



# Piloting Site Questionnaire: User and Acceptance Evaluation

L3Pilot Final Event

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# Pilot Sites and Questionnaire: 3 Urban Chauffer and 11 Motorway Chauffer



**L3 Pilot Driving Automation**

User and Acceptance Evaluation /  
Pilot Site Questionnaire - Traffic Jam/Motorway Pilot

Version: Final  
Dissemination level:  
Lead contractor: University of Leeds  
Due date: 31.07.2019  
Version date: 13.02.2019

Fatigue affects my decision to drive.

- TJM.24** How often do you experience fatigue while driving on a motorway?  
 Never or hardly ever  
 Sometimes  
 Often or always

Driving on a motorway	
Driving on a congested motorway	
Driving on rural roads	
Driving on urban streets	
Driving at night	
Driving fatigued	

- TJM.25** Below is a list of driving conditions. How strongly you agree or disagree with the statement?  
 Strongly disagree  
 Disagree  
 Agree  
 Strongly agree

Driving on motorways is stressful	
Driving on motorways is difficult	
Driving on motorways is demanding	
Driving on motorways is fun	

- TJM.26** Do you generally experience motion sickness when travelling as a passenger on the motorway?
  - Never or hardly ever
  - Sometimes
  - Often or always

User and Acceptance Evaluation / 13.02.2019 / version Final 13

# System Description in Brief

With the Motorway Chauffeur the car adapts to various traffic conditions. It follows the lane and adjusts speed considering various factors such as keeping a safe distance to the vehicle in front or following the speed limit. If a preceding slower vehicle is detected the car overtakes automatically as soon as it is safely possible.

**L3Pilot**  
Driving Automation

**MOTORWAY CHAUFFEUR**

SAE LEVEL 0 1 2 3 4 5

## Capabilities

- Automatic Lane Changes
- Speed/Distance
- Lane Keeping/Centring/Following
- Motorway Exits and Entrances

