale:

Provided valuable contextual information, helping to inform the design of the subsequent research programme.

Stage 2

Initial Qualitative Research

Approach:

Six groups and ten in-depth interviews spread across three locations conducted with all key Strategic Road Network (SRN) typologies:

Leisure users; business users; professional drivers; HGV drivers; motorcyclists; and disabled users (both passengers and drivers)

Rationale:

Established initial reactions to the smart motorway concept: awareness; understanding; and overall appeal.

Stage 3

Pre-sensitised Qualitative Research

Approach:

Six groups and ten in-depth interviews with the same key SRN typologies that were interviewed in stage 2. Respondents completed pre-tasks prior to interviews to fully immerse them

Rationale:

Provided an in-depth look at the most salient issues and a full exploration of key positive and negative experiences. Provided informed opinions on what could be improved about smart motorways, particularly with respect to communications.

Driver types

Business drivers

- Self defined as making ‘business trips’

HGV drivers

- Self defined as ‘an HGV driver’

Leisure drivers

- Self defined as making ‘personal/leisure trips’

Professional driver

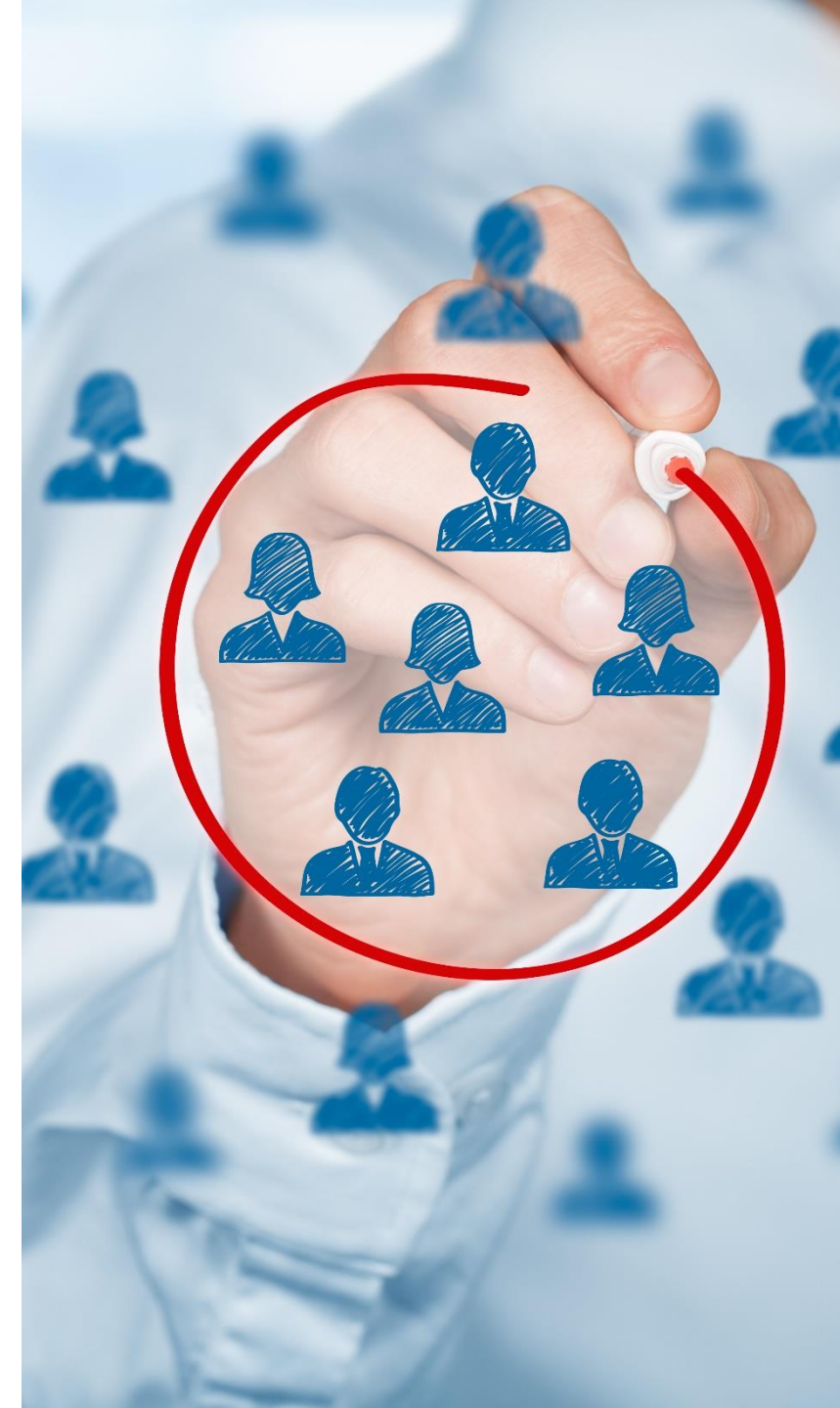
- Self defined as someone who ‘drives for a living (e.g. a taxi driver, delivery driver, not an HGV driver)’

Motorcyclist

- Those that answer ‘motorcycle’ to:
What vehicle do you primarily drive on these sections of motorway?
- Open quota for leisure, business, professional drivers

Disabled driver

- Defined as those that are ‘affected by any physical or mental health conditions or illnesses lasting or expecting to last 12 months or more’
- Only recruited those answering ‘yes a little’, or ‘yes a lot’, to the following question:
How much does your health conditions or illness make driving, or being a passenger, on motorways or major A-roads more challenging?
- Open quota for leisure, business, professional drivers, motorcyclists and HGV drivers



Research locations

 Birmingham

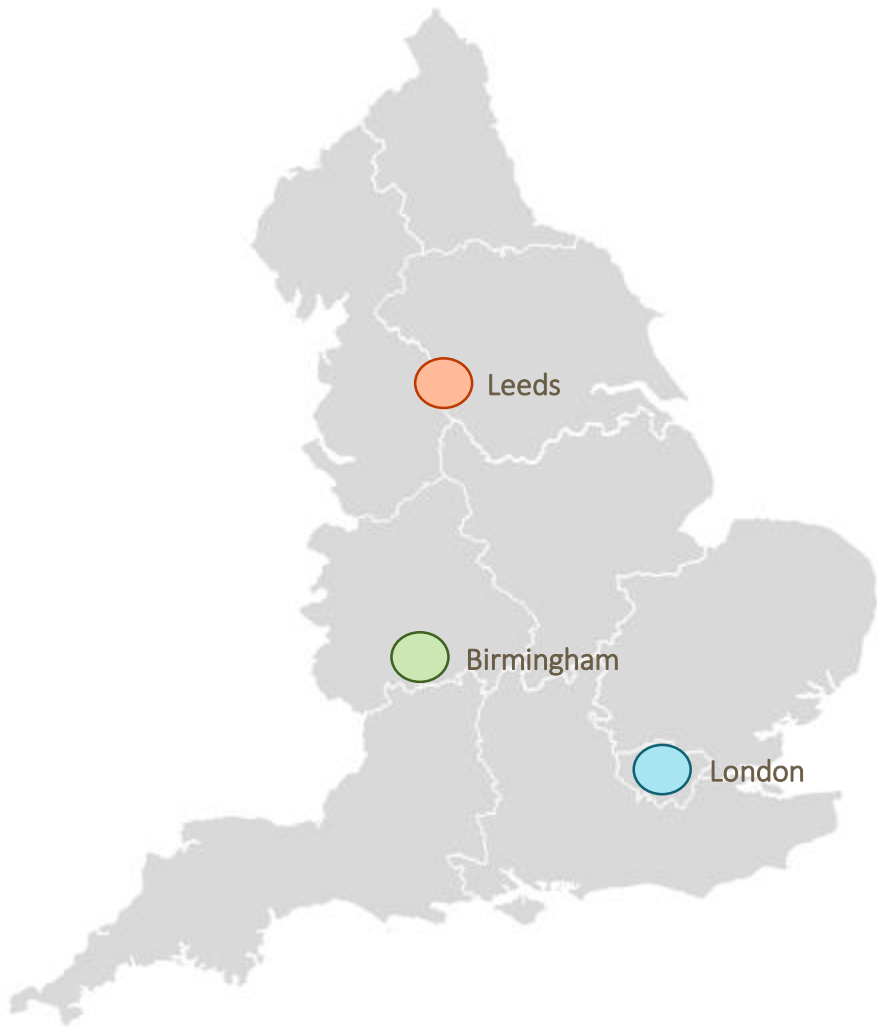
Motorways	Controlled motorway	Dynamic hard shoulder	All lane running
M40	J16 – M42 J3a	N/A	N/A
M42	J7 – J9	J3a – J7	N/A
M6	J10a – J11a	J4 – J10a	J11a – J13

