Dealing with driver distraction.
Dr. Andreas Keinath

Joint ITU/UNECE Workshop on „Intelligent transport systems in emerging markets – drivers for safe and sustainable growth"

Geneva, Switzerland, 27 June 2013

Dealing with driver distraction.
Agenda.

1. Driver distraction.

2. BMW`s HMI Design Process & Role of HMI Guidelines.

3. Application of AAM Guidelines for the new BMW iDrive.

4. Conclusion.

Dealing with driver distraction.
Agenda.

Dealing with driver distraction.
Future challenges – emerging technologies in modern vehicles.

Infotainment

Entertainment
Information
Smartphone / Mobile Phone
Internet / Social Media
Mobile Office

Navigation

Real Time Traffic Information
Route Options
Point of Interest
Parking

Head-up Display
Night Vision
Lane Departure Warning
Lane Change Warning

Safety & Driver Assistance

On-board computer
Fuel consumption
Driver profiles

Vehicle Management

Dealing with driver distraction.
Future challenges – many systems have not been designed for use while driving.

By today far more mobile navigation systems than fixed installed systems are used while driving.

Many mobile devices are not designed for use while driving due to small screens, complex keyboards and menus.
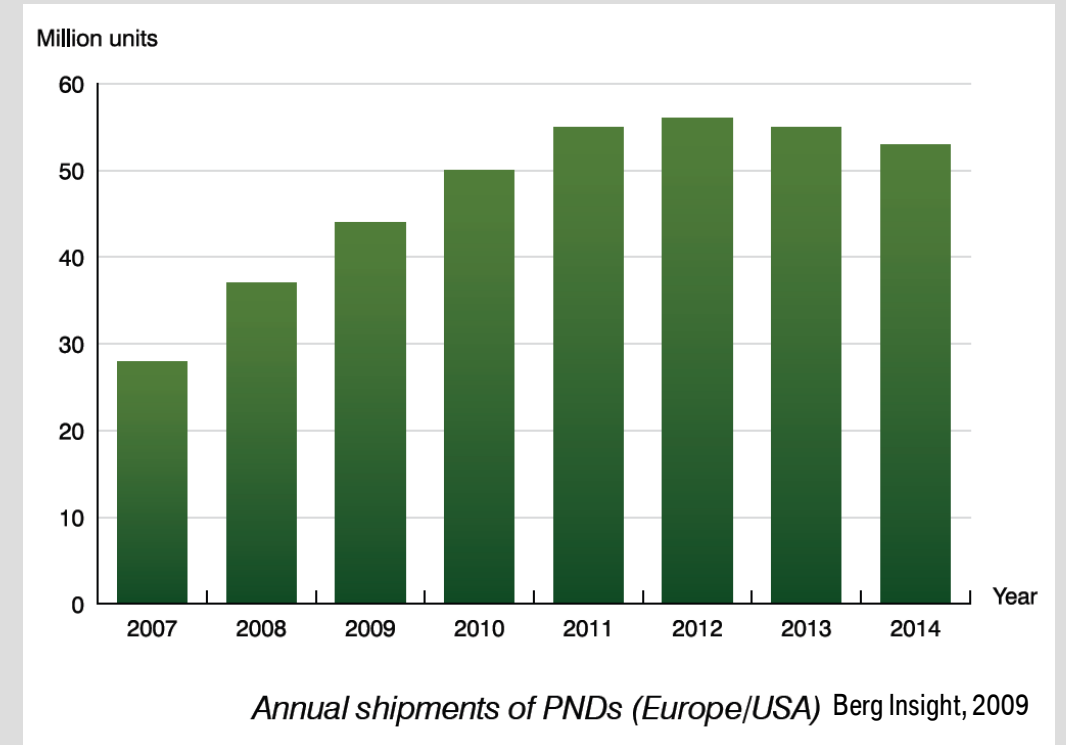
Guidelines for design of save in-vehicle HMI only developed by OEMs.