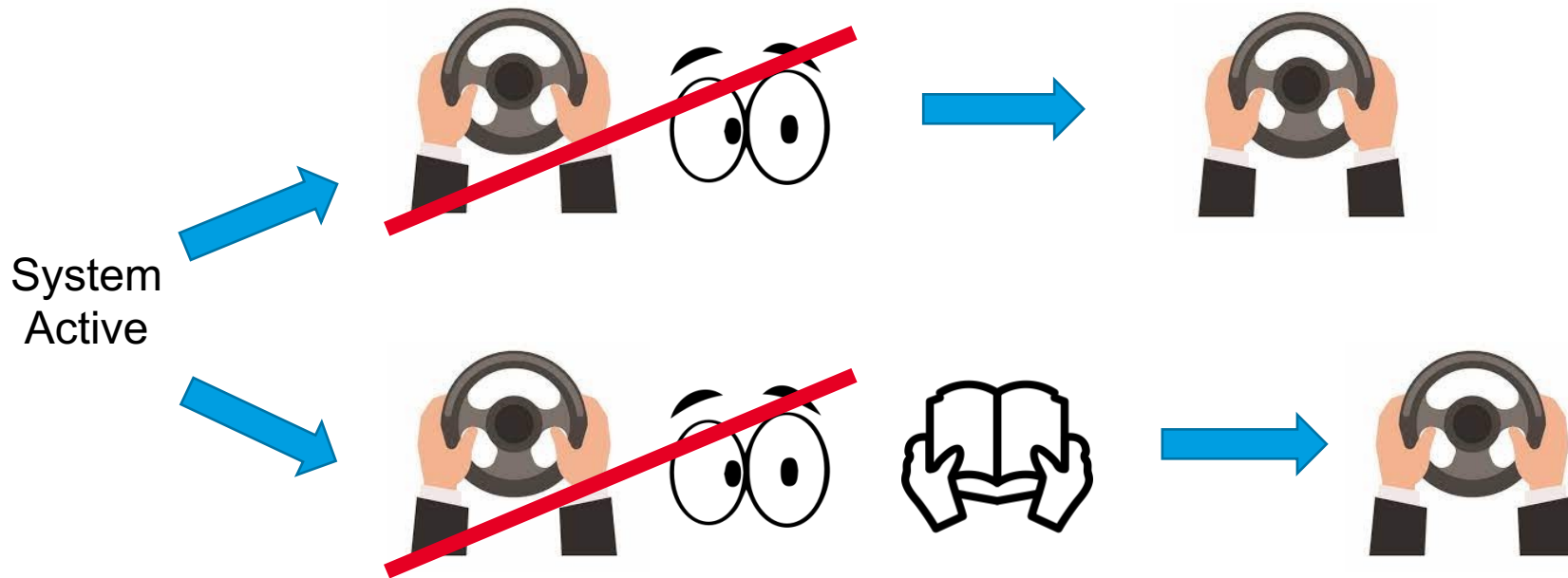


## Limitations

- Construction sites
- Extreme weather (i.e. heavy rain and snow)
- Night time



# Motorway Chauffeur System - Method



# Motorway Chauffeur System - Method



May 2019 – September 2021



Various Locations in Europe  
Traffic: quiet → traffic jam



Ave: 1 to 1.5 hours  
Min: 30 mins, Max: 6 hours  
Between 60 and 133km

# Urban Chauffeur System

With the Urban Chauffeur the vehicle automatically follows the lane, starts and stops and handles overtaking within cities. When coming to a crossing the car handles right and left turn, recognises on-coming traffic and vulnerable road users such as pedestrians, and selects the correct crossing path, even if no lane marking is present.

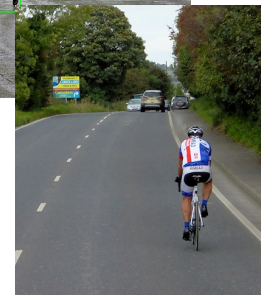
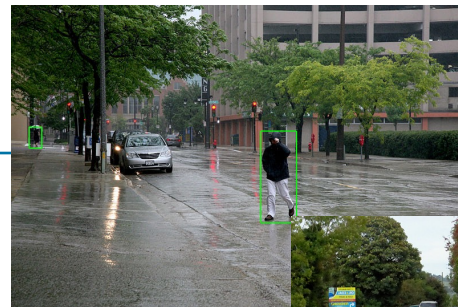
**L3 Pilot**  
Driving Automation

**URBAN CHAUFFEUR**

SAE LEVEL 0 1 2 **3** 4 5

## Capabilities

- Detect Vulnerable Road Users



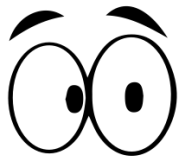
## Limitations

- Extreme weather (i.e. heavy rain/snow)
- Detection of traffic lights



## Urban Chauffeur System - Method

Most of the participants were front seat **PASSENGERS**, and they were asked to



Focus, observe and experience the system



In some studies: allowed to engage in a secondary task because they were the passengers



In some studies: participants were also asked to imagine sitting in the driver's seat be aware of the take-over request from the vehicles.

## Urban Chauffeur System - Method



September 2020 to November 2020



Several locations in Europe. Multiple-lane urban roads, including signalised and non-signalised intersections, pedestrian crossings, traffic lights, presence of bicycle lanes. The speed limit of urban roads were 50 km/h.



The test routes were 2.4 km to 2.8 km per route, the drives were between 10 and 40 mins (one or two laps).



## Overall Method



### Briefing:

Motorway: ✓

Urban: ✓



### Practice Drive:

Motorway: ✓

Urban: NA



### Motorway:

- Monitoring hazards & the system
- Prompt the driver to take over during critical situation
- In some cases, taking over control
- Triggering Level 3 availability
- Ensuring travel directions were correct

### Urban:

- Seated in the driver's seat
- Similar role as Safety Driver on Motorway
- Did not have to warn the passengers

