



# What are the key factors associated with road sign satisfaction?

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# Executive Summary

Kantar was commissioned to conduct a 'deep dive' analysis to explore which aspects of road users' journeys are associated with satisfaction and dissatisfaction with road signage and road markings. The analysis was based on data from the Strategic Roads User Survey (SRUS) for journeys undertaken on England's motorways and major 'A' roads – the Strategic Road Network (SRN) – between April 2018 and January 2020. A three-stage process was used:

- First, we created a composite variable which represented the best measure of signage satisfaction to be used as the outcome variable in analysis.
- Second, we examined which factors in isolation were most associated with signage satisfaction.
- Third, we examined which factors in combination were most associated with signage satisfaction and identified those combinations of factors associated with highest and lowest levels of signage satisfaction. To do this a CHAID analysis (Chi-square Automatic Interaction Detector) was performed. CHAID is a form of analysis that determines how variables best combine to explain the outcome - in this case satisfaction with signage - once all variables are controlled for.

## Headline results

The most significant factors which explain signage satisfaction, once all other factors are controlled for, are:

- Feeling calm/relaxed/happy or having no specific emotion while driving
- Having a high level of confidence when driving on motorways
- Weather is not overcast
- Driving on a motorway (as opposed to an 'A' road)

Looking at all factors in combination, the top segments of SRN users that are most and least satisfied with signage are shown below. In each row, the variables are shown in order of level of significance; the 1st column shows the variable within the combination which most significantly discriminated between high and low levels of signage satisfaction; 2<sup>nd</sup> is the variable that is next discriminatory etc. It should be noted that the findings only identify relationships between signage satisfaction and other variables in the dataset, and we can make no claims about the causality of any such relationships or the direction in which they apply.

Highest satisfaction with road signage					
	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	% satisfied*
1	Feeling relaxed/calm/happy	Very confident on motorways	Driving on a smart motorway (road category A**)		60%
2	No emotion while driving	Very confident on motorways			59%
3	Feeling relaxed/calm/happy	Very confident on motorways	Driving on a non-smart motorway (road categories B or C**)		51%
4	No emotion while driving	Less confident on motorways	Journey distance low		47%
5	Feeling relaxed/calm/happy	Very confident on motorways	Driving on an 'A' road (road categories D,E or F**)	Sunny weather	47%

Lowest Satisfaction with road signage				
	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	% satisfied
1	Feeling relaxed/calm/happy	Less confident on motorways	Weather overcast	32%
2	Feeling angry/stressed/anxious or unsafe/frightened/weary	More confident on motorways		30%
3	Feeling in control/safe/confident or bored	Weather overcast	Female driver	29%
4	Feeling angry/stressed/anxious or unsafe/frightened/weary	Less confident on motorways		22%

\* See section 2 for an explanation of how this composite measure is derived. Overall rate of satisfaction is 41%.

\*\* Road categories provided by Transport Focus, see section 2 for more detail.

# 1. Introduction

## 1.1 About the SRUS

The Strategic Roads User Survey (SRUS), conducted by Kantar until 31 March 2020 on behalf of Transport Focus, asks questions about a range of aspects of journey experience on the Strategic Road Network (SRN). This includes roads on the motorway and major 'A' road network in England (these are the roads managed by Highways England on behalf of the Department for Transport). The topics the survey covers include overall journey experience, journey time, surface quality, roadworks management, permanent and electronic information, and feelings of safety.

The SRUS provides a detailed picture of the experience of all drivers, whether in cars, vans, lorries or coaches, or as motorcyclists. It generates data, which is made available to those who manage specific roads to help them understand users' views and prioritise where to make improvements.

The survey is based on an annual sample of around 8500 road users who have driven on the road network managed by Highways England. The survey is conducted continuously, and the survey focuses on drivers who have driven on a 'strategic' road in the previous four weeks. Each driver is asked questions about a single road (referred to as 'one road') based on a portion of their last journey if they used more than one SRN road on the same journey.