 London

M25	J2 – J3 J7 – J10 J10 – 16 J16 – J23 J27 – J30	N/A	J5 – J7 J10 – J16
M1	J6a – J10	J10 – J13	N/A

 Leeds

M62	J28 – J29	J26 – J28 J29 – J30	J25 – J26 J29 – J30
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Executive summary

Key takeouts

Smart motorways are broadly self-explanatory

- Drivers learn about smart motorways **simply by using them** and as such, frequency of use drives understanding of, and ultimately engagement with, the smart motorway concept
- But for some (particularly less frequent) users there are gaps in **understanding of the overall smart motorway concept** and some confusion about *specific aspects* of smart motorway operation
- This lack of understanding **can undermine trust** in how smart motorways are operated and doubts about the benefits that smart motorways can deliver
- Thus, even while most claim that they find smart motorways easy to use, many drivers concede that they **could be better informed** and/or see a need for ‘other drivers’ to be better informed.

Drivers are broadly positive about smart motorways and feel they should be rolled out further

- That said, they do not in general feel informed enough to make specific recommendations about smart motorway implementation
- However, there is a general consensus that **improved information/education** is key to future successful roll out of smart motorway.



Understanding & awareness of smart motorways

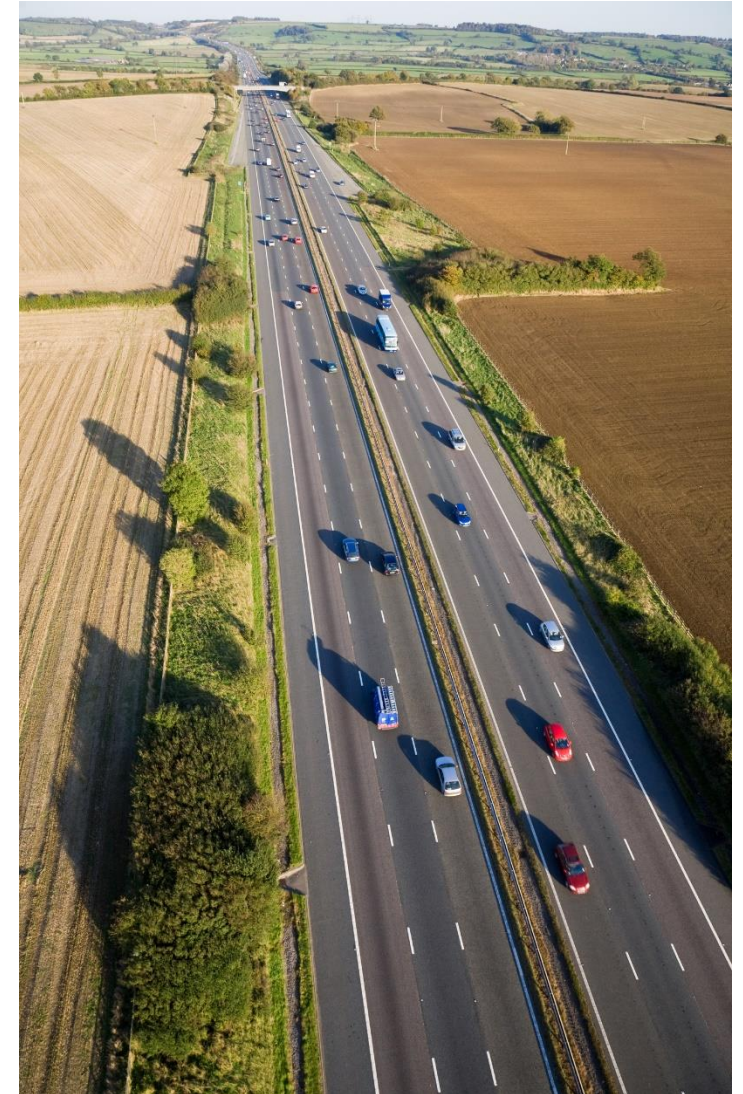
Awareness & understanding of smart motorways is often incomplete

“Smart motorway” is not a term that resonates strongly with most drivers

- On an unprompted basis, few talk about ‘smart motorways’ to describe the range of new motorway features
- It is assumed that the changes have been implemented to improve traffic flow and it is similarly assumed (hoped) that safety has been a primary consideration
- But understanding of smart motorways is developed passively/experientially
- As such many drivers' views on smart motorways are not ‘joined up’ and this leads to challenges that exist at four levels:
 - Understanding the *purpose* of individual features of smart motorways and how these *fit together*, leading to a lack of understanding of the *rationale* behind smart motorways
 - Apparent inconsistency between road conditions and road instructions, *undermining trust* in the smart motorway concept
 - For some drivers, *confusion about key signals and instructions (and for many drivers, uncertainty about the role and use of ERAs*)*
 - Some subconscious *concerns about safety*.

“It kind of rings a bell but I don't know why... I don't know what it is though... I think I've seen an advert or a poster or something but I don't know what it is... Isn't it what the M42 is?”

Birmingham, infrequent leisure



*An Emergency Refuge Area (ERA) is a layby by the side of a smart motorway where motorists can exit a broken down vehicle and call for roadside assistance. ERAs are spaced regularly along a smart motorway where the hard shoulder is in use as a running lane

Most drivers learn about smart motorways simply by using them but there are gaps in their understanding of the overall smart motorway *concept*

Smart motorways are broadly self-explanatory

- Most drivers are comfortable with using smart motorways after their first few journeys
- Knowledge and confidence builds up over time
- Few feel that they do not know how to drive on smart motorways (although many have example of 'other drivers' not using the road correctly).

"I didn't know it was called smart motorways, no. If it's got the camera, the thing above and it changes variable speed, is that a smart motorway?"

Birmingham, infrequent leisure

However, the smart motorway *concept* is not fully understood

- When prompted, drivers can generally identify the individual features of smart motorways (Emergency Refuge Areas are something of an exception)
- Yet not all drivers fully understand the purpose of each of these features and how they **interrelate**
- As a result, many are unclear about the **overarching purpose and rationale** behind the smart motorway programme.

"I think the word 'smart', not a lot of people know that's what they're actually called. I mean, it's just a motorway with a gantry over the top. It's not really anything else, is it?"

London, professional

"Another thing this motorway does a lot of is quite often the hard shoulder is used as a lane on this motorway as well. When the traffic's busy, they open up the hard shoulder so it goes to four lanes."

Birmingham, frequent business

"The overhead gantries say 60 miles per hour. Then suddenly you get to one that says 40 miles an hour. So you literally go from 60 to 40 and there's nothing explaining - no reason, justification, why you need to drop down."

Leeds, frequent business

Active Traffic Management can feel unresponsive, undermining trust in the smart motorway concept

Drivers know (or at least assume) that road conditions are being monitored

- Almost all are aware of the extensive use of cameras on smart motorways
- Most make the connection between this and the dynamic features of smart motorways (messaging, variable speeds etc.)
- (NB few are aware of the use of sensors in the road to monitor conditions)

“I thought the roads were already monitored – and it was switched on when there was congestion just to ease it up and then they turned it back off.”

Leeds, frequent leisure

Most drivers can also point to situations where message boards appear to be relaying ‘incorrect’ information or where variable speeds do not reflect road conditions. For example:

- Variable message signs indicating an incident up ahead but no incident is apparent
- Restricted speeds when there is no congestion or other reason given
- Signs and restricted speeds for active roadworks without any workers present

“The same sign was left up 24 hours later, but it's meant to be giving you live information.”

Leeds, frequent business

Such incidents lead drivers to question the extent to which the roads are being truly *actively* managed, if at all

- Drivers begin to question the significance of the signs and even whether or not they need to obey them
- There are doubts about how closely signs are being activated to incidents, whether they are activated at all, or whether they are kept up to date
- Some also begin to question what might happen in the event of an accident

“I was coming off of the slip on junction ten, there was an accident, and it hadn't picked that up, so like they say, where is this, what signals are they getting, and what kind of real time are they getting them in?”

