

interactive



Accident avoidance by active intervention for Intelligent Vehicles

www.interactIVe-ip.eu

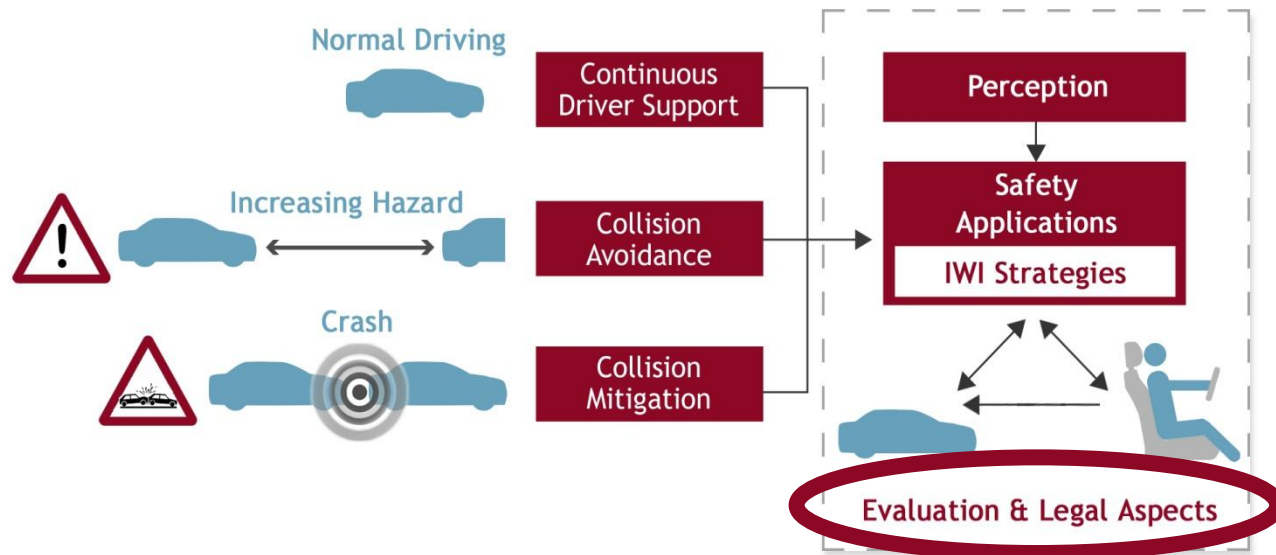
Overall Evaluation Methodology in interactIVe

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interactIVe Final Event**

20th-21st November 2013

Content

- “Evaluation and legal aspects” – Overview and Methodology
- Technical Assessment
- User-related Assessment
- Safety Impact Assessment



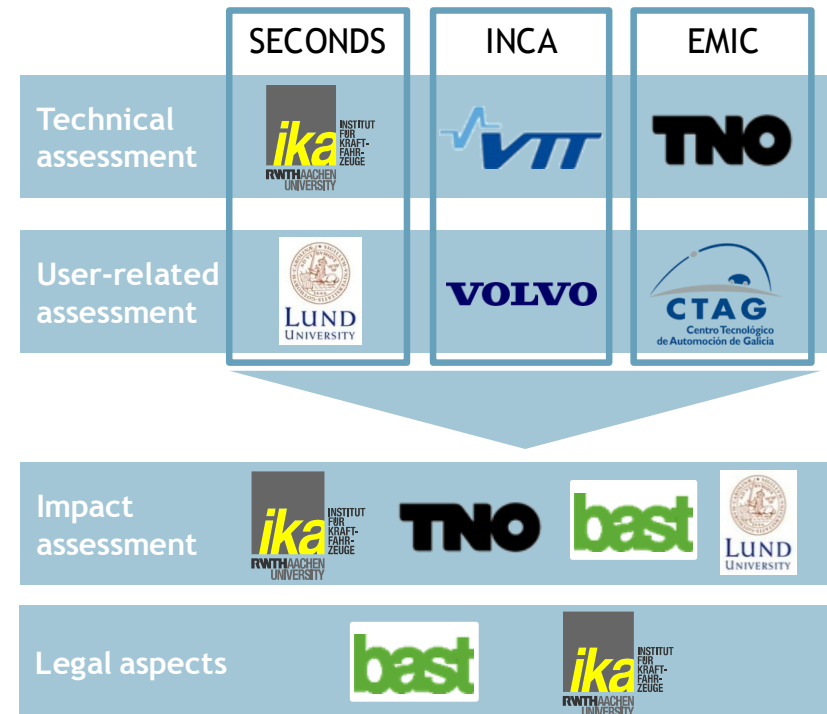
“Evaluation and legal aspects” - Overview