## 1.2 Objectives and methodology

In addition to conducting the main survey, Kantar was commissioned to conduct additional 'deep dive' analysis to explore aspects of a road user's journey which are associated with satisfaction with signage. The objectives were to discover:

- Which types of drivers (for example by age, licence holding length, confidence on motorways) rate satisfaction with signage highest and lowest?
- Which types of journey or types of road are associated with the highest and lowest satisfaction with signage?

A three-stage process was used:

- First, we created a composite variable which represented the best measure of signage satisfaction to be used as the outcome variable in analysis.
- Second, we examined which factors in isolation were most associated with signage satisfaction
- Third, we examined which factors in combination were most associated with signage satisfaction and identified those combinations of factors associated with highest and lowest levels of signage satisfaction. To do this a CHAID analysis (Chi-square Automatic Interaction Detector) was performed. CHAID is a form of analysis that determines how variables best combine to explain the outcome - in this case satisfaction with signage - once all variables are controlled for.

This report is structured as follows:

Section 2 describes the process for creating a composite outcome variable of signage satisfaction.

Section 3 considers the variation in satisfaction with signage by type of journey and road user type.

Section 4 brings these factors together using a CHAID analysis. This is a form of analysis that determines how different attributes best combine to explain an outcome (in this case satisfaction with signage). This results in a 'tree' which helps to visualise which groups of road user are most and least satisfied with signage on motorways and major 'A' roads.

## 2. How satisfaction with signage is defined in this report

The SRUS covers five measures of satisfaction with road signs or road marking on the 'one road' selected to be the focus of the questionnaire. These are:

- Information provided on permanent signs (not electronic messages)
- Information provided on electronic message signs (not permanent signs)
- The road signs and markings when joining the road
- The road signs and markings when leaving the road
- Road markings

There were strongly significant positive correlations between the answers to each of these. The internal consistency (Cronbach's  $\alpha$ ) of the five items was 0.865 and the paired inter-item correlations ranged from 0.456 to 0.639. These values are sufficiently strong to indicate that they are all essentially measuring the same underlying construct.

Analysing the answers across the five questions, the best outcome measure to use as the basis of satisfaction with signage was based on levels of satisfaction across two different measures: satisfaction with road markings and satisfaction with permanent signs. These two questions were asked of the complete sample and therefore provide the highest number of cases that could be used in the analysis. A combination of how these two questions were answered was used to construct a 'composite satisfaction with signage' measure that was used within the analysis. The computation of this composite measure is:

- Satisfied: *All drivers who were very satisfied with both road markings and permanent signs OR who were very satisfied with one and fairly satisfied with the other.*
- Dissatisfaction is therefore defined as: *All drivers who were very or fairly dissatisfied on either measure OR who were only fairly satisfied with both.*

This definition was chosen as it provides a good discrimination between 'satisfied' and 'not satisfied'. After this point in the report 'satisfaction with signage' is the proportion satisfied on this composite measure as defined above.

**On this measure, overall 41% of drivers rate signage or road markings as satisfactory.**

The data are based on all road users who made journeys between April 2018 and January 2020, a total sample of 15,903 respondents. All findings in this report are based on unweighted data.

In addition to the data, Transport Focus provided a segmentation designating each SRN road within a Highways England Area into either one of three motorways categories or one of three 'A' road categories based on the predominating characteristic of the road in that Highways England Area, as follows:

- Category A.** Smart Motorways, whether 'all-lane running' or 'dynamic hard shoulder'
- Category B.** Other motorways, in predominantly urban (conurbation) or suburban areas
- Category C.** Other motorways in predominantly rural areas
- Category D.** 'A' roads on the SRN, dual carriageway with over bridges/under-bridges at junctions, so designed to be predominantly free flowing
- Category E.** 'A' roads on the SRN with stretches of both dual and single carriageway
- Category F.** 'A' roads on the SRN which are predominantly single carriageway