London, professional

Some drivers feel ill-informed about certain smart motorway features and this can lead to confusion and guesswork

Some drivers (most often less frequent motorway users) admit they are not entirely confident about all aspects of smart motorway operation

- Key areas of concern/confusion include:
 - Do motorists have to stick to variable speed limits?
 - Where has the hard shoulder gone?
 - What is the role and use of the ERA?

“An Emergency Refuge Area has got to be somewhere you can take refuge. But I didn't see anything like that for a car? So it's got to be sort of for once you're out of your car, go and refuge over there. So it must be for when you're broken down, and you stand on the bank and stuff like that.”

Birmingham, infrequent leisure

“When the overhead cameras get someone, the first time I saw a big flash of light from the opposite carriageway I had the shock of my life. Didn't realise there were cameras there or what they even do.”

Leeds, frequent business

“I didn't know that you could get penalised for being in a red X, even though it is self-explanatory and wouldn't be doing it.”

Leeds, frequent leisure

“All lanes running, and people that don't use the motorway a lot wouldn't know what that was all about. If the sign says, 'All lanes running, no safety lane', that would tell people... I don't know what that tells people. Everybody's not Brain of Britain, that's the trouble.”

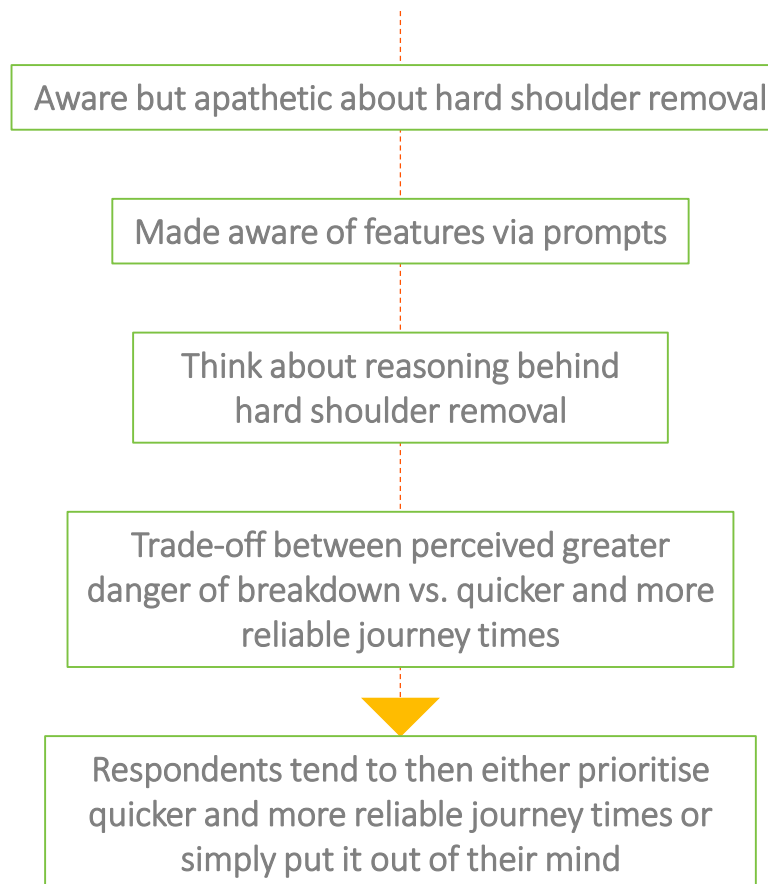
London, professional

When prompted, there are concerns about Smart Motorway safety but on a day-to-day basis, these concerns are largely reflected on and dismissed

- When the subject is raised, the general consensus is that all lane running Smart Motorways are less safe than conventional motorways
- However, on a day-to-day basis most drivers do not give a great deal of consideration to questions of safety on Smart Motorways
- When prompted, the salience of the issue is raised, but drivers tend to rationalise these concerns away (assuming that the system has been designed with safety in mind)

I do feel a bit more unsafe on them because there is no hard shoulder. I guess I try not to worry because there are fewer cars breaking down, and if someone does break down then they put the Red X up and hopefully no one goes into the back of me
Leeds, frequent business

Trade-off between hard shoulder running and safety follows a process:



In an ideal world, you'd have a breakdown lane, and you'd have the gantry with the signage on it, but there's not that many that do it, so I think you've got to compromise, and I suppose a Smart Motorway is the compromise.

London, professional

I'd still rather ease the congestion if you're stuck in the motorway. You've got to think that the probability of the congestion is every day. The probability of you breaking down is minute compared to the fact that there is going to be congestion all the time on that section of motorway.

Birmingham, infrequent leisure

Frequency of use drives understanding of, and ultimately engagement with, the smart motorway concept

Little engagement
with concept



Full engagement
with concept

Frequency
of use
increases
familiarity
with the
features
on smart
motorways

Awareness
of these
features
increases
but questions
are raised
around
their purpose

Understanding
of the overall
concept
becomes clearer
as users become
more informed
around the specific
purpose of each of
the features

Clarity
around the benefits
is achieved as users
link positive aspects
of their experience
with the presence of
specific smart
motorway features

"It's all confusing. I don't even know which lane to drive in. If I drive in the middle lane my husband moans at me for being a lane hogger and if I go on the outside I've got people up my bum and if I go on the inside..."
Birmingham, infrequent leisure

"The smart motorway network is good for me because I'm used to it. I feel confident driving [on them]."
Birmingham, HGV

'Education' raises questions but also helps to build engagement

Exposure to pre-tasks raises salience of the subject

- The accompanied journeys and dash-cam exercises directed users to look for and evaluate specific smart motorway features
- Asking drivers to consciously focus on the concept in this way raises its salience
- This raises questions about the operation of smart motorways not spontaneously considered before and thus, highlights a need/desire for more information
- In addition, and notwithstanding the desire to know more about the concept, increased focus on smart motorways helps to build understanding and enables drivers to more easily identify links between the features of the concept and the beneficial effects on the driving experience

"I think it's a good thing, but you've got to educate the public. Like we're on the road all the time but if you're not, if you're only using it every now and again like people going on holiday, right, and they hit it and they think, 'Well what do we do with this?'"

Birmingham, HGV

"Unless there was a sign saying, 'You are now entering a smart motorway system', telling them what you're doing. But just by having overhead gantries saying, 'Slow down. Speed up. Accident', you're not relating that to a smart motorway."

London, professional

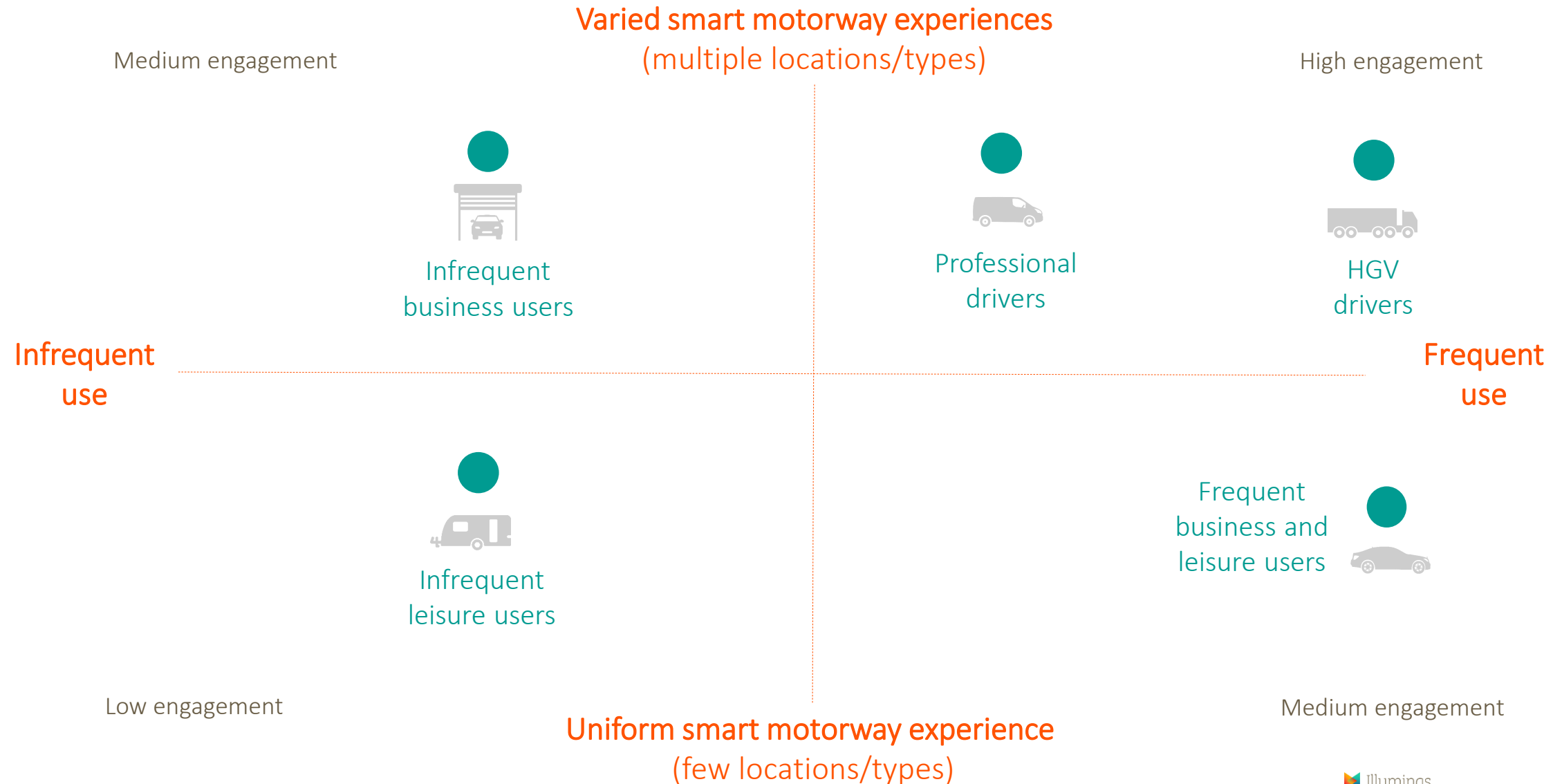
"I think its got potential. Once it's fully opened up North and South then you will get a really good feel for how it works. At the moment as soon as I get on it the traffic does seem to flow better and my experience has improved."

