User-related Assessment in interactIVe: From Simulator Studies to Field Studies

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interactIVe Final Event

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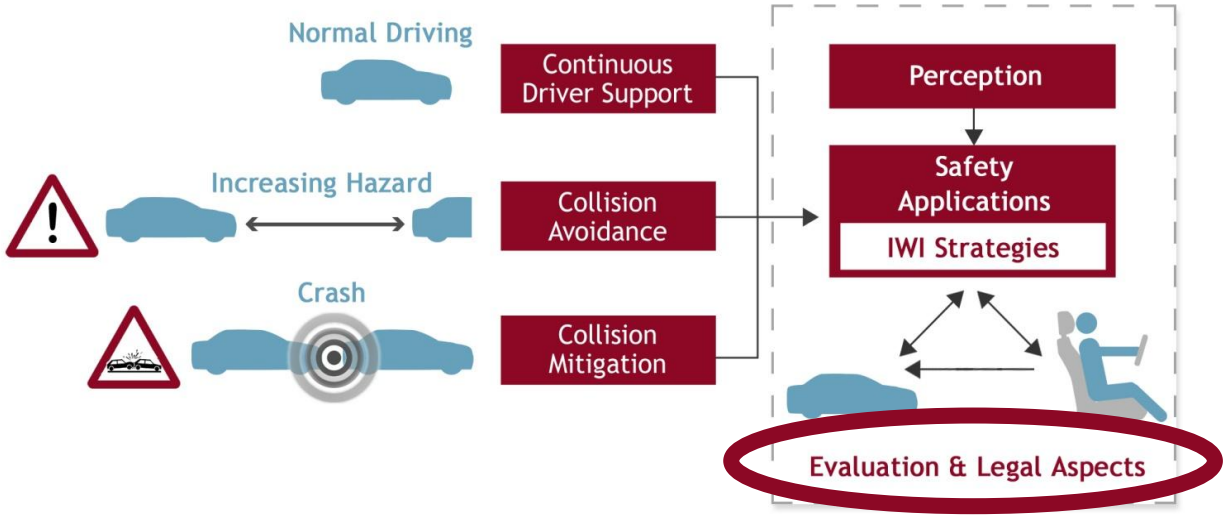


The aim of the user-related assessment was to evaluate the systems' effect on driver behaviour and their acceptance

- Type of study is chosen depending on:
  - criticality of the relevant scenario (speeding vs. rear-end),
  - expected function reaction (warning vs. intervening),
  - activation point (TTC at warning / intervention).

