



Innovations for safe driver behavior

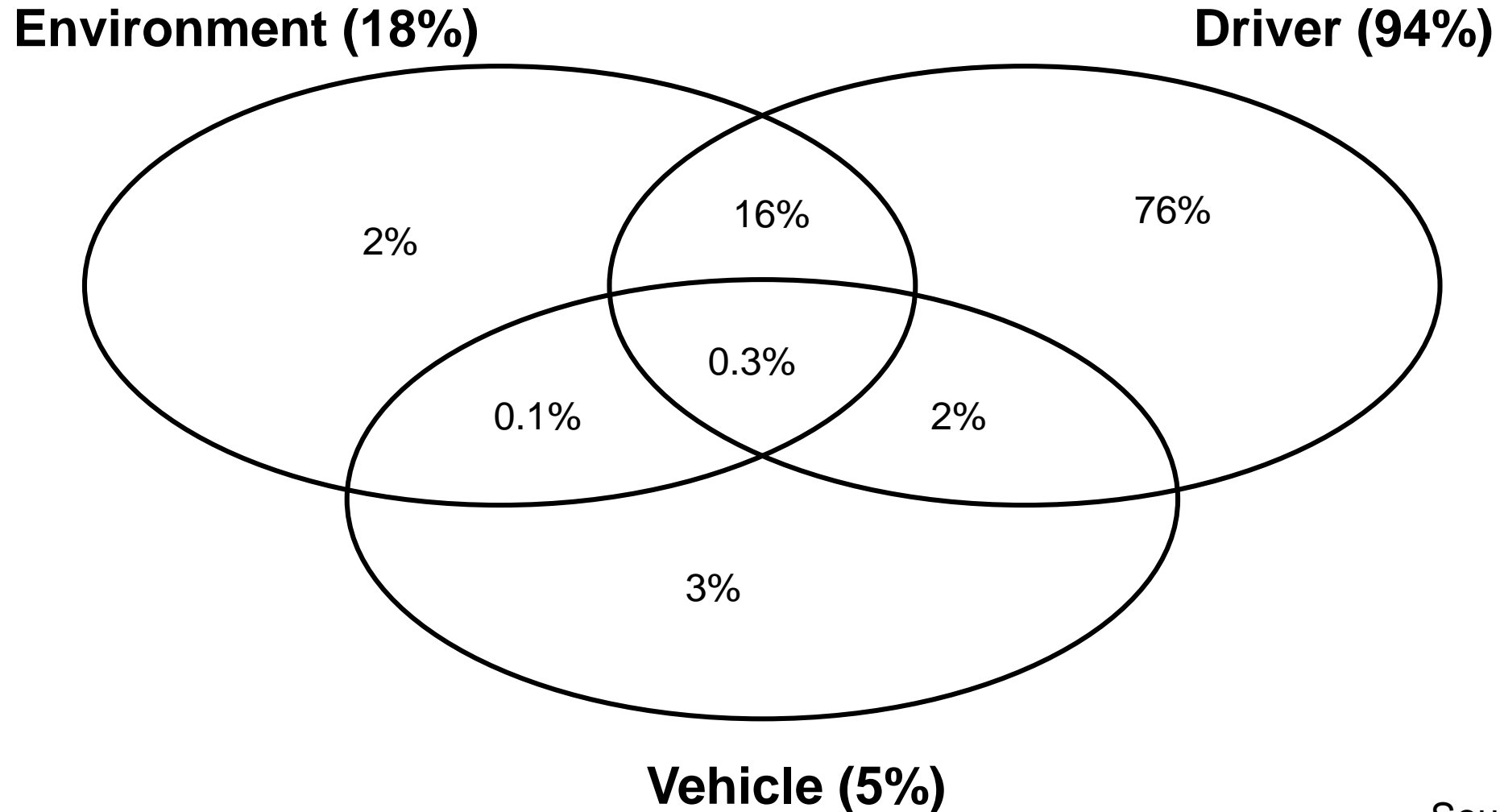
Innovation in Road Safety Research
NTUA Road Safety Scientific Workshop 2021