# 3. What factors are associated with satisfaction with signage?

## 3.1 Driver characteristics

According to the satisfaction measure defined in section 2, 41% of all drivers were satisfied with road signage. The following groups of drivers were most likely to be satisfied with signage on this measure:

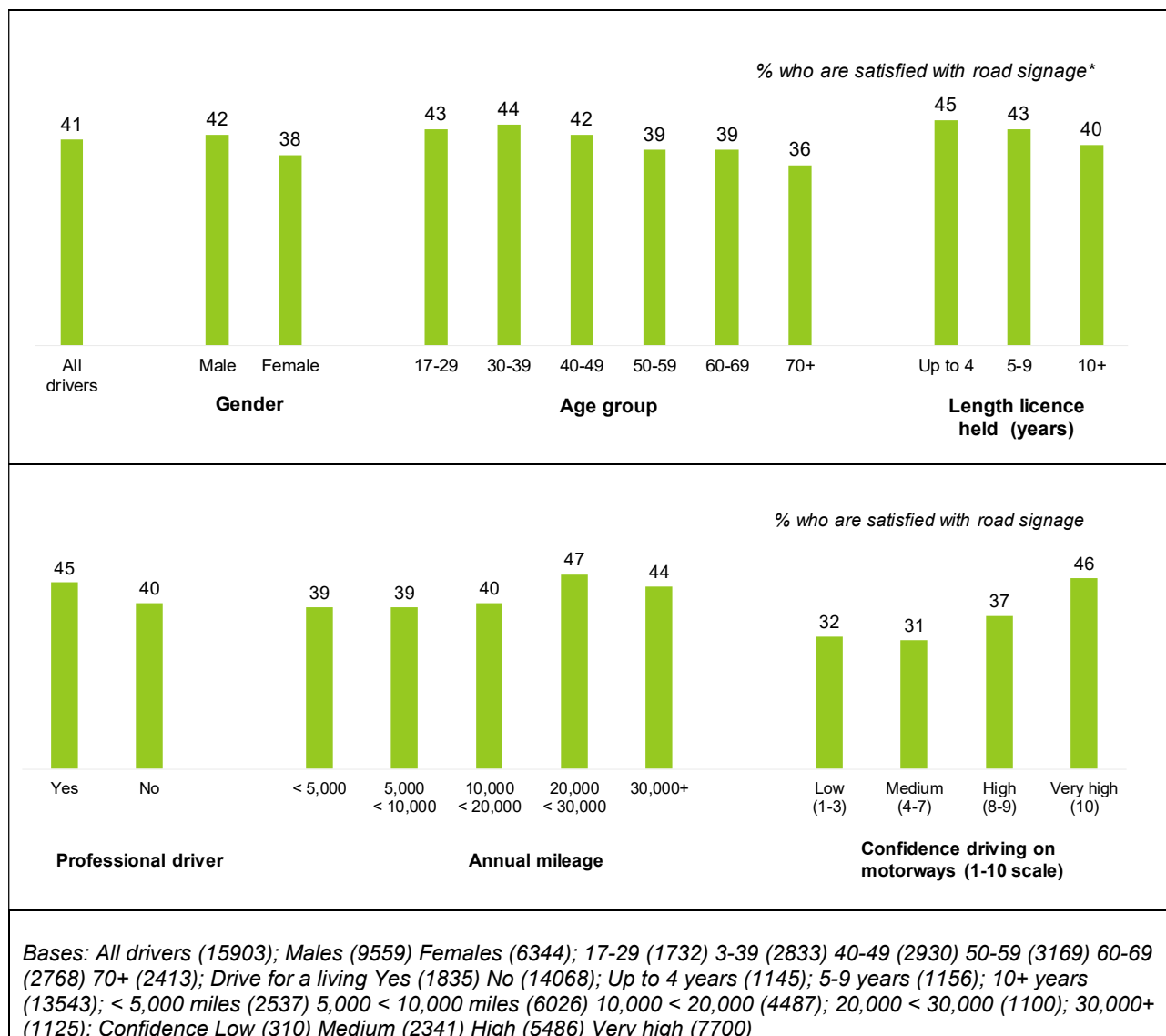
- Male drivers (42% compared with 38% of female drivers)
- Younger drivers (43% of those aged 17-29 which in general declined through the age groups to 36% of those aged 70+)
- Those who held a license for less than 5 years (45% compared with 40% who have held a license for 10+ years)