Leeds, frequent business



User groups

With a diverse range of travel profiles, user groups have differing levels of understanding and engagement with the smart motorway concept



Awareness of **different types** of smart motorways is also experiential: the more experience motorists have of different varieties of smart motorways, the more aware they are of them

Varied smart motorway experiences
(multiple locations/types)

High engagement drivers were aware of different types of smart motorways:

- Their knowledge of different smart motorway types was accumulated through experience and ‘learning on the job’
- Did not mention names of different types of smart motorway (e.g. ‘all lane running’), instead mentioned features associated with smart motorway types (e.g. no hard shoulder)

**Infrequent
use**

Low engagement drivers were not aware of different types of smart motorways:

- They did not know that their local smart motorways were ‘smart’, instead they thought that they simply had extra features
- They may recognise these features in other areas of the country but do not associate this with anything in particular

**Frequent
use**

Uniform smart motorway experience
(few locations/types)

For infrequent users, the variation in smart motorway experiences between leisure and business users is key to their differing engagement levels with the concept



Infrequent leisure/business users are least familiar/engaged with smart motorways

- Given limited use, familiarity with smart motorway features is lower than other groups
- On a prompted basis, infrequent users are typically able to identify most smart motorway features (although this can be limited by what they have experienced locally)
- Many are unsure about the putative benefits of smart motorways
- These drivers are also most likely to admit that they are sometimes unsure about what to do on a smart motorway



“I think the speed control, it can be a benefit, but I don't think that it improves journey times. I don't feel I could get anywhere any quicker than I did years ago really, and I still feel like there's traffic congestion.”

Birmingham, infrequent leisure



Infrequent business drivers benefit from experiencing more varied journeys

- Business users tend to have more varied experiences of smart motorways
- Even if infrequent, business trips are more likely to involve a variety of locations and thus a wider range of conditions and smart motorway types
- As a result, business users are typically better informed about smart motorways and more likely to see the benefits of the concept

“I've never heard it called that [Active Traffic Management] but I just know from going to the airport a lot, I've travelled that M42 bit and all that's on there, isn't it?”

Birmingham, infrequent leisure

Familiarity with smart motorway features has the potential to improve engagement for frequent leisure and business users



Frequent leisure/business users are familiar with smart motorways

- These drivers are aware of most smart motorway features and confident in their abilities to drive on smart motorways
- However, commuters continually using the same stretches of motorway are not always aware of features that they haven't experienced locally
- Many report that journeys are still subject to frequent congestion
- As a result, they are not always convinced about the putative benefits of smart motorways.

"I've always thought they brought the hard shoulder [in as a running lane] because we could do with it in slow moving traffic, basically when congestion is about."

Leeds, frequent leisure

"I remember reading about them and thinking that's a great idea. Someone needs to do something about the traffic problem in this country. After using them, however, I'm not so sure. They don't seem to have made much difference."

Leeds, frequent business

Leisure users often feel less safe than business users

- Frequent leisure users are also most likely to travel on motorways with children (school runs, regular family shopping trips etc.)
- As a result, they are more likely to be safety conscious than other groups and have heightened concerns around the closure of the hard shoulder.

"I've never thought about it, but now I do, [smart motorways are] very dangerous. Touch wood, I've never broken down on a motorway. If I did break down, yes, I can see there being some risk of someone coming into the back of you."

Birmingham, infrequent leisure

Professional drivers have high levels of familiarity with smart motorways but are not as knowledgeable as HGV drivers



“Well, I quite like smart motorways – I like the interactivenss of it. I like the fact that it will react to the road conditions or what's going on.”
London, professional

Professional drivers are highly engaged with the smart motorway concept

- Due to frequent use of a variety of motorways, professionals are largely familiar with, and value, smart motorway features

But not to the same extent as HGV drivers

- Although this group use smart motorways frequently on a professional basis, they are less informed on the concept than HGV drivers
- They are less likely to plan/research routes and tend to have more gaps in knowledge on smart motorway features.

- As a result, they are less clear around the benefits of smart motorways than HGV drivers

Some are uncertain about using the hard shoulder lane

- Due to their lack of knowledge of ERAs and breakdown/emergency procedures, and the fact that they use smart motorways quite frequently and drive for long hours, they have a heightened concern around the absence of a hard shoulder
- This makes it harder for them to fully engage with the concept.

“I mean, you drive through a smart motorway section, and you see the variable speed limit. What is there to learn? You just see the speed limit and you just put your foot on the brake.”
London, professional

HGV drivers are the most knowledgeable user group



"I remember on the M42 when I first came across smart motorways and I hadn't had any preconception about it and didn't know about it. But then I remember thinking this is quite good. I can actually do this. So if that experience happens to lots of people every day that can't be a bad thing."

Birmingham, HGV

HGV users are the most engaged with the concept

- Of all user groups, HGV drivers were the most aware of and knowledgeable about smart motorways
- HGV drivers understand the rationale behind the scheme better than any other user group

They feel the concept is safe and are clear on its benefits

- They are able to pinpoint all the safety measures in place and are most likely to understand breakdown procedures and ERAs.

"There are more vehicles on the road. There are more people. So they are having to improve the facilities and they're having to improve the roads now to make it safe and they're having to make it more of a flow and less congested."

Birmingham, HGV

- They are also more likely to appreciate the key benefits of the concept:
 - Smoother traffic flow
 - Easing congestion
 - Up-to-date messaging via signs
- As a result, this group is the most likely to endorse the roll-out of more smart motorways in the future.

"They're trying to make it safer and they're trying to make it less congested. So that's a massive positive but if people don't know what it is and don't know how to use it, it can have an adverse effect and it can cause you more congestion, cause you more problems."

Birmingham, HGV

Levels of understanding and engagement are broadly in line with other leisure/business groups, but motorcyclists are more concerned with safety



"I think car drivers would be better drivers if they had to drive a motorcycle for a year first... I definitely think the standard of driving is appalling in this country."
Birmingham, motorcyclist

Motorcyclists are particularly safety conscious

- Motorcyclists feel especially vulnerable with the absence of the hard shoulder, with some also pointing out that motorbikes have less rolling capacity than other vehicles (i.e. they can travel less distance after an engine failure)
- Motorcyclists' feel their safety is often compromised by the behaviour of other road users. As a result, they are particularly keen for drivers to be educated about the use of smart motorways to minimise risks from any errors.