Prof. dr. Tom BRIJS



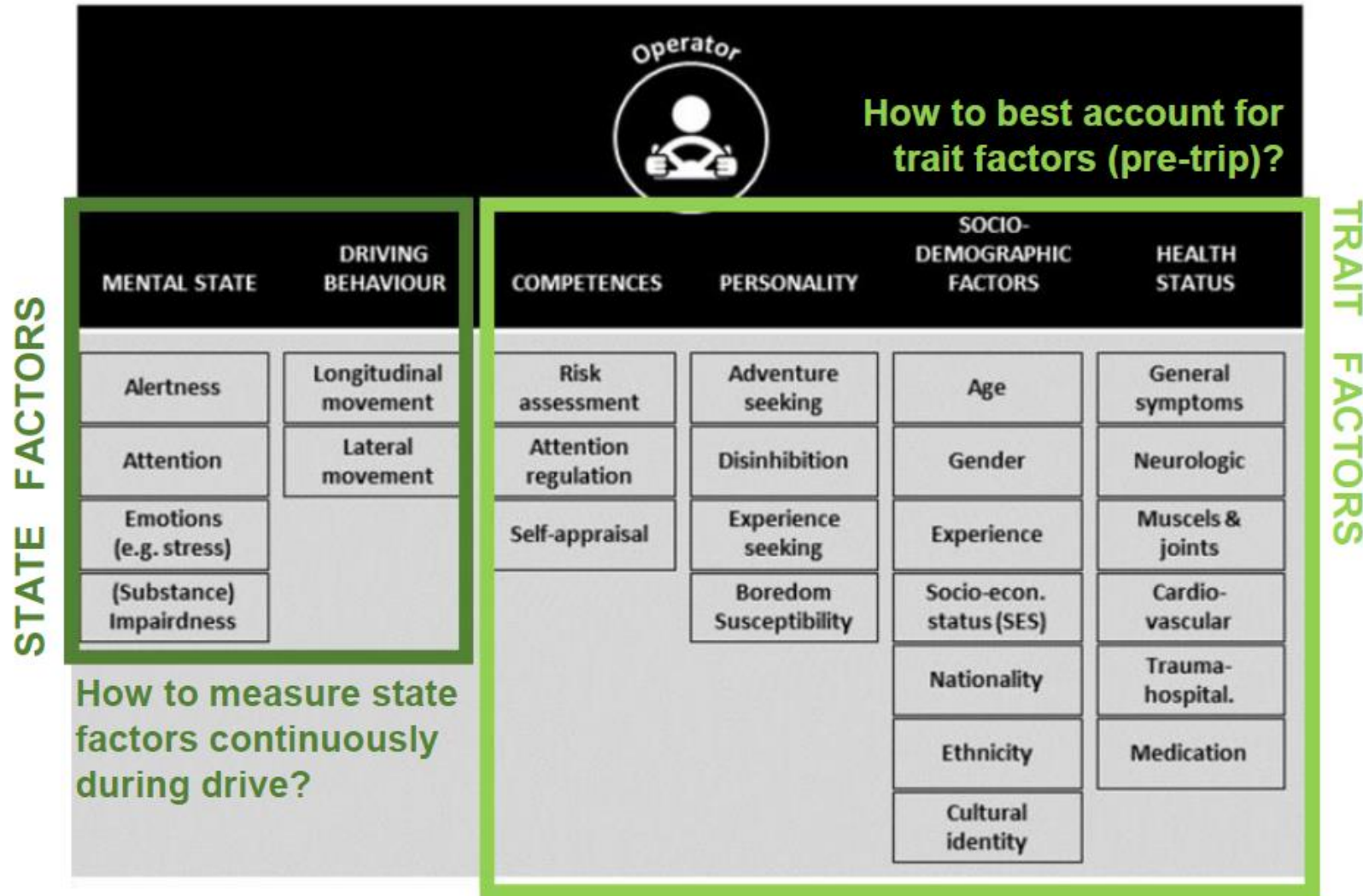
This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 814761