Satisfaction with driving was also related to various measures which indicate level of experience and confidence in driving, with more experienced and confident drivers generally more satisfied with signage. The following groups of drivers were most likely to be satisfied with signage:

- Those who drive for a living (45% compared with 40% who do not)
- Road users with an annual mileage of 20,000-30,000 miles (47% compared with 39-40% of those who drive less than 20,000 miles a year)
- Those who feel very confident driving on motorways (46% of those who feel very highly confident compared with 31-32% among those with low to medium levels of confidence)

These findings are summarised in Figure 3A.

**Figure 3A: Satisfaction with signage by driver characteristics**



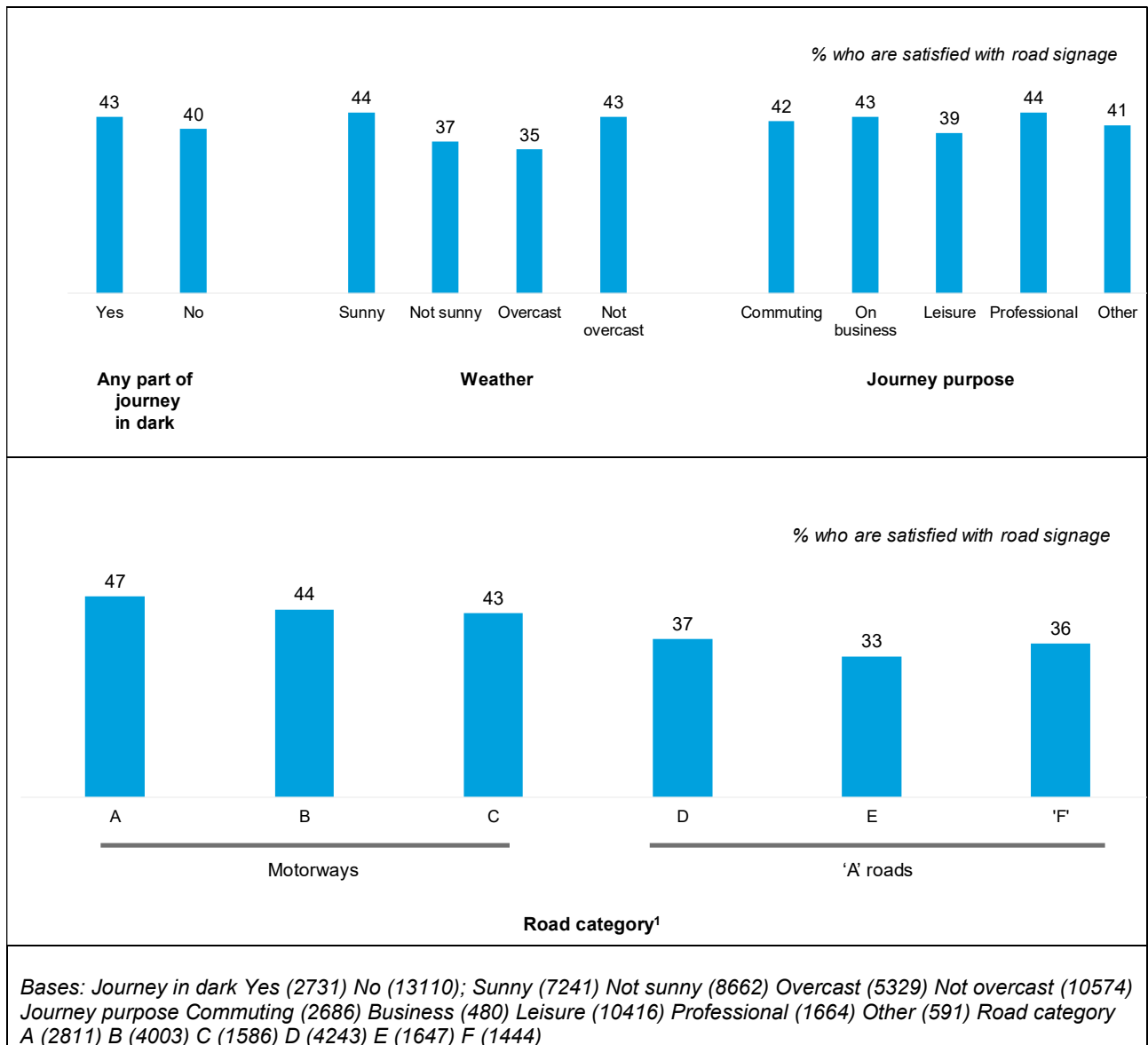
### 3.2 Journey characteristics

Some journey types were associated with higher levels of satisfaction than others. Drivers on the following journeys were more satisfied than average (see Figure 3B):

- Those driving professionally (44%) or on business (43%) compared with those driving for leisure (39%)
- Those driving at least part of the journey in the dark (43% compared with 40% of those driving fully in the daytime)
- Those driving in weather that was sunny (44% compared with 37% when not sunny) or not overcast (43% compared with 35% when overcast)

- Those driving on 'category A motorways' (47%) or 'category B motorways' (44%) compared with those driving on 'category F (36%) or 'category E 'A' roads' (33%).<sup>1</sup>