"I firmly believe that motorcyclists are more aware of road conditions than car drivers. You have to be. Wet roads... gravel... pot holes... anything like that can be catastrophic on a bike."

Birmingham, motorcyclist

"I've considered using a car on motorways... It's not going to be too long until someone does hit me... I just don't know why they don't see you."

Leeds, motorcyclist

"You're taking a chance every time you go on it – no doubt about that."

Leeds, motorcyclist

Disabled respondents also have heightened concerns around safety



Levels of engagement are broadly in line with other groups

- This group also has heightened concerns around the absence of the hard shoulder
- Disabled users with mobility difficulties have particular concerns about breaking down on motorways because exiting a vehicle can be difficult
- However, disabled drivers are no more aware of breakdown procedures than other groups.

“We have to get to services on the motorway... we usually stop about every 2 hours just for a quarter for an hour so I can stretch... smart motorways have helped with congestion so I’m not as worried.”

Leeds, disabled driver

“For me I’d prefer [to break down in the ERA]. You’re not as close to the motorway with the cars speeding past you.”

Leeds, disabled driver

- People with certain types of disabilities aim to avoid spending too long in the car, therefore a reduction in congestion and faster journey times is a positive development

“If you’re on the motorway and you break down and there’s no hard shoulder, I would feel very vulnerable... If I’m stuck I can’t get out of my car and walk across three lanes.”

Leeds, disabled driver

“We [used to drive beside the hard shoulder] because I didn’t feel safe... I felt we might come across a broken down car.”

Leeds, disabled passenger



Stakeholder perspective

Stakeholders agree that smart motorways are worth the investment

The stakeholders that we spoke to had a good understanding of smart motorways

On the whole they agree that the modernisation of motorways is a worthwhile pursuit and smart motorways are effective

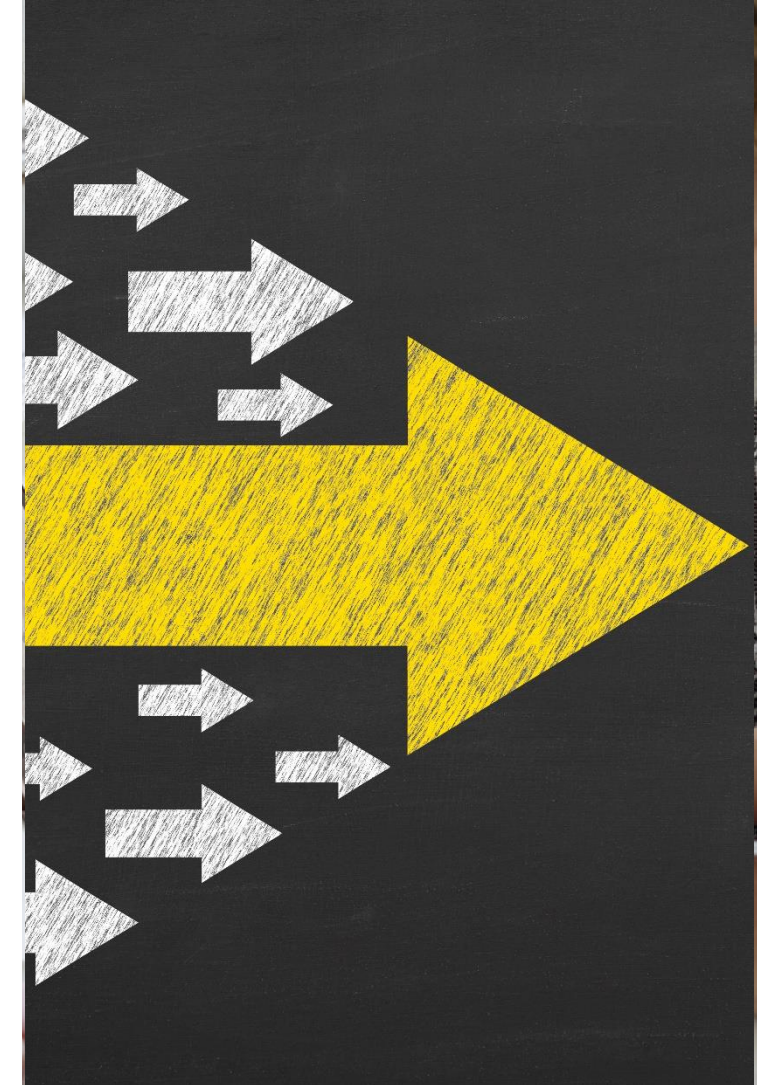
- Speed cameras and variable speed limits work well to improve traffic flow and they are self-explanatory
- Traffic flow is felt to be better on smart motorways. This has led to a positive business impact for some stakeholders involved in distribution
- It has been noted that ERAs are safer to work in for recovery workers because drivers don't drift into them the way they can do with hard shoulders.

"Speed cameras and variable speed limits work well. It slows people down and everyone feels they are getting their fair share."

"The completed M62 demonstrates how much better it is to have the hard shoulder converted to All Lane Running. It was very congested and now there is smooth running."

"I think [ERAs] are a brilliant idea... They give the possibility of a recovery area... if that means a broken down vehicle can be towed into a refuge and the motorway's back open again, that's absolutely worth having."

"We see the benefits of smart motorway in reliability. This helps the cost base which is fundamental for low margins."



Stakeholders' primary concerns are with safety and making sure the public are educated

Some stakeholders have concerns over safety

- Safety could be negatively impacted by drivers who are confused by the improvements
- Whilst some don't feel that safety has been neglected, there are concerns that smart motorways could be less safe due to the removal of the hard shoulder
- Breakdowns on live lanes could put recovery staff at unnecessary risk
- They feel ERAs should have more room: enough to accommodate multiple vehicles
- It is felt there should be more ERAs: one stakeholder believes there should always be one in eyesight.

"I wonder how often you don't have your emergency in the right place?"

"The Emergency refuge areas are 2km, sometimes two and a half km apart, which means that very often broken down motorists don't even know they are there because they can't see them. As a result they end up stuck in a live running lane, which is an extremely frightening experience"

Education is felt to be a key factor to a successful roll-out of the scheme

- It is important that drivers understand the breakdown procedures on smart motorways, including the correct use of ERAs
- smart motorways can confuse people and campaigns for driver awareness have been suggested
- Whilst some stakeholders represent or employ well-trained drivers who know how to use smart motorways the concern is that other users do not – that there is a 'need to make the drivers smart'.

"For people who are travelling down a [smart motorway] for the first time I can see that it might be confusing, especially for older drivers."

"The biggest concern for people is what happens if there is an incident."

"The number one priority is the safety and wellbeing of people so [they need to know] what to do in those [breakdown] circumstances."



Smart motorway features

Hard shoulder running: awareness of hard shoulder running high



"I was sort of wary of do I go in [to the hard shoulder]? There's no sign to give me a nudge that it's now usable. Maybe I missed something? I'm aware I shouldn't be in that lane. I suppose, the strong white line rather than the dotted ones? Yes, that would be my assumption. It's a long time ago since I took my Highway Code."

Birmingham, infrequent leisure

Awareness

- Awareness is high and this is often the feature first mentioned spontaneously by drivers
- That said, not all are aware of the range of both permanent and dynamic hard shoulder running (often dependent on experiencing these features on different roads)

Understanding

- Purpose in terms of congestion relief is broadly understood
- And signage via overhead gantries typically seen as clear and intuitive
- However, many are unsure about breakdown contingency plans or the role of ERAs
- Few fully understand the use of road sensors/cameras to manage lane closures (although often assume 'something/ someone' will intervene in the event of an emergency).

"I love the fact that on the stretch of the M62, the hard shoulder is open, because it has made a difference, it really has."

Leeds, frequent business

"Although there are teething problems because of the roadworks, overall the motorways are better than they used to be, and the extra lane makes a big difference."

Leeds, frequent leisure

"Does it tell you by the side of the road that there's one of these emergency things coming up?"

London, professional

Hard shoulder running: removal of hard shoulder is a contentious issue



"It worries me to be honest. I've been driving for lots of many years, but I mean I've seen cars have blow outs in tyres and things like that and it is hard, even on a normal road, but to try, if you were in busy traffic and it happened, I'd be absolutely petrified and I'm an experienced driver."