Importance of driver behavior



- Driver behavior is **complex** and influenced by
 - A variety of driver state and trait related factors
 - A variety of exogenous factors
 - A variety of vehicle related factors
- Focus on **normal** driving or **risky** driving behaviour?
- How to **measure** driver behavior?
 - Observational versus self-reported data
 - Naturalistic versus simulated environment
 - Behavioural outcomes versus behavioural predictors & physiological indicators
- How to **understand** and **model** driver behavior?
 - Driver psychology models
 - Modelling techniques (static, dynamic, explanation, prediction)
- How to **influence** driver behavior (in a sustainable way)?

State versus trait factors



- **Exogenous** factors
 - Road layout
 - Traffic conditions
 - Weather
 - Time of day
- **Vehicle related** factors
 - Type of vehicle (light, heavy, ...)
 - Vehicle characteristics (engine, actuator status, system status)
 - Safety systems on board (ADAS)

How to measure driver behavior?



- **Instantaneous** versus **past** behavior
- Outcome measures (e.g. speed, acceleration, tailgating, ...)
- Self-reported measures (e.g. violations, accident involvement)
- Underlying **predictors** of behavior (e.g. Theory of Planned Behavior)
 - Attitudes and opinions
 - Subjective norms
 - Perceived behavioral control
 - Behavioral intentions
- **Physiological** indicators (EDA, EEG, HRV, blood pressure, skin temperature, ocular variables...) of driver state (e.g. arousal, fatigue, sleepiness, stress, emotions)

A word cloud featuring various measurement technologies. The words are arranged in a roughly circular shape, with some words being larger and more prominent than others. The colors of the words are green, red, and purple.

social media data
travel card data
wearables
cameras
traffic
in-vehicle sensors
eye tracking
mobile phone data
roadside sensors
loop detectors
floating car data