Role in interactiVe:

- Definition of a test and evaluation **framework**
- Development of **test scenarios**, **procedures** and evaluation **methods**
- Provision of **tools** (e.g. equipment, test catalogues, questionnaires or software) and test support
- Definition of test and evaluation **criteria**
- Analysis of **legal aspects**

Evaluation divided into:

- Technical assessment (on function level)
- User-related assessment
- Impact assessment
- Legal aspects

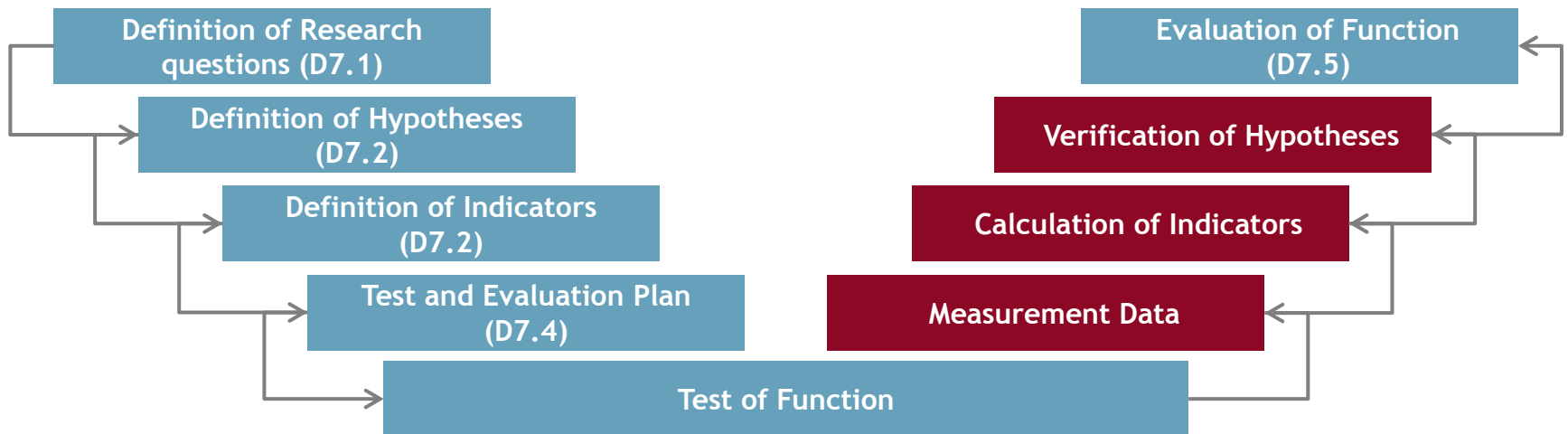


“Evaluation and legal aspects” - Methodology

Methodology for the evaluation bases mainly on the PReVAL methodology:

- Step 0: System and function description
- Step 1: Expected impact and hypotheses
- Step 2: Test scenario definition
- Step 3: Evaluation method selection
- Step 4: Measurement plan
- Step 5: Test execution and analysis