Leeds, frequent leisure

Benefits

- Reduction in congestion: traffic 'flows' rather than 'stop-starts'
- Journey times more reliable

Concerns

- Hard shoulder removal is frequently seen as dangerous
- Using hard shoulder is counter-intuitive and can 'feel' wrong
- Condition of road surface on hard shoulder is poor (a particular concern for motorcyclists)
- Hard shoulder running is too near to junctions where it becomes a slip lane (i.e. they would not be able to use it for long before changing lanes again)
- Some drivers unconvinced of time-saving benefits
- Users are particularly anxious about breakdown.

"Obviously it's good in peak times because it keeps the traffic flowing. To take it to four lanes is much better than having it at three."

Birmingham, frequent business

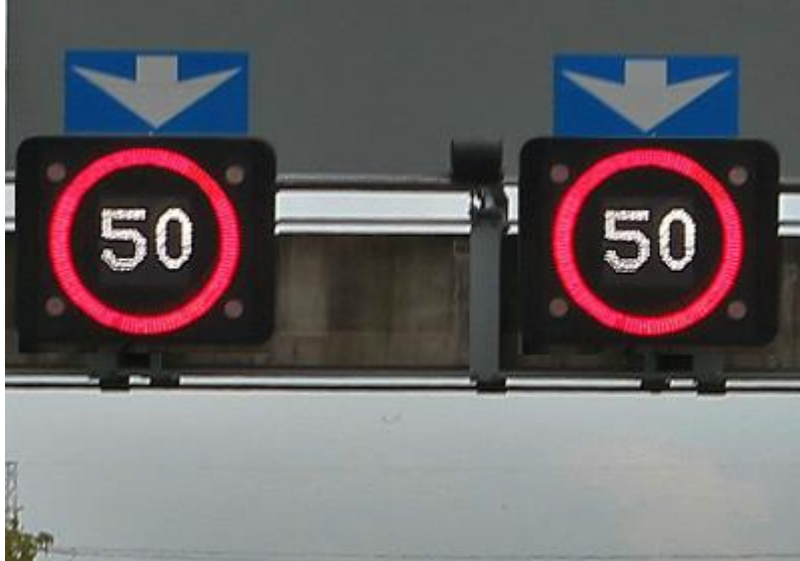
"What gets me is it's scary. It really is scary. I ran out of diesel on the M25 and there was no hard shoulder, and I mean roadworks and free recovery, and it took him about 15 minutes to come and get me and I never felt so frightened."

Leeds, frequent leisure

"However if you're zooming along and you break down or whatever, what the heck happens if it's not responding really quickly? You know, at 60, 70 miles an hour, your stopping distance – if someone's not paying attention... So I like it but it bothers me a little bit."

Leeds, frequent business

Variable speed limits: users need to know how long they have to change speed when the signs change



"I'm not convinced they [variable speed limits] always work or how they work because it seems they'd have to be really sophisticated to change the speed and monitor vehicles and then change again so there must be a certain buffer there?"

Birmingham, HGV

Awareness

- Variable speed limits on overhead gantries are most recognisable features of smart motorways – even infrequent users have no problem spotting them
- Electronic signs seen to be brighter and clearer than ordinary signage

Understanding

- Most motorway users understand the need to obey the speed limits
- A minority is not sure speed limits are mandatory
- Rationale for speed limits during busy periods – to improve traffic flow – tends to be understood, particularly by more frequent drivers
- Rationale accepted as necessary.

"They are supposed to manage motorways now, aren't they, with this variable speed limit?"

Leeds, frequent leisure

"[We should be told] 'Be aware, now the M6 is turning into a smarter motorway, please be aware of the variable speed limits'."

Birmingham, infrequent leisure

"I've noticed when I'm driving and it changes to 40, or 50, 60, whatever, I'm the only one that seems to slow down; everyone else carries on, and I'm like, 'Do I speed up and go with the flow of traffic, or do I stick to the 50 like it's saying?'"

London, professional

Variable speed limits: users can be frustrated if variable speed limits do not appear to reflect conditions



"I was going to Hull from Wakefield and there was one sign on the right hand lane that said 50. I didn't know what speed limit I was going on. Everybody is whizzing past me and I've got to go down to 50 and I was like, 'What's going on?' I thought: 'have they just forgot to take this down?'"

Leeds, frequent leisure

Benefits

- The variable speed limit signs are clear and unambiguous
- Many think that this is a good way to keep motorists alert on the motorways
- Some understand its purpose of easing congestion

Concerns

- Only a minority see variable speed limits and speed cameras as a 'money-making scheme' but many feel it is easy to get 'caught out'
- Can be confused/annoyed by what seem to be rapid changes in speed limits
- Frustration at speed limits which do not reflect road conditions, particularly amongst those who are regularly confronted by the same limits on the same regular journeys
- Concerns over time that drivers are given to slow down after a speed limit is changed, which can lead to sudden braking after speed change.

"There must have been something happening, and then they were able to change the speed limits to make it continue onto a decent pace, while you were still going. So it didn't wait for the whole thing to bottleneck and then continue on, they actually changed it."

London, professional

"One place might be 40, another place might be 50, another place might be 70, it's all over the place. There's no consistency."

Birmingham, infrequent leisure

"That variable speed limit will cause somebody to break which gives you the tailback 15 miles down the road, so it's actually counterproductive."

Birmingham, infrequent leisure

Variable information signs: frustration can ensue when variable signs appear to be wrong



Awareness

- All smart motorway users are aware of variable message signs
- Message signs are easy-to-read, clearly noticeable and drivers do not require any extra education to make use of them

Understanding

- Users understand that the signs are in use
- Variable message signs indicate that Active Traffic Management is working properly
- Some users would like more information on *why* something has occurred (e.g. particular speed limit).

“I think if you're going to put that the junction is shut down, you need more information. Not everybody knows what junction 46 is. But if you put Garforth on there, you would know.”
Leeds, frequent business

“You could probably do with a few more of them actually. I don't think there's enough of them message boards.”
Birmingham, infrequent leisure

Variable information signs are very popular



“Signs should be less about junction names and more about places or where traffic is: three miles down the road or five miles down the road there should be a sign with a chance for you to get off. So if you're at Wednesbury you could come off at Walsall. If you live down that area you could probably get off if you knew there was a traffic jam four mile down the road.”

Birmingham, infrequent leisure

Benefits

- On balance this is the most popular addition to motorways across the user groups
- Drivers enjoy having more live information
- Live congestion information useful for more frequent drivers (especially HGV) who know their routes well and may use the information to seek alternative routes
- Messaging is concise
- No perceived drawbacks of having more information

Concerns

- Information can appear out-of-date (e.g. communicating former hazards ahead)
- Some information is seen to have limited use (e.g. warnings about foggy conditions may not be required)
- Some information is not relevant (e.g. conditions on routes that few drivers will use)
- Use of junction numbers rather than names is not useful for many drivers.

“When you are seeing those signs – ‘accident’ – what do you do? Get off. Next junction you're off, but, you see, I don't know if there is or isn't [an accident].”

Leeds, frequent leisure

“I think the information can be really useful sometimes. Other times it's given to me too late or it is a bit obscure.”

Leeds, frequent business

“Rather than saying there's a traffic jam in Scotland when you're in Birmingham, saying why there's variable speed limits on this motorway or something so you're aware of it.”

Birmingham, infrequent leisure

Variable lane use information: lane gantry signs are clearly understood



"It's just a common sense thing. I mean, if you were sort of dropped into a motorway and told to drive along it, and you came up to this gantry and there was like a great big red X. Is there anything to learn?"

London, professional

Awareness

- Most users have experienced the 'red X' and once prompted can recall it
- Drivers not always aware of the reasoning behind variable lane use

Understanding

- No difficulty understanding the red X or diagonal arrows to signify lane change
- It is understood that lanes are closed for hazards or emergencies
- Some unsure of time period allowed for them to change lanes when signs are first shown.

"It's on the radio and everything, isn't it? telling you that if it's an 'X' don't go in it. They are trying to educate people."

Birmingham, HGV

"The red X is clear, you can see it from a long way off."

London, professional

"Normally it's got a red X on it hasn't it? But the problem is sometimes when you presume the hard shoulder's going to be open: I've been on the M42, got on it, gone into the hard shoulder and I get to the end and think there's no one in this lane."

Birmingham, infrequent leisure

Variable lane use information: motorists recognise the importance of obeying lane gantry signs



"I heard the red X advert on the radio and it was useful."