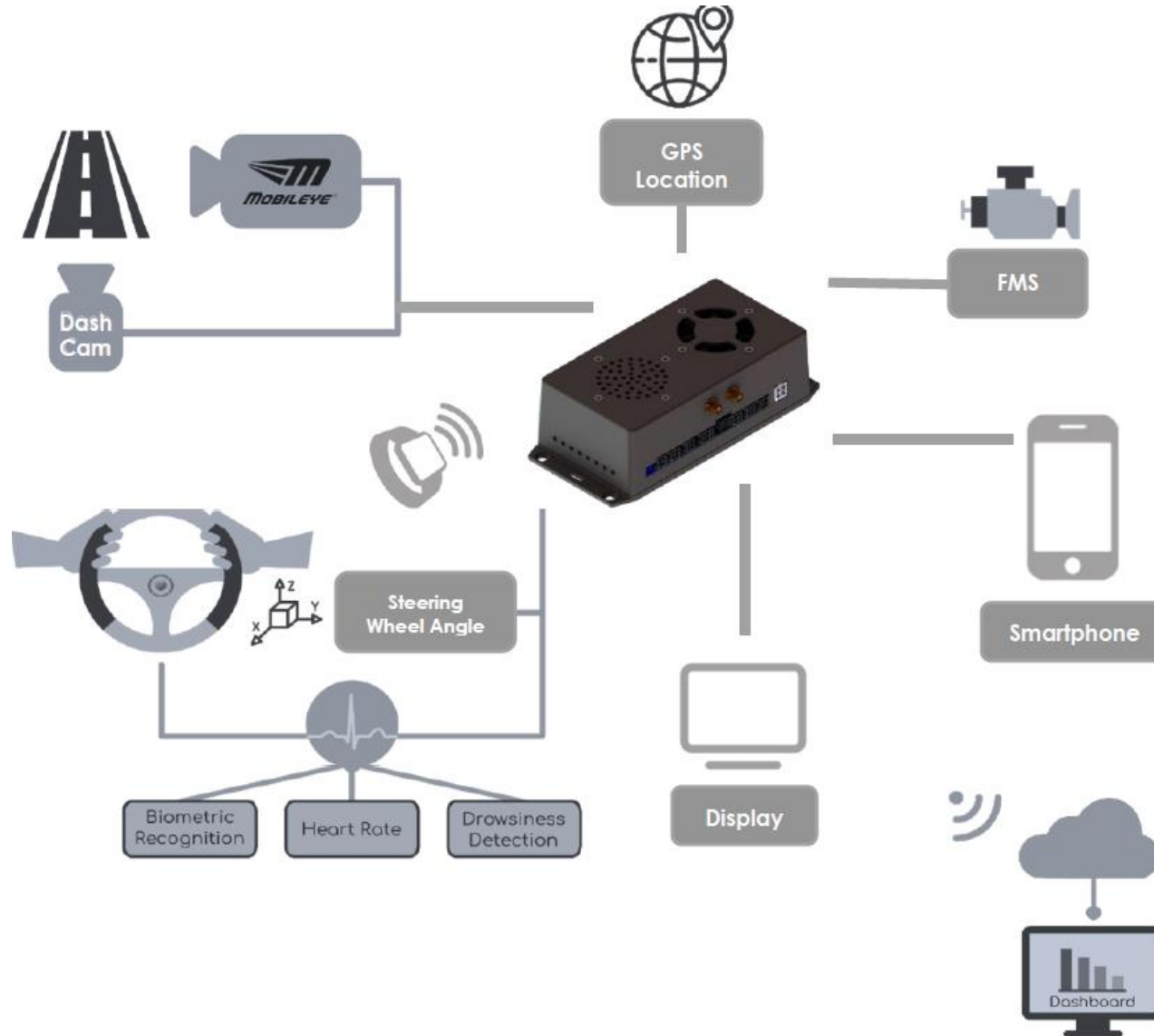
i-DREAMS measurement technologies

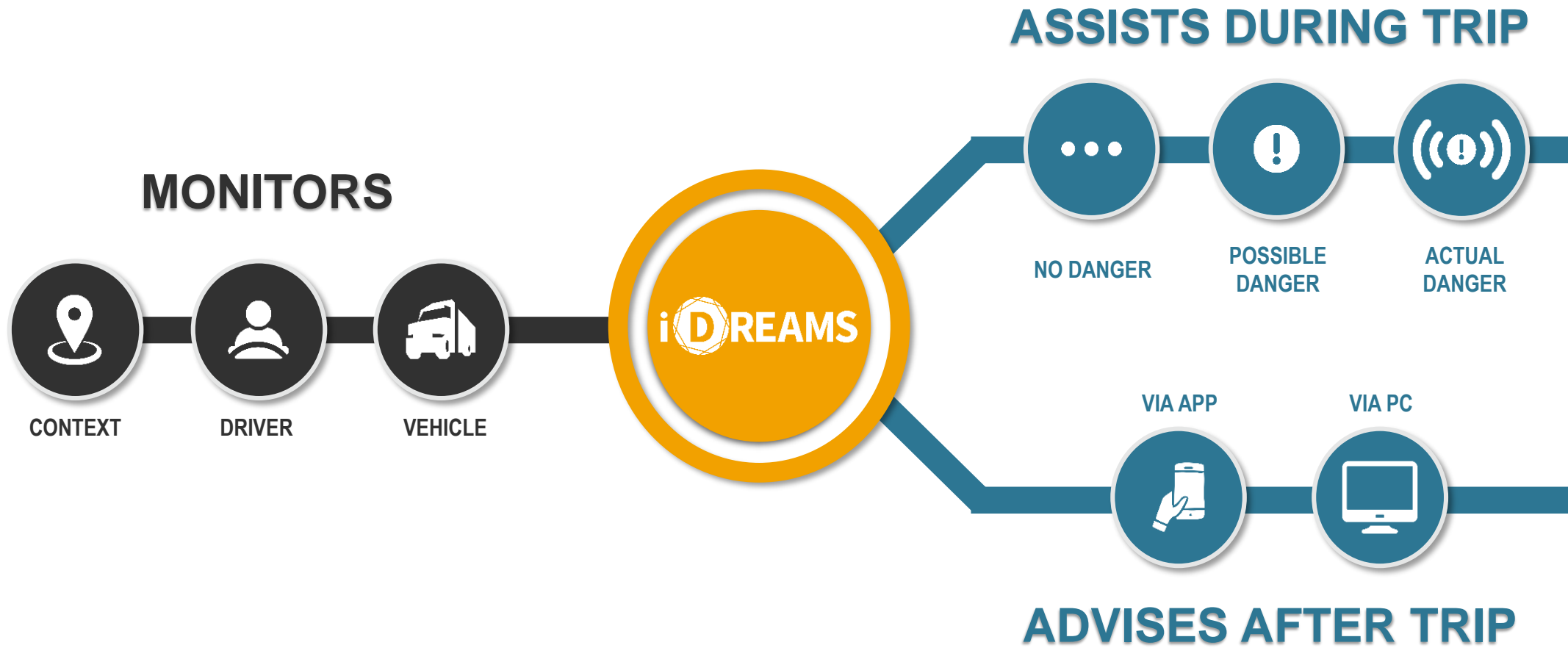


i-DREAMS measurement technologies

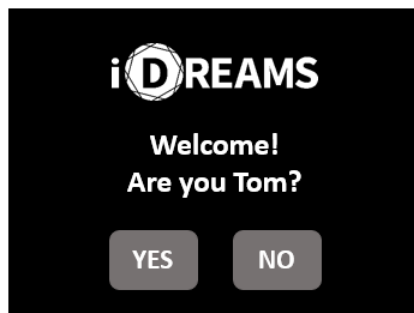


i-DREAMS data fusion & interpretation





i-DREAMS in-vehicle interventions



Driver identification



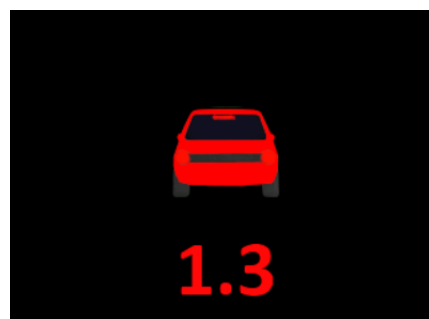