Real traffic

Test track

Driving Simulator

Time point, at which the function becomes active

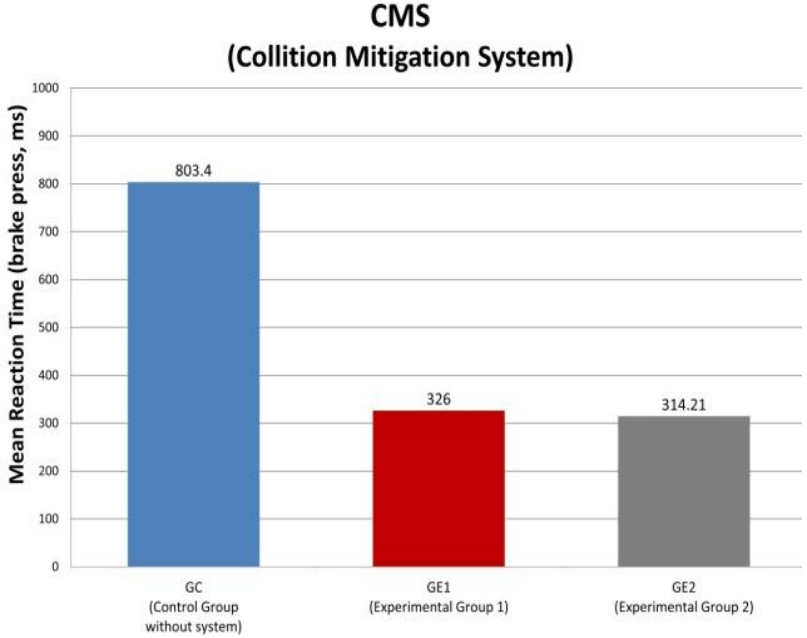
Overview on user-related studies

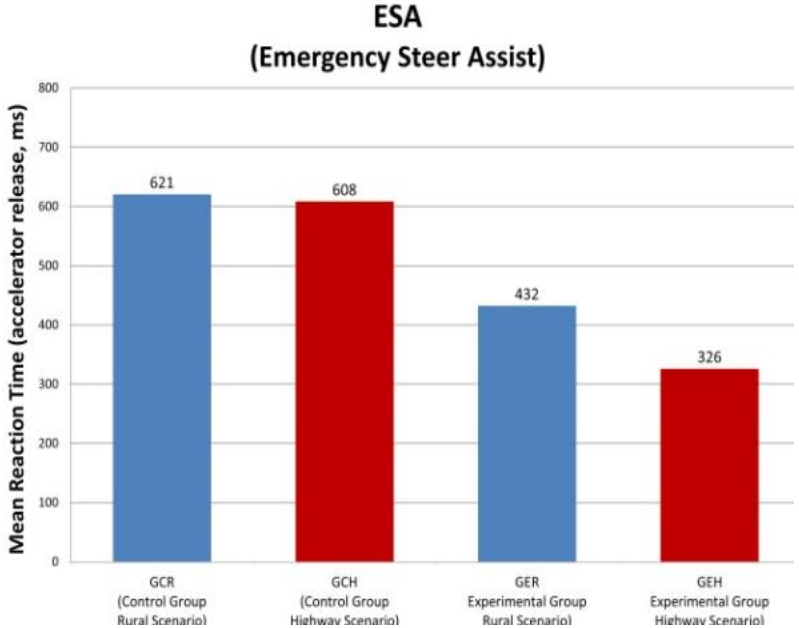
Function	Demo	Test site	Test design	Test persons	Resp.
EMIC (CMS)	VW	Porriño	Driving Simulator study	59 persons from the public	CTAG
EMIC (ESA)	CONTI	Porriño	Driving Simulator study	68 persons from the public	
INCA (SIA & RECA)	Ford	Aachen	Driving on a test track.	25 persons from the public	VTEC
INCA (RoRP & LCCA)	VCC	Hällered	Driving on a test track	10 persons (employees of VCC)	
INCA (OVCA, SIA RECA, RoRP)	VTEC	Göteborg	Driving Simulator study	31 persons (prof. truck drivers)	
SECONDS (eDPP)	BMW	Aachen	Video presentation, two focus groups	17 persons from the public	LUND
SECONDS (CS & CSW)	CRF	Turin	Driving without- and with the system on public roads	24 persons (employees of CRF)	
SECONDS (CS & CSC)	FFA	Aachen	Driving on a test track, two focus groups	19 persons from the public	
SECONDS (SC & SS)	VCC	Hällered	Driving on a test track	10 persons (employees of VCC)	

EMIC – Collision Mitigation System (CMS) & Emergency Steer Assist (ESA)

CTAG's Driving Simulator (59 and 69 participants)

- Shorter reaction time with systems
- Useful and Satisfying (Collision Mitigation System - CMS)
- Useful to improve safety (Emergency Steer Assist - ESA)
- Main use on motorways (Emergency Steer Assist - ESA)





INCA – RoRP, SIA, RECA, OVCA

VTEC Fixed-base driving simulator, 31 participants

Run-off Road Prevention (RoRP)

- Reaction time is shorter with RoRP
- Reaction is stronger with the RoRP
- High acceptance and usability

Side Impact Avoidance (SIA)

- No difference in reaction time/strength
- Fewer collisions with SIA (9 vs. 14)
- High acceptance and usability