Leeds, frequent leisure

Benefits

- Red X clear and unambiguous
- Arrows signifying lane change understood
- Users happy to comply with procedures for the sake of safety

Concerns

- On dynamic motorways, if nothing is shown on gantries a few are unsure about hard shoulder use, therefore a minority requested additional signage (e.g. a green X when lane is open)
- Unsure of penalties involved with driving in a lane showing a red X
- Unsure of how long they have to comply before penalties are enforced
- Some unsafe immediate lane changes due to red X.

"If you can't understand that the red X means that the lane's closed, then you shouldn't be driving... I think the red X is perfect."

Leeds, motorcyclist

"It's got the red X. Yes, they put the red X. If it's been open, they'll put the red X in and put the open signs up on the other lanes, or the big message signs will say 'hard shoulder not in use', or 'hard shoulder in use'."

Birmingham, infrequent leisure

"A few weeks back I was on the hard shoulder and the red X came up and I couldn't get off it safely. It was shocking."

Leeds, frequent business



Emergency refuge areas

ERAs are the least well understood aspect of smart motorways



Awareness

- When prompted, most smart motorway users tend to have *some* recall of ERAs
- Predictably, more frequent users have higher levels of awareness (HGV drivers are the most aware)
- But some are completely oblivious to their existence

Understanding

- Understanding of ERAs is incomplete amongst most driver groups (HGV drivers the exception)
- Most understand that ERAs are for use in a genuine emergency only
- There is little knowledge about the ‘proper’ use of ERAs: many have not even considered this
- Minority of users would attempt to re-join the motorway without speaking on the emergency telephone.

“I’ve never had to use one and I wouldn’t have known anything about, what the distances are, et cetera until I came here today. At least I know a bit about them now!”

Leeds, frequent business

“If you stop by one you’re laughing, but if you don’t, then you’re stuck.”

London, professional

“You can’t have them too far apart, but then, if you’re going to have them within half a mile of each other, you might as well have a long stretch...you might as well have a hard shoulder.”

London, professional

The current state of ERAs



"I have to say, I haven't really paid a lot of attention to them, no. You do notice them more because of the fact the hard shoulder's being used, so certainly, coming the other way, there are a couple that are quite, they're like lay-bys are they?"

Birmingham, infrequent leisure

Benefits

- ERAs a safe place to breakdown
- Segregation from main carriageway safer than breaking down on conventional hard shoulder
- Current ERA signs are clear and informative

Concerns

- ERAs spaced too far apart (2.5 km seems too far, although underlying assumption is that they have been spaced with safety in mind)
- As such, prevailing fear of being unable to locate ERA in breakdown scenario
- Fear of ERA being occupied when needed
- Concerns about how closely ERAs are monitored – or even whether they are monitored at all
- HGV drivers have some concern about sufficient space for more than one truck.

"If you could crawl to one of those then you would, but sometimes if something goes, but if you have a blowout, you got to pull over as soon as you can. If you could limp to one of those, then I would."

Birmingham, infrequent leisure

"I would rather have a hard shoulder. I honestly think that 2.5km is pretty far and it's dangerous to break down."

Leeds, frequent business

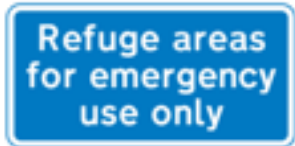
"I suppose if you're panicking on a busy four-lane motorway and you can't really see the next emergency refuge area you're going to be a bit of a liability on the motorway."

Birmingham, HGV

ERA signage

Current signage

Scheme Entry



Distance



ERA Entry



"You can only use it for breakdown emergency. It tells you that. You cannot use it for having a picnic or going to a loo or something."
Leeds, frequent leisure

Existing ERA signs are

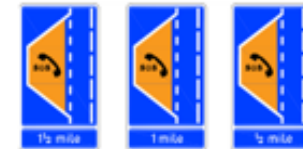
- Clear and informative
- In line with style of other familiar motorway signs
- 'SOS' is also often understood by foreign drivers.

Proposed signage

Scheme Entry



Distance



ERA Entry



"When you're in danger, you want to know how far away the SOS station is rather than what it looks like and what sort of shape it is."
Leeds, frequent leisure

Not an improvement

- Too cluttered/too much information
- Picture of layby unclear
- However seen to make more sense in the context of ERA surface painted orange (see next slide).

Signage inside ERAs

Existing



- Clear and informative about proceeding steps
- 'Mandatory' phone call instruction understood
- Most do not know what "further advice" they would receive – assumed they will be given advice on how to rejoin the motorway – but some also think that help may be sent in the form of highway patrols or tow trucks.

Proposed



Proposed 'In' ERA signs are

- Unclear and call seems optional
- But wording friendlier and more reassuring.

ERA surface colour change received well



ERA surface colour

- Our research tested a proposal to paint the surface of ERAs orange
- Respondents were shown a mock-up of an ERA painted orange (as in above image).

This was well received

- Painted ERA removed most drivers' concerns about previously shown signage
- Raises awareness of ERAs' existence
- Makes ERAs easier to locate if one were needed
- Provide a clear delineation from the live lanes of the motorway
- Drivers feel more comfortable with the concept if painted orange
- New proposed signage seen to make more sense in the context of painted surface.

"I think that's fairly obvious though, isn't it? Especially with painting the road orange."

Birmingham, HGV

"Goodness me! Well, that's what they're like. That's just how they are. That's just how the lay-by should be."

Leeds, frequent leisure

"It doesn't ever use that acronym does it? It's always going to be emergency refuge area on the sign. If it just said ERA I think people would be, 'What the hell is ERA?'"

Birmingham, HGV



Future rollout

Drivers are broadly positive about smart motorways and feel they should be rolled out further but there are question marks over some benefits

Potential benefits

Assessment

Addressing traffic congestion	✓?	<ul style="list-style-type: none"> Most drivers feel congestion has improved – though regular business/leisure drivers on some routes report little improvement
Improving journey times	✓?	<ul style="list-style-type: none"> Whilst many report a small improvement in journey times, this impact does not feel significant to the majority of drivers – with the exception of HGV drivers
Improving road capacity	✓✓	<ul style="list-style-type: none"> Increased capacity through use of the hard shoulder is self evident, although few put it in the context of any broader roads strategy
Improved driver experience	✓?	<ul style="list-style-type: none"> Most appreciate the ‘smoother’ flow of traffic Some concern around safety and lack of understanding of rules and procedures
Speed control	✓✓	<ul style="list-style-type: none"> Most drivers see the positive impact of variable speed limits
No less safe than a conventional three lane motorway	??	<ul style="list-style-type: none"> Low understanding of ERAs, Active Traffic Management and breakdown procedures heightens concern around lack of hard shoulder for many drivers
Implementation of smart motorways reduces planning/construction impact vs. alternatives (e.g. busmartg new roads)	?	<ul style="list-style-type: none"> The majority of drivers do not have an opinion on this

“I think they [smart motorways] are meant to improve safety and reduce congestion.”
Leeds, frequent leisure

“I get on there every morning and someone's put it at 60 and its clear the whole way down. Easy, no traffic!”
Leeds, frequent business

“The hard shoulder run-in is a bit scary sometimes. You see some silly people on there and they haven't quite got the idea.”
Birmingham, HGV

Drivers identified **improved information** as key to future successful roll out of the smart motorways

Drivers do not feel informed enough to make specific recommendations about implementation of smart motorways

- They generally support the further implementation of smart motorways and assume/expect that smart motorways will be implemented appropriately

Use of smart motorways is largely intuitive but most drivers see a need for more information

- Most claim that they find smart motorways (mostly) easy to use, but at the same time often feel that they could be better informed and/or see a need for 'other drivers' to be better informed

Given this, drivers identify a need for communications/information on two levels

- Understanding smart motorways as a whole : rationale and benefits
- Improved understanding of using specific features correctly.

"Education has got to be a key part of it. I don't know how you would go about it but public service announcements or something?"

Birmingham, HGV

"I still see at least once a week someone driving on the hard shoulder when there's a red X on it. Its obvious but I get the feeling many drivers don't know about it."

Leeds, frequent business

"Advertise different parts of the system: what it's for, and that it's a safety issue as well, I think. It's all about advertising."