# User Acceptance & Evaluation

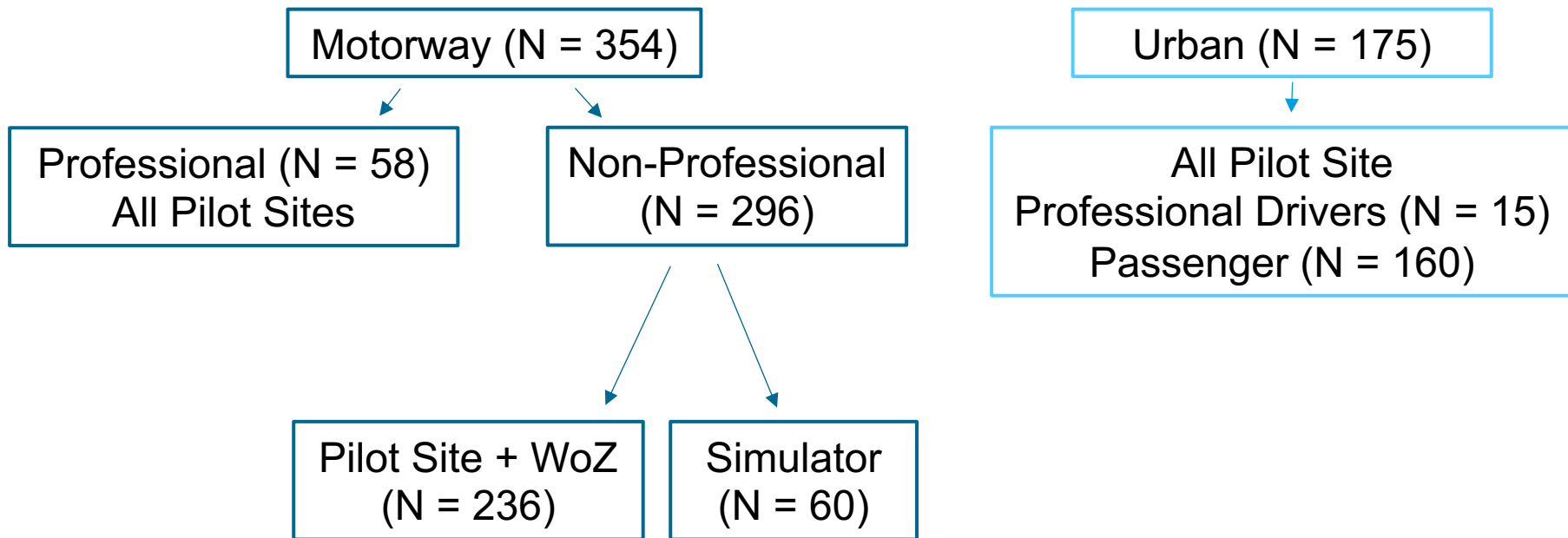
## User Acceptance & Awareness

- Are drivers **willing to use** an Automated Driving Function (ADF)?
- What is the **user acceptance** of the ADF?
- What is the impact of ADF on **driver state**?
- What is the impact of ADF use on **driver awareness**?
- What are **drivers' expectations** regarding system features?

## User Experience

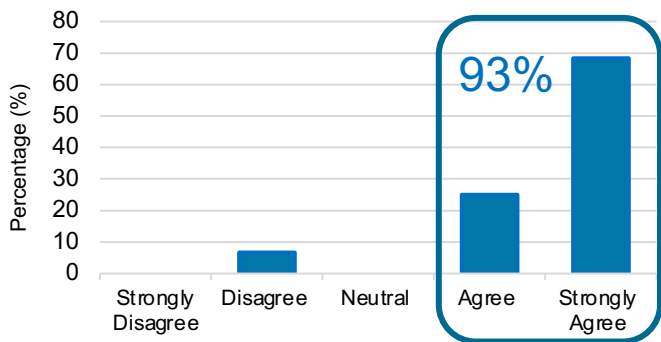
- What is drivers' **secondary task** engagement during ADF use?
- How do drivers respond when they are required to **retake control**?
- What is the impact of ADF use on **motion sickness**?