Development of technologies to integrate mobile device operation with vehicle:

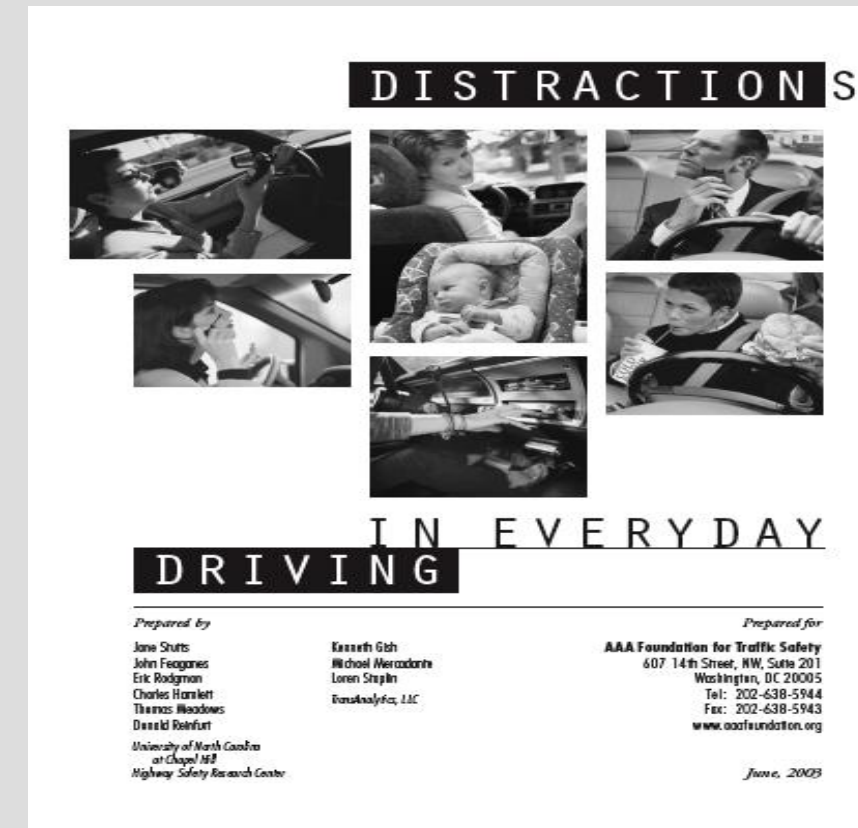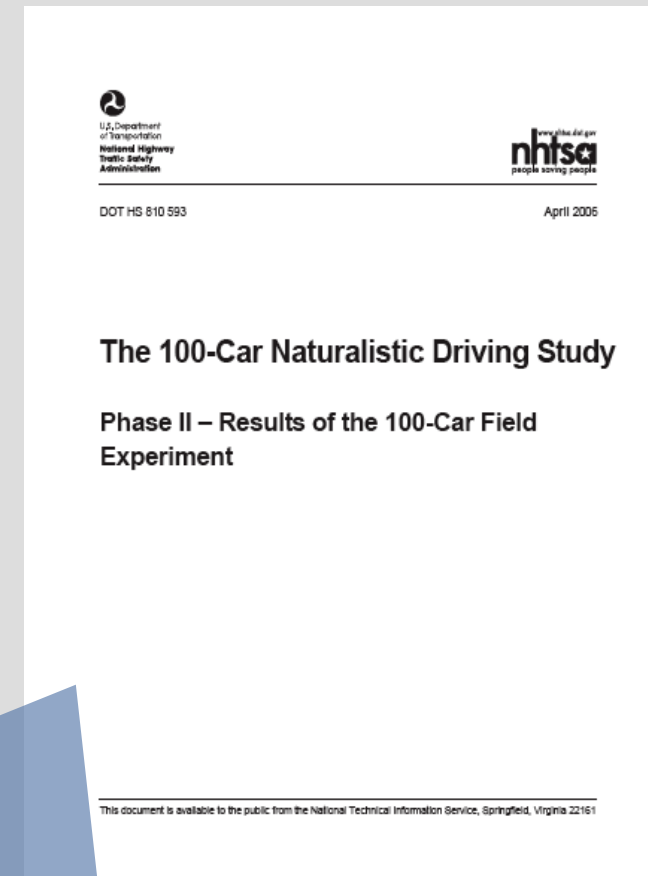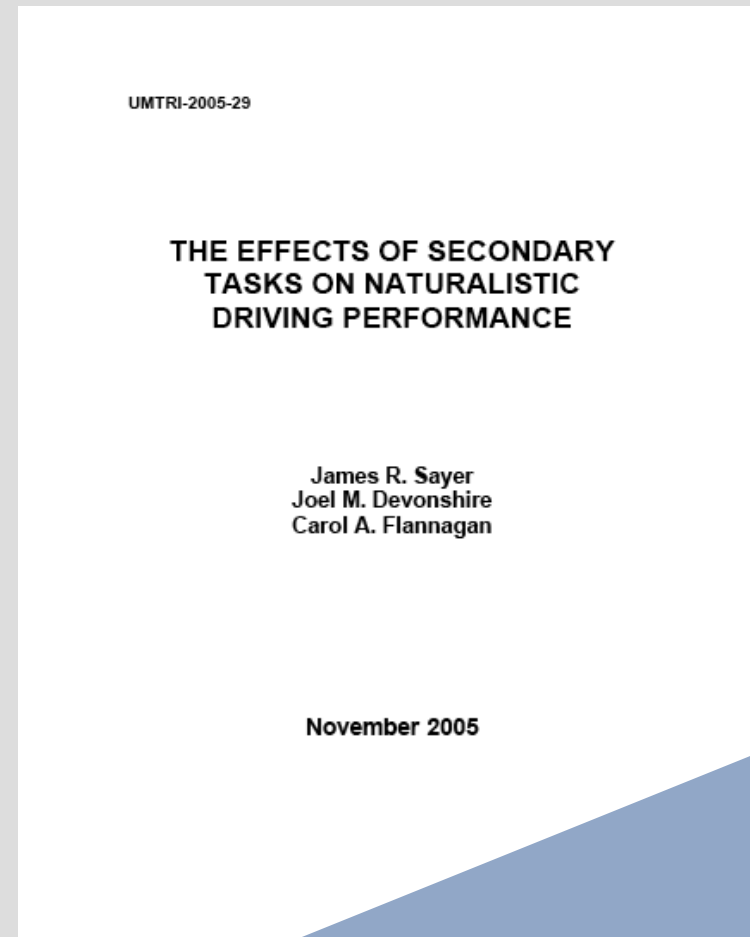Hands-free phone operation via Bluetooth
iPod / MP3 integration via USB
Text-to-Speech and Text-by-Voice applications