London, professional

Drivers identified a number of appropriate communication channels for the different types of information

Understanding smart motorways as a whole

- Drivers want a clear introduction to the concept that includes the rational and potential benefits as well as detailed information on all the relevant rules and procedures
- Suggestions for communications included the following:
 - Booklets provided through tax/insurance/driving license forms
 - Education during driving lessons for new drivers
 - Section provided in the Highway Code
 - Personalised mail from official government bodies

Improved understanding of using specific features correctly

- Drivers were very receptive to short but impactful radio/TV adverts that focus on the purpose and benefits of specific features and any ramifications of incorrect use
- As a result, they saw Radio and TV as the primary communication channels for this kind of information
- Other channels deemed as appropriate included
 - Roadside billboards
 - Adverts at service stations
 - YouTube/internet banner adverts.

“I can envisage that for new drivers all this will be part of the theory test. You shouldn’t be allowed on a smart motorway until you have learnt about it in your test.”

Leeds, frequent business

“I’d like to see clear advertising, clear signage. They could have signs along the motorways spaced quite frequently. Some kind of campaign.”

Birmingham, infrequent leisure

“Emotive hard hitting campaigns that clearly point out the cost of using the smart motorways inappropriately.”

London, professional



Conclusions

Summary

Smart motorways are broadly self-explanatory

- Drivers learn about smart motorways **simply by using them** and as such, frequency of use drives understanding of, and ultimately engagement with, the smart motorway concept
- But for some (particularly less frequent) users there are gaps in **understanding of the overall smart motorway concept** and some confusion about *specific aspects* of smart motorway operation
- This lack of understanding **can undermine trust** in how smart motorways are operated and doubts about the benefits that smart motorways can deliver
- Thus, even while most claim that they find smart motorways easy to use, many drivers concede that they **could be better informed** and/or see a need for ‘other drivers’ to be better informed.

Drivers are broadly positive about smart motorways and feel they should be rolled out further

- That said, they do not in general feel informed enough to make specific recommendations about smart motorway implementation
- However, there is a general consensus that **improved information/education** is key to future successful roll out of smart motorway.

In taking smart motorways further, both messaging and media need to be considered

Core messages

Context:

- The reasons why smart motorways are introduced and the benefits they are intended to deliver

Connections:

- Demonstrate how the different features of smart motorways are part of the same overall system devised to both improve your journey and keep you safe

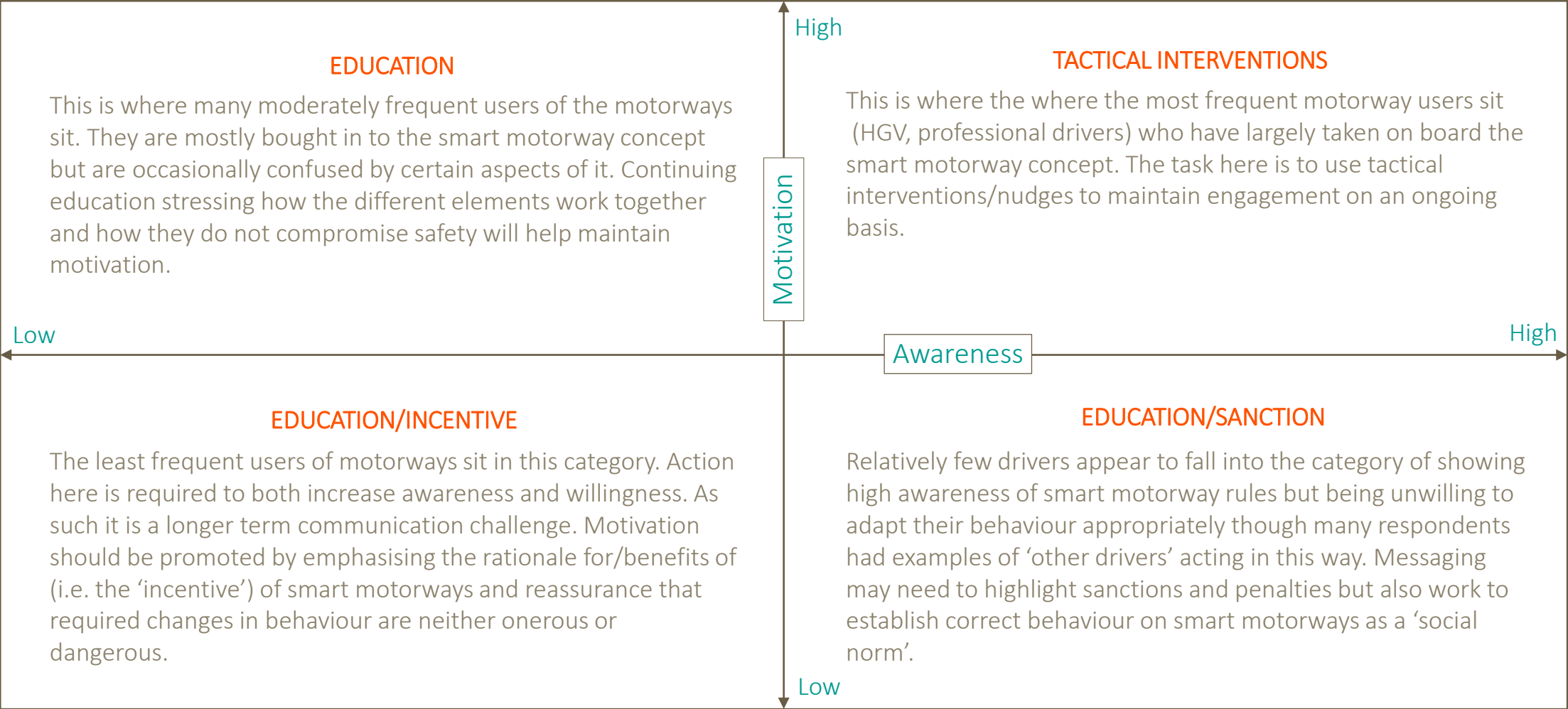
Evolution:

- Ensure positioning of message stresses that smart motorways represent an evolution of motorway practice, not radical change.

Media

- There is no particular ‘magic bullet’ as regards channels of communication
- Furthermore, given different levels of experience of/engagement with smart motorways, both short-term, tactical and longer-term bigger picture messaging will be required
- At the strategic level a requirement for general public information on role and rationale for smart motorways
- Combined with making use of the occasions to communicate with drivers, both physically (e.g. roadside billboards, service station posters/screens) and more virtually (e.g. via contacts with DVLA, tax authorities etc.) to get across messages that reinforce the bigger picture but more in ‘bite size’ pieces.

There is also a need to tailor messaging to take into account relative levels of awareness and motivation





Appendix

Research method: recruitment criteria

Stage 1

Stakeholder interviews

Six interviews were conducted with stakeholders at public bodies and organisations that represent SRN user groups or provide services on the SRN.

Stage 2

Initial qualitative research

Six groups and ten depth interviews were conducted:

Focus groups			
Group	Location	Journey purpose	Frequency
1	Leeds	Leisure	Frequent
2	Leeds	Business	Frequent
3	Birmingham	Leisure	Infrequent
4	Birmingham	HGV	Frequent
5	London	Business	Infrequent
6	London	Professional	Frequent
In-depth interviews			
Five with disabled users		Five with motorcyclists	

- Use of all three smart motorway types was represented in each user group
- The locations were chosen for regional representation and because each had access to different types of smart motorway.

Stage 3

Pre-sensitised qualitative research

Six groups and ten depth interviews were conducted with respondents in the same configuration as stage 2.

The pre-task was a 20-minute journey on a smart motorway. Depending on which user group they belonged to, they either:

- Recorded this journey with a dashboard camera/helmet camera
- Filled out a journey diary afterwards
- Were accompanied by a researcher.

Pre-tasks undertaken by each respondent type in stage 3

User group	Pre-task
Business users; leisure users; professional drivers; disabled users	<p>A 20-minute smart motorway journey recorded with a dash cam. Users were invited to talk as they drove about smart motorways</p> <p><i>or</i></p> <p>A 20-minute smart motorway journey whilst accompanied by a researcher. At the end of the journey there was a brief 20-minute interview to probe about the experience.</p>
Motorcyclists	<p>A 20-minute smart motorway journey recorded with a helmet camera. Respondents then filled out a journey audit where they were given a chance to explain how they found the experience and offer their opinions on smart motorways.</p>
HGV drivers	<p>A 20-minute smart motorway journey followed by a journey audit report where respondents were given a chance to explain how they found the experience and offer their opinions on smart motorways.</p>



Smart motorways research
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