Handheld mobile phone use



Illegal overtaking



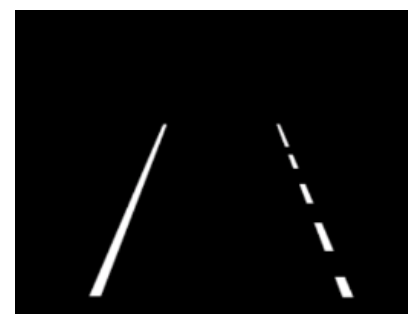
Fatigue monitoring



Tailgating



Vulnerable road users collision warning

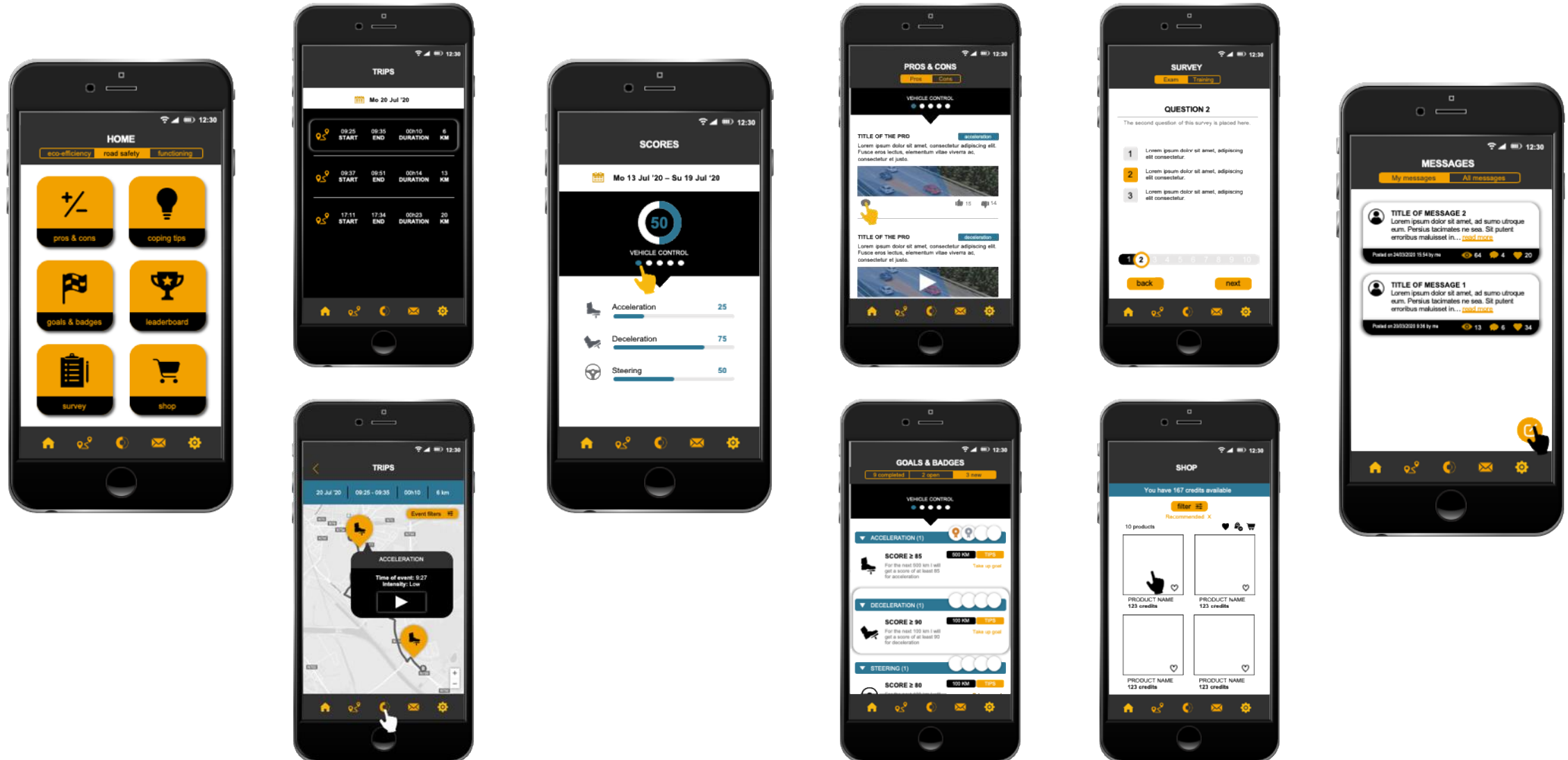


Lane departure warning



Over speeding

i-DREAMS post-trip intervention app



i-DREAMS web dashboard

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Trips

Safety ▾

7/4/2021



7/5/2021



ghswc ▾

Health

- ☐ 0 Fatigue 100
- ☐ 0 Distraction 100

Vehicle Control

- ☐ 13 Acceleration 25
- ☐ 2 Deceleration 90
- ☐ 27 Steering 0

Road Sharing

- ☒ 39 Tailgating 96
- ☐ 0 Lane discipline 100
- ☐ 0 Overtaking 100
- ☒ 5 Collision avoidance 35
- ☒ 1 Vulnerable road user collision avoidance 0