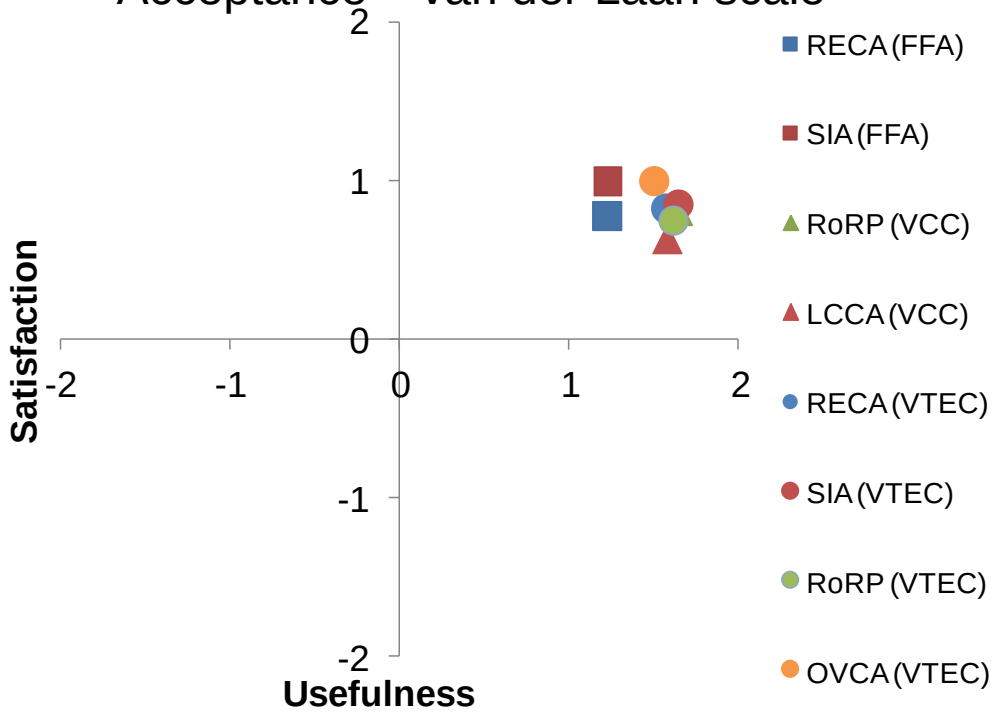
Rear-End Collision Avoidance (RECA)

- No difference in reaction time
- Only 1 collision with RECA vs. 12 without
- High acceptance and usability

Oncoming Vehicle Collision Avoidance (OVCA)

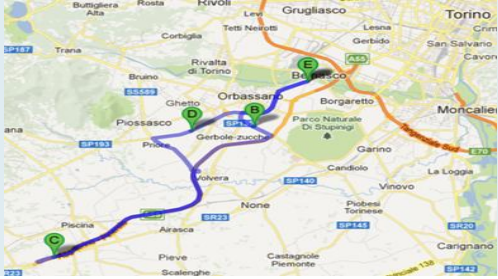
- Harder braking with OVCA
- Slightly lower acceptance

Acceptance – van der Laan scale



FFA: Ford; VTEC: Volvo Truck; VCC: Volvo Car

SECONDS – Continuous Support (CRF)