## Data Grouping

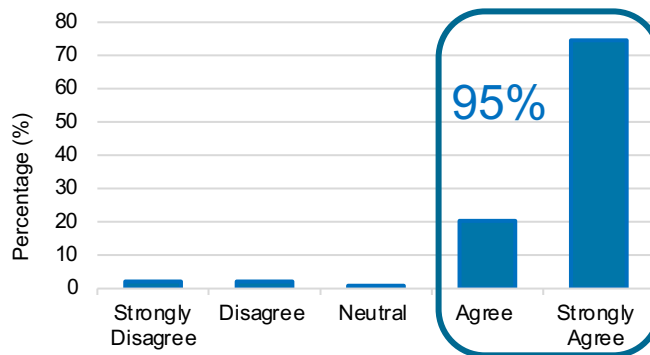


# Willingness to Use – Perceived Safety/Trust/Usefulness

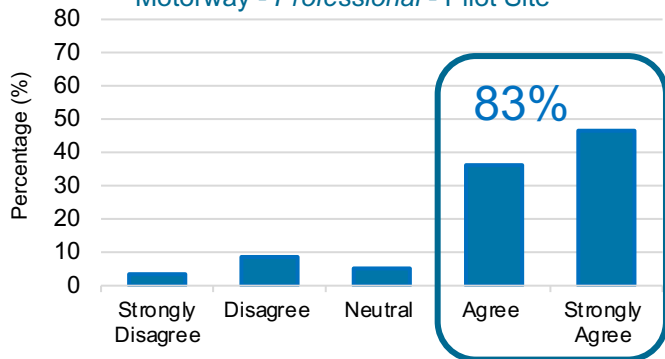
Motorway - Non-Professional - Simulator



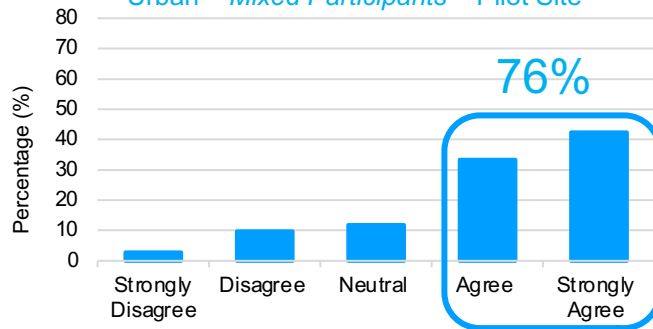
Motorway - Non-Professional Pilot Site/WoZ



Motorway - Professional - Pilot Site

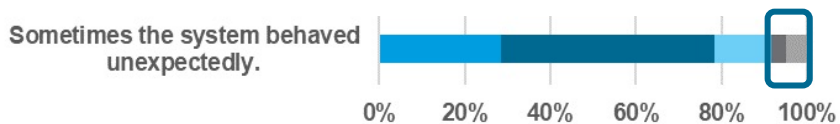


Urban – Mixed Participants – Pilot Site

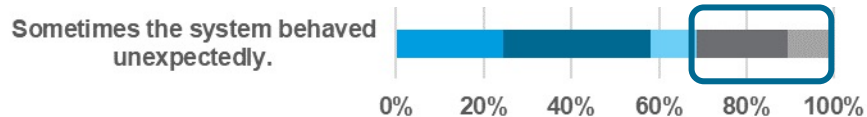


# System Performance

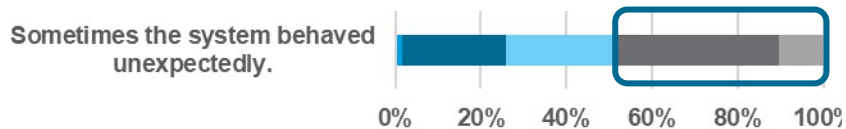
Motorway – Non-Professional - Simulator



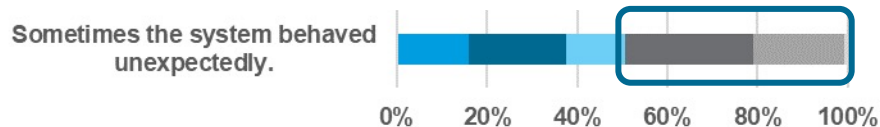
Motorway – Non-Professional - Pilot Site / WoZ