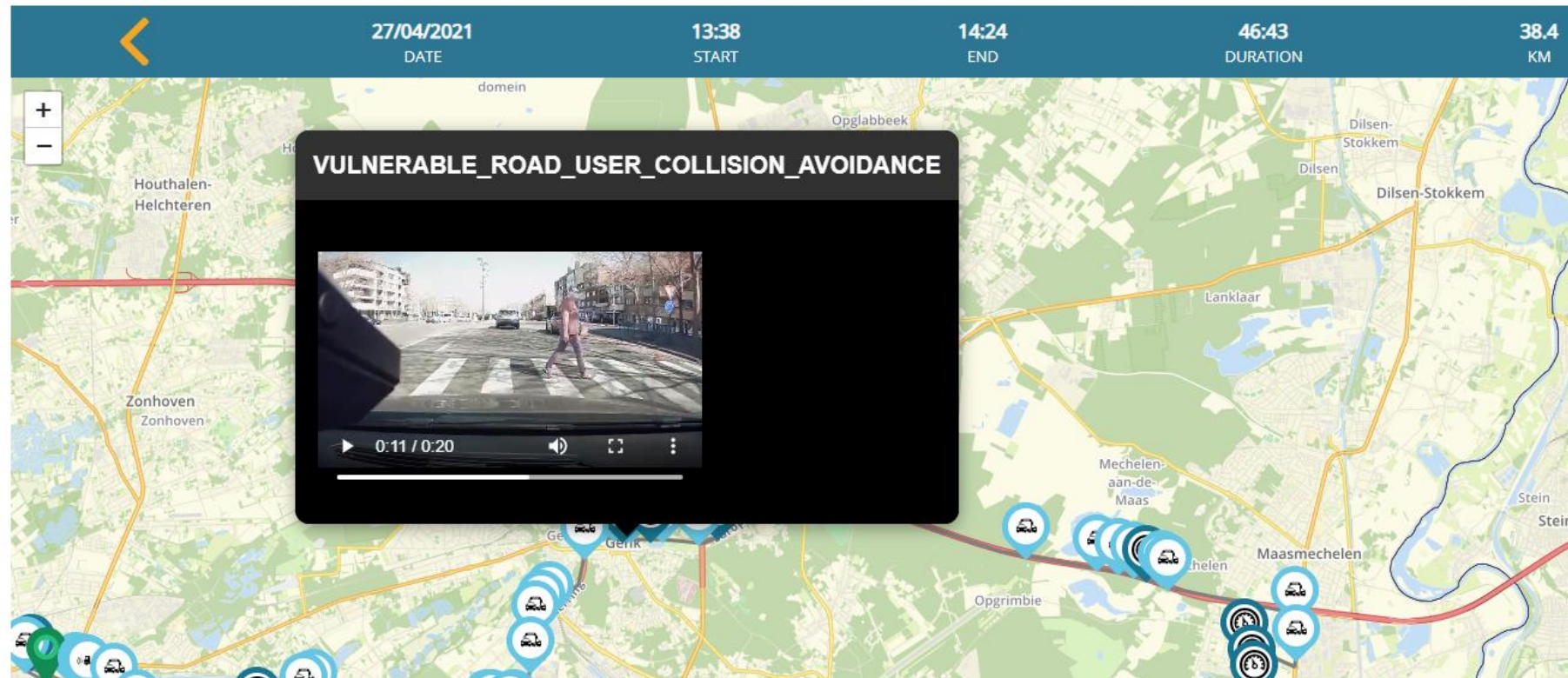
Speed Management

- ☒ 10 Speeding 90

Safety Devices

- ☐ 0 I-DREAMS device 0
- ☐ 0 App usage 0

Score



Prof. dr. Tom Brijs

Project co-ordinator

Transportation Research Institute (IMOB)

Hasselt University

Wetenschapspark 5 bus 6

3590 Diepenbeek – BE

tom.brijs@uhasselt.be

Tel. +32 (0)11 26 91 55



www.idreamsproject.eu



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