**Figure 3B: Satisfaction with signage by journey characteristics**

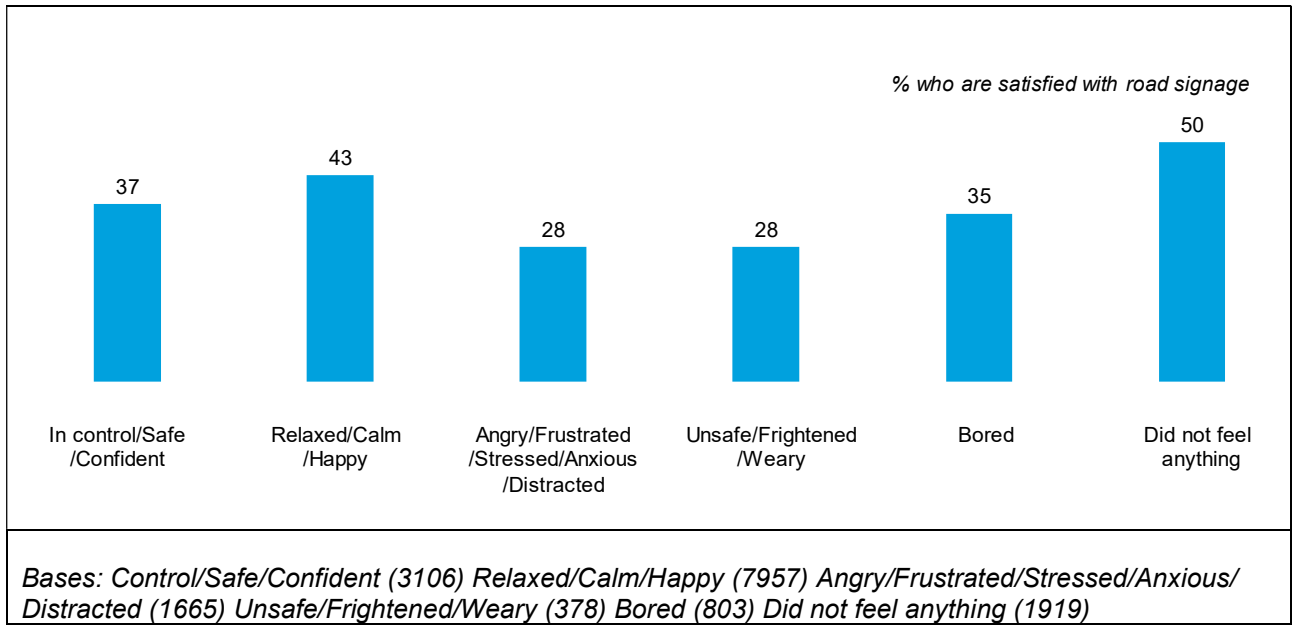


In addition, the main emotion felt during the journey was strongly associated with signage satisfaction:

- Signage satisfaction was especially high when drivers did not recall any specific emotion while driving (50%). It was also relatively high among those who felt relaxed, calm or happy (43%).
- However, for drivers who felt angry/frustrated/anxious or unsafe/weary/frightened signage satisfaction was much lower than average (28%).

<sup>1</sup> This is based on a segmentation of road types provided by Transport Focus; see section 2 for more detail.

**Figure 3C: Satisfaction with signage by main emotion while driving**



## 4. What factors in combination help explain satisfaction with signage?

### 4.1 Introduction to CHAID analysis

In section 3 it was shown that a range of both driver and journey characteristics are associated with signage satisfaction. In this section we describe the results of a CHAID analysis, a form of analysis that determines how variables best combine to explain the outcome - in this case satisfaction with signage - once all other variables are controlled for.

CHAID analysis looks for interactions of variables within a data set. It divides the sample through a series of splits across a set of independent variables (such as driver and journey characteristics), which produce the greatest discrimination in an outcome variable (in this case signage satisfaction). Taking the percentage who state that they are satisfied with signage, the analysis examines all the other input variables to discover where there is greatest discrimination. Using the chi-square test, the CHAID analysis then splits the outcome variable into two or more categories that are called the initial, or parent nodes. Those nodes are further split until no further statistically significant splits can be made and the end points are called terminal nodes. The output is visualised in the form of a tree diagram (see Figure 4C).