Annual shipments of PNDs (Europe/USA) Berg Insight, 2009

Dealing with driver distraction.
Drivers engage in a large variety of activities.

UMTRI-2005-29

THE EFFECTS OF SECONDARY
TASKS ON NATURALISTIC
DRIVING PERFORMANCE

James R. Sayer
Joel M. Devonshire
Carol A. Flannagan

November 2005

U.S. Department
of Transportation
National Highway
Traffic Safety
Administration

nhtsa
www.nhtsa.dot.gov
people saving people

DOT HS 810 593   April 2006

The 100-Car Naturalistic Driving Study

Phase II – Results of the 100-Car Field
Experiment

This document is available to the public from the National Technical Information Service, Springfield, Virginia 22161

DISTRACTIONS

IN EVERYDAY

DRIVING

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June, 2003

1. In 54 % of all 20000 six-second baseline epochs drivers were engaged in tasks other than driving.

⇨ People may want to make use of the steadily increasing amount of time they spend in their vehicles.

2. "Reaching for a moving object" was shown to have the highest impact on the likelihood of crash or near crash followed by "external distraction", "reading", "applying makeup", and "dialing hand-held device".

⇨ **Driver distraction** must be regarded as a **societal problem**, not as a problem of a specific industry alone.

Dealing with driver distraction.
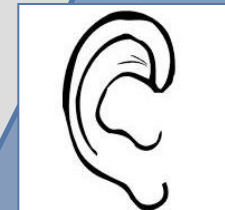## BMW`s strategic vision and goals as response to driver distraction.