Field test on public roads, 24 test persons

Driving without- and with the system, within subjects design

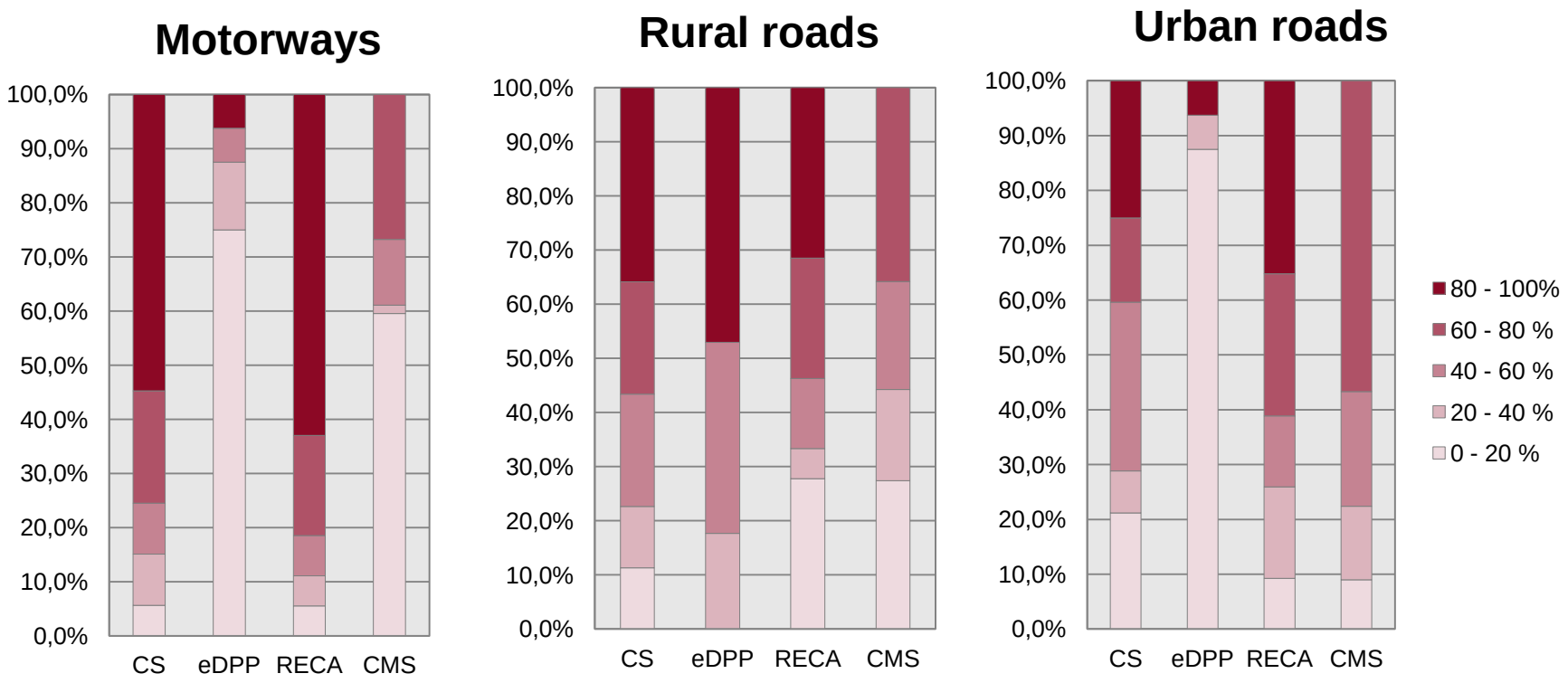
Effects:

+ Curve speed warnings gave the expected effect
+ Better speed adaptation to the speed limits and situations
+ Less dangerous lane changes with the system active
- Slightly more late adaptations of speed before intersections and obstacles

Opinions:

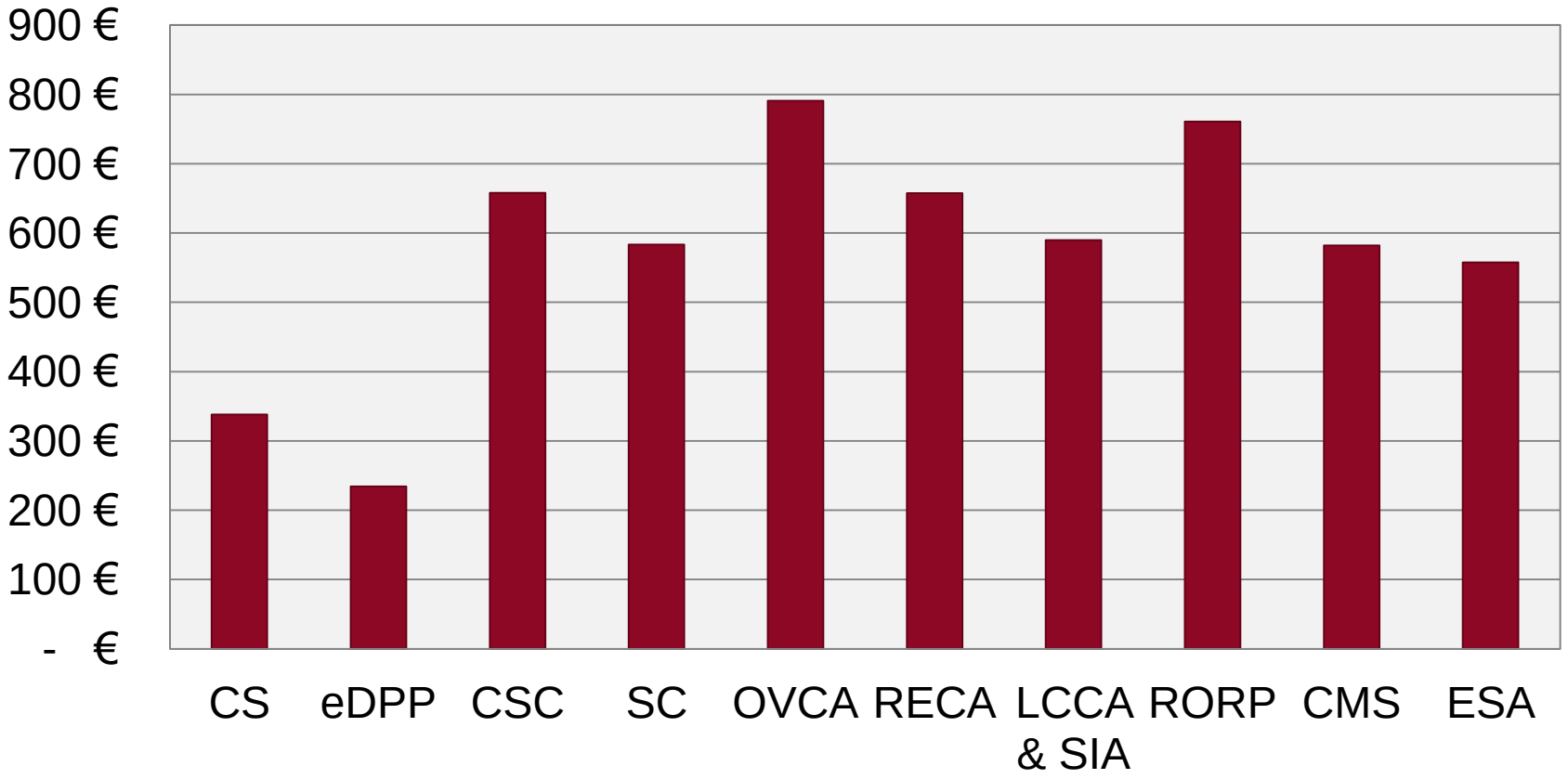
- Useful
- Blind spot warning especially useful in the overtaking process
- Appreciated not giving information all the time

Intended usage of interactIVe functions



- The test persons would use interactIVe functions frequently
- Drivers would use the function more on motorways and less in urban regions – exception CMS, eDPP

Willingness to pay for interactIVe functions



- The test persons are willing to pay more for functions that intervene than for functions which only warn

Recommendations

- Recommendations for functions
  - The system should not warn the driver too often, but also not too late.
  - In an emergency situation, visual information should be given and be shown for enough time, so the driver finds out the reason for the haptic or acoustic warning.
  - The visual display for the forward collision warning should be put as high as possible.
  - An additional haptic warning for the blind spot warning would be preferable
  - Safety belt tensioning should not be used for speed or forward collision warning.
  - Some training of the warnings would be useful before using the system, at least to get to know the different warning signals in order not to be surprised when they come the first time. (Introduction by the car seller or a demo-mode should be available, so that the warnings can be shown while the vehicle stands still)
- Recommendations for user assessment:
  - The system to be assessed in user-related tests should be completely flawless.
  - The final test should be in real life setting, when naïve drivers drive on public roads.
  - The test driver selection should include the population of elderly drivers (65+) as this group of drivers are under a strong increase and they will have an important role in defining the usability of newly developed ADASs.

Conclusions

- 9 studies with over 250 participants in driving simulator, on test track and in real traffic, focus groups, questionnaires
- Expected behavioural effects (+) few compensatory (-) effects
- The test persons found the systems useful
- Recommendations for improvements from users

- Acknowledgement:
  - interactIVe “Evaluation and Legal Aspects” team

ika INSTITUT FÜR KRAFT-FAHR-ZEUGE RWTH AACHEN UNIVERSITY bast CTAG Centro Tecnológico de Automoción de Galicia LUND UNIVERSITY TNO VOLVO VTT

  - Demonstrator owners

    BMW, Continental, CRF, Ford, Volvo Car, Volvo Truck, Volkswagen

Thank you.

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SEVENTH FRAMEWORK
PROGRAMME

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