Motorway – Professional - Pilot Site



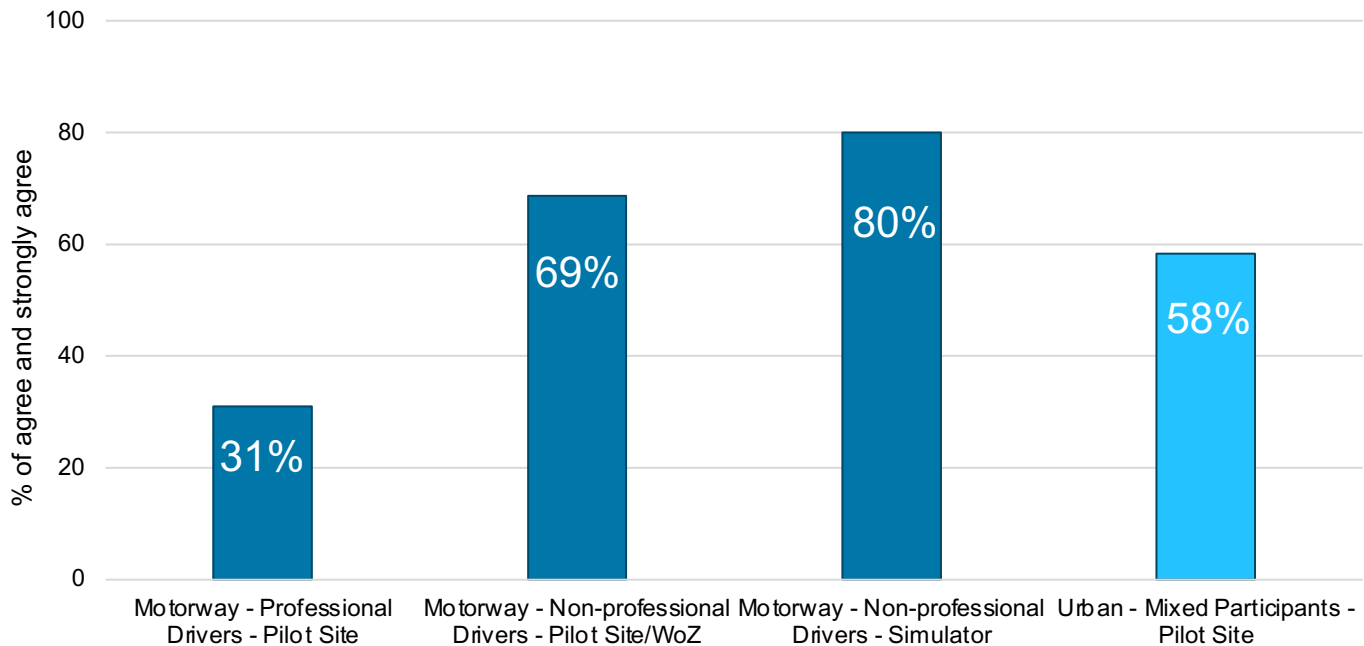
Urban – Mixed Participants - Pilot Site



■ Strongly Disagree ■ Disagree ■ Neutral  
■ Agree ■ Strongly Agree ■ Don't know

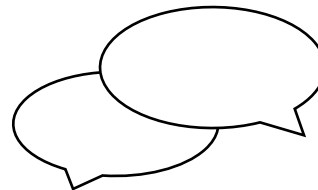
# The system acted appropriately in all situations

The system worked as it should work.