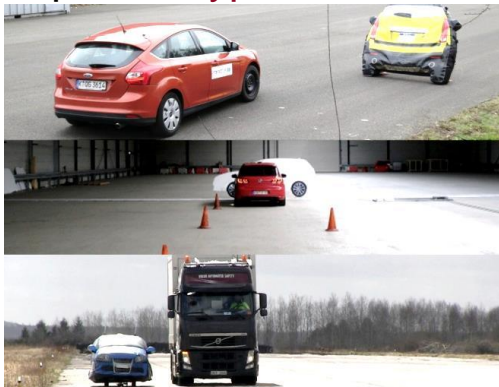
Adaptation and application of methodology in interactiVe ■ interactiVe evaluation tool



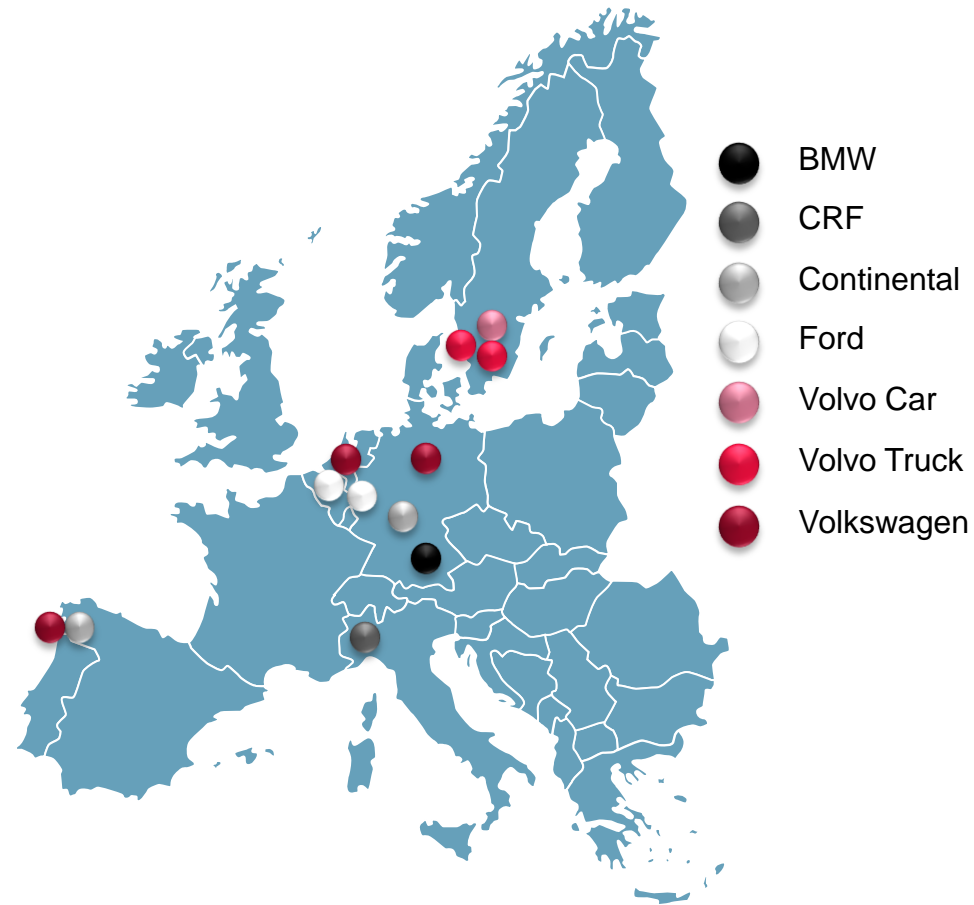
Technical Assessment – Evaluation and Test Design

Facts

- 11 different functions in 7 demonstrator vehicles
- Tested conflict types:
 - Rear-end, Head-on, Blind spot, Road Departure, Crossing Traffic, VRU, Excessive Speed, Traffic Rule Violation
- In total over 900 test runs
- 30 general hypotheses (for all functions)
- 63 specific hypotheses