Dimensions of driver distraction:

- visual
- haptic
- acoustic
- cognitive

Well designed human machine interfaces combat driver distraction.

In order to minimize driver distraction, the HMI has to …

… be the synapsis between driver and vehicle.

… be intuitively understood, efficient and interruptable.

… enable the driver to drive safely and to use the vehicle's functionality easily.

… be more than a necessary prerequisit for „sheer driving pleasure".

Dealing with driver distraction.
BMW`s strategic vision and goals as response to driver distraction.

New vehicle technologies combat driver distraction.

Innovative BMW Driver Assistance Systems:
- Forward Collision Warning
- Active Pedestrian Protection
- Night Vision with pedestrian detection
- Lane Change and Blind spot warning
- Lane departure warning

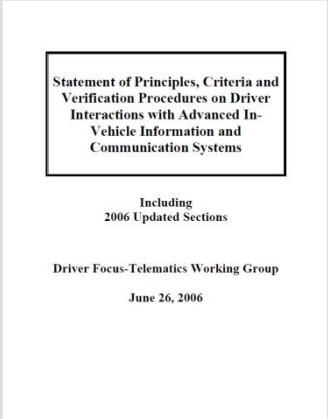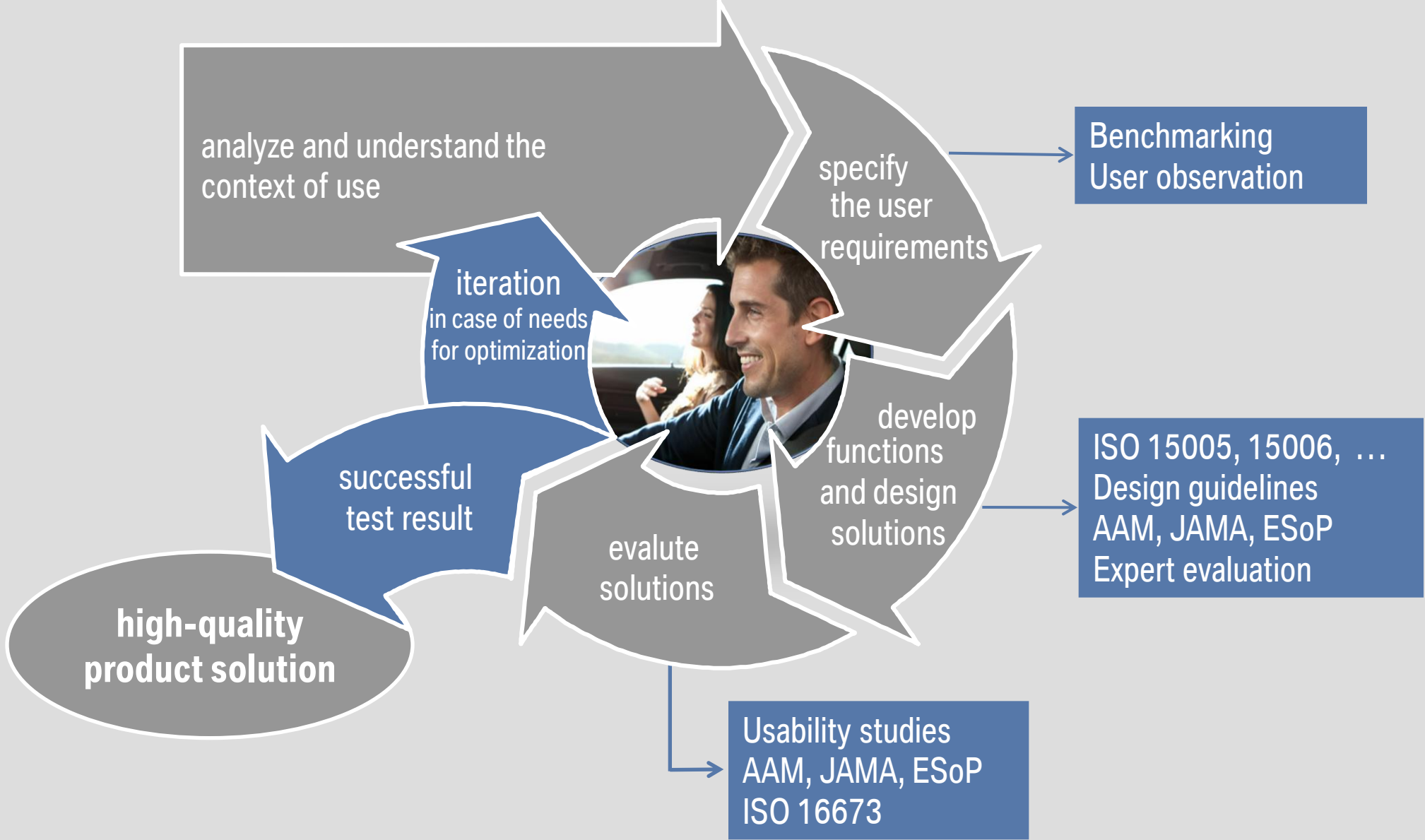# Dealing with driver distraction.
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Dealing with driver distraction.
BMW`s HMI design process.