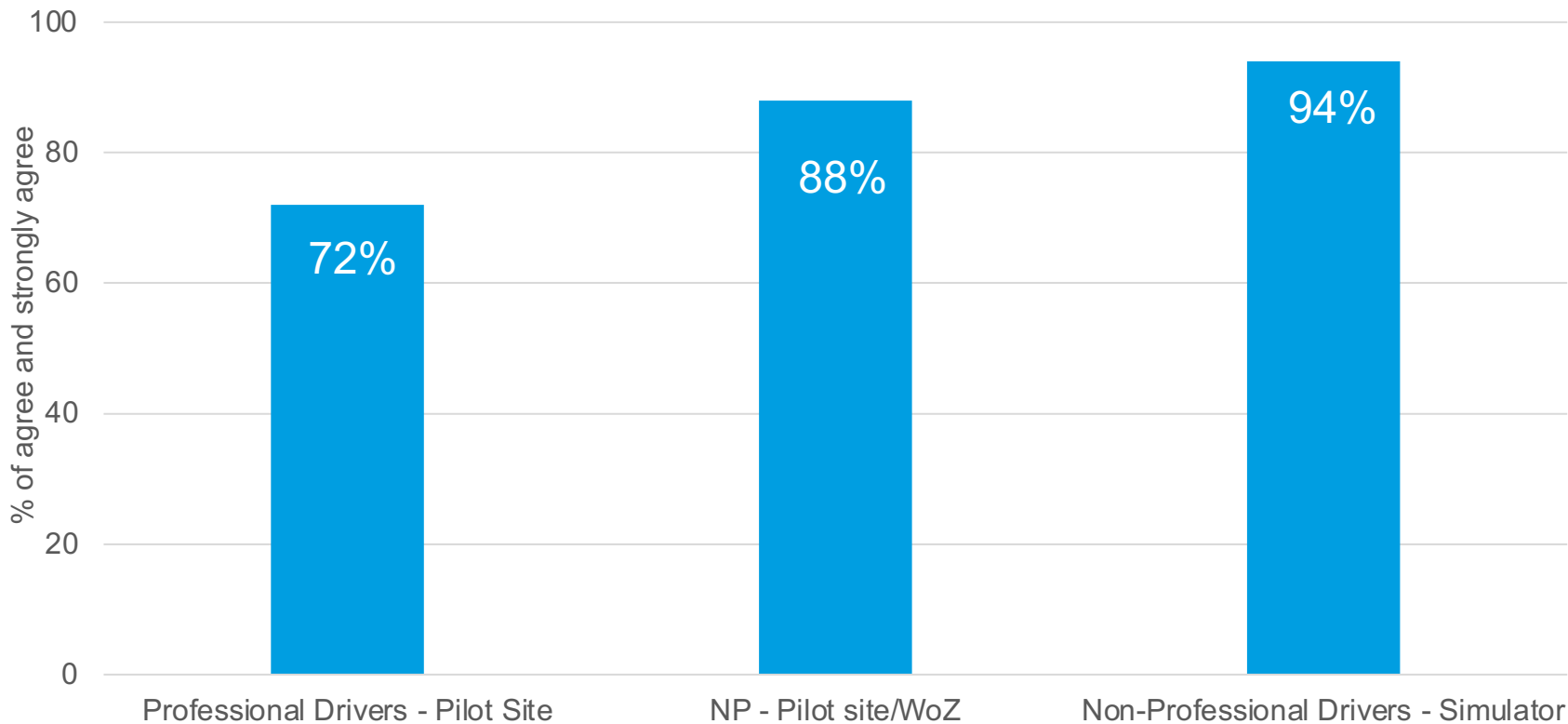


## Secondary task engagement and driver comfort

- Engagement in Non-driving related activities was high for *non-professional* drivers in Motorway (82% and 98%); compared to *professional drivers* (41%) and Urban (56%)
  - music, radio, audiobook
  - navigation
  - interact with a passenger
  - smart phone apps, texting
- Majority agreed that the system was comfortable (average 88%), with no motion sickness (average 98%)
  - Less so for motorway junction areas and lane change behaviours (potentially when interactions were involved)



## During the takeover, I always felt safe (Motorway)





# Summary

- Drivers who experienced Motorway and Urban systems were **generally positive**
- Room for improvement to match **users' expectations**
- Professional drivers were **less positive** about the Motorway system than non-professional drivers.
- A hierarchical regression model showed that *Willingness to Use* increases with **opportunity to engage in secondary tasks** and the **usefulness** of the system.
- The hierarchical model also showed that in the Motorway, **system familiarity** and **driver type** did not affect *Willingness to Use*— but it did in Urban (small effect)
- Caveats:
  - Pilots studies
  - Urban: Passengers, not drivers.



Thank you for your kind attention.

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