### 4.2 CHAID analysis for signage satisfaction

In this analysis, the outcome variable was all those who were satisfied with signage using the same definition referred to in section 2. That is: *All drivers who were very satisfied with both road markings and permanent signs OR being very satisfied with one and fairly satisfied with the other.* The input variables included all those covered within in Section 3 (these being the independent variables) as follows:

- I. **Driver characteristics:** age, gender, license holding length, whether drive for a living, annual mileage, level of confidence on motorways
- II. **Journey characteristics:** journey purpose, light and weather conditions, type of road, main emotion while driving, distance travelled on selected road

Figure 4C shows the decision tree output. There are 26 nodes in total, and 16 terminal nodes. The results are split out into layers, with the first layer showing the characteristics that are most significant in discriminating between high and low levels of signage satisfaction. The second layer shows which characteristics are next best at differentiating levels of satisfaction within those categories identified in the first layer, and so on.

This shows the most significant factors which explain signage satisfaction are (broadly in order):

- Main emotion while driving
- Level of confidence in motorway driving
- Whether weather was overcast or not
- Category of road (as defined in section 2)

It should be noted that the findings only identify relationships between signage satisfaction and other variables in the dataset, and we can make no claims about the causality of any such relationships or the direction in which they apply. For example, we cannot say whether feeling anxious while driving results in drivers finding more signage more difficult, or whether poor signage on the roads leads to driver anxiety. What we can say is that, once everything else is controlled for, those who feel anxious while driving are less likely than those who do not feel anxious to feel satisfied with road signs on their journey.