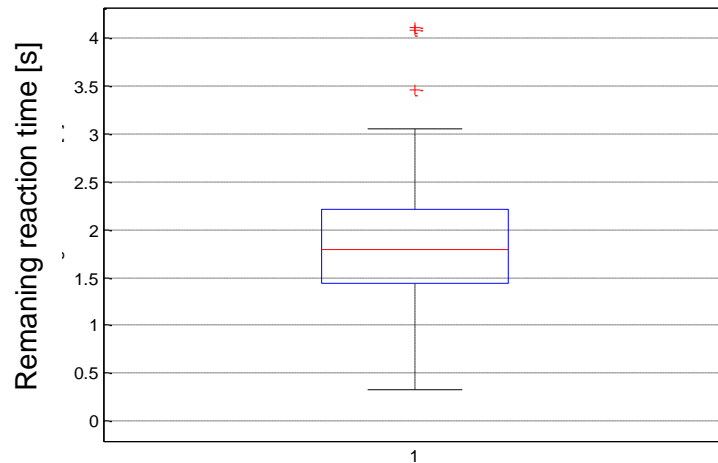
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Technical Assessment – Example Results

- **Example:**

Hyp_T_gen_TecU_01: The driver has enough time to react and avoid the accident, when the warning is issued



- The remaining reaction time is $(TTC @ \text{warning} - t_{\text{Manoeuvre}})$ compared to the presumed reaction time
→Hypothesis is confirmed at significance level of 5% at a reaction time of $t_{\text{Reaction}} = 1.2$ s in the example

- In general the interactive functions behave in the intended way
- Considering the activation behaviour at least some function are still in the research phase

User-related Assessment – Evaluation and Test Design

- 9 studies with 263 test persons have been conducted
- Method chosen depending on the criticality of the system under investigation
 - Small field test
 - Focus group studies
 - Test on a test track
 - Driving simulator studies



Source: Ford



Source: VTEC

Safety Impact Assessment – Methodology

- Literature review on impact assessment methodologies:
 - Safety Mechanisms
 - Accident Reconstruction
 - Neural Network
 - FOT – Approach
- Selection of appropriate methodology by considering available data as well as advantage and disadvantages of the methodologies:
 - **Nine Safety Mechanisms**
- Direct effects
 1. Direct in-car modification of the driving task,
 2. Direct influence by roadside applications,
- Indirect effects on user
 3. Indirect modification of user behaviour,
- Effects on non-users
 4. Indirect modification of non-user behaviour,
 5. Modification of interaction between users and non-users,
- Exposure effects
 6. Modification of road user exposure,
 7. Modification of modal choice,
 8. Modification of route choice,
- Effects on post-accident consequence modification
 9. Modification of accident consequences.

Safety Impact Assessment – Methodology

- Literature review on impact assessment methodologies:
 - Safety Mechanisms
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 - FOT – Approach
- Selection of appropriate methodology by considering available data as well as advantage and disadvantages of the methodologies:
 - **Nine Safety Mechanisms**
- Direct effects
 1. Direct in-car modification of the driving task,
 2. Direct **Only in-car functions** modifications,
- Indirect effects on user
 3. Indirect modification of user behaviour,
- Effects on non-users
 4. Indirect modification of non-user behaviour,
 5. Modification of interaction between users and non-users,
- Exposure effects
 6. **Exposure effects, typically small** Modification of road user exposure,
 7. Modification of modal choice,
 8. Modification of route choice,
- Effects on post-accident consequence modification
 9. Modification of **Only post-collision** consequences.

Conclusion

- Evaluation Methodology in interactive base on PReVAL
- 11 different functions integrated in 7 demonstrator vehicles were successfully tested in interactive
- interactive functions were tested with respect to their technical and user-related performance
- Afterwards based on the results a safety impact assessment of interactive functions were conducted
- **Acknowledgement**
 - interactive “Evaluation and Legal Aspects” team



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Thank you

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SEVENTH FRAMEWORK
PROGRAMME

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