Tables 4A and 4B display the pattern of circumstances which are associated with the highest and lowest rates of signage satisfaction.

**Table 4A: Groups of drivers who are most satisfied with road signage (overall rate of satisfaction=41%)**

Terminal Node	Tree levels (see Figure 4C)				Percent satisfied with road signs
	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	
Node 18	Feeling relaxed/calm/happy	Very confident on motorways	Driving on a smart motorway (road category A)		60%
Node 13	No emotion while driving	Very confident on motorways			59%
Node 19	Feeling relaxed/calm/happy	Very confident on motorways	Driving on a non-smart motorway (road categories B or C)		51%
Node 23	No emotion while driving	Less confident on motorways	Journey distance low		47%
Node 26	Feeling relaxed/calm/happy	Very confident on motorways	Driven on an 'A' road (road categories D,E or F)	Sunny weather	47%

**Table 4B: Groups of drivers who are least satisfied with road signage (overall rate of satisfaction=41%)**

Terminal Node	Tree levels (see Figure 4C)			Percent satisfied with road signs
	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	
Node 15	Feeling relaxed/calm/happy	Less confident on motorways	Weather overcast	32%
Node 11	Feeling angry/stressed/anxious or unsafe/frightened/weary	More confident on motorways		30%
Node 22	Feeling in control/safe/confident or bored	Weather overcast	Female driver	29%
Node 10	Feeling angry/stressed/anxious or unsafe/frightened/weary	Less confident on motorways		22%

This indicates that high levels of satisfaction with road signage tend to be experienced by confident motorway drivers, while driving on a motorway, who feel either relaxed/calm or who recalled no specific emotion while driving. The highest rate of satisfaction (60%) was found among drivers on a smart motorway who feel relaxed/happy and are confident motorway drivers.

On the other hand, low levels of satisfaction tend to be experienced by drivers who feel anxious or unsafe, who lack confidence on motorways and when the weather is overcast. The lowest level of satisfaction was found among drivers who felt angry, stressed or anxious and who lacked confidence on motorways (22%).

Some verbatim findings are provided below to illustrate some of the reasons that underly satisfaction and dissatisfaction with road signage and marking. These correspond with the final nodes indicated in the tables above.

All roads surfaced better and better road signs (improvements). (*Female, 35-39, A1(M), Node 19*)

No traffic, good road surface, well signed (*Male, 25-29, M25, Node 18*)

It's nice and smooth and the signs are clear (*Female, 80-84, A1, Node 26*)

The A5 has improved considerably by imposing a 50mph speed limit and ... road markings for cars waiting to turn right at junctions. (*Male, 55-59, A5, Node 26*)

Adequate signage telling me where to get off (*Female, 35-39, A453, Node 23*)

Clear sign on exit junction (*Female, 65-69, M1, Node 23*)

Great roads, very smooth, good sign posting (*male, 65-69, M62, Node 13*)

Electronic road signs bore no resemblance to traffic problems (*Male, 80-84, M20, Node 10*)

Not enough warning about coming off the motorways, I don't use motorways very much, found it difficult, needed more warning on signs (*Male, 65-69, M32, Node 10*)

The electronic signs tell you too late and are not cleared when incident resolved. Too much street signage and furniture (*Male, 55-59, M27, Node 11*)

Trees are not being trimmed so signs not visible. Broken signs not being repaired (*Female, 50-54, A47, Node 11*)

Too many road signs adds to stress of a journey rather than improve it. (*Female, 30-34, M1, Node 11*)

Electronic signs need to be more precise i.e. length of queue or time in queue. (*Female, 60-64, M67, Node 15*)

Motorway lights turned off, couldn't see the road markings (*Male, 30-34, M1, Node 10*)

# Figure 4C: Decision Tree output

**Key**

Node number

Subgroup (% who are satisfied with road signs and markings)