Guidelines and Standards support the HMI design in order to reduce driver distraction.

analyze and understand the context of use

specify the user requirements

Benchmarking
User observation

iteration
in case of needs
for optimization

develop functions and design solutions

ISO 15005, 15006, …
Design guidelines
AAM, JAMA, ESoP
Expert evaluation

successful
test result

evalute solutions

high-quality
product solution

Usability studies
AAM, JAMA, ESoP
ISO 16673

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Dealing with driver distraction.
Application of AAM Guidelines for the new BMW iDrive.

Guidelines as HMI design parameters.

1 Installation Principles
- Location and fitting of system
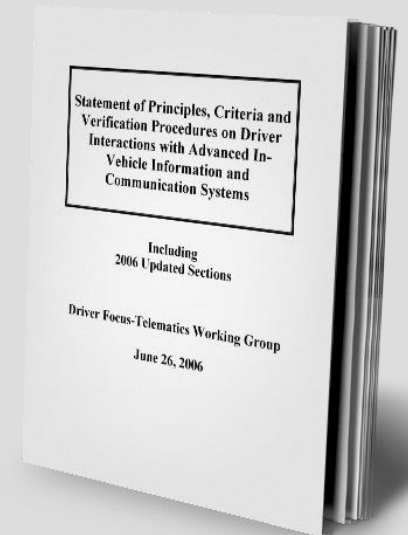- Positioning of displays

2 Information Presentation Principles
- Legibility, icons, symbols, character size
- Contrast, luminance
- Short and sequential

3 Interaction Principles
- Interruptible, resumable
- Pace of interaction controlled by the driver
- Timely and clearly perceptible system response

4 System Behavior Principles
- Video and moving images should be disabled
- Malfunction information should be presented to driver

Statement of Principles, Criteria and Verification Procedures on Driver Interactions with Advanced In-Vehicle Information and Communication Systems

Including 2006 Updated Sections

Driver Focus-Telematics Working Group

June 26, 2006

Dealing with driver distraction.
Application of AAM Guidelines for the new BMW iDrive.

Guidelines as HMI design parameters.

Driving Functions ⟵ ⟶ Comfort Functions

Highly
Mounted displays

Controls

BMW iDrive meets AAM design requirements

Dealing with driver distraction.
Application of AAM Guidelines for the new BMW iDrive.

Guidelines as HMI evaluation criteria.

"A visual or visual-manual task intended for use by the driver while the vehicle is in motion should be designed to the following criteria:" (AAM-Guideline, 2006)

Alternative A:

A1: Single glance durations should not exceed 2 seconds.

A2: Task completion should not require more than 20 seconds of total glance time to task displays and controls.

Alternative B:

B1: Number of lane exceedences observed during secondary task execution should not be higher than the number of lane exceedences observed while performing a reference task.

B2: Car following headway variability observed during secondary task execution should not be worse than the car following headway observed while performing a reference task.

Dealing with driver distraction.
Application of AAM Guidelines for the new BMW iDrive.

Guidelines as HMI evaluation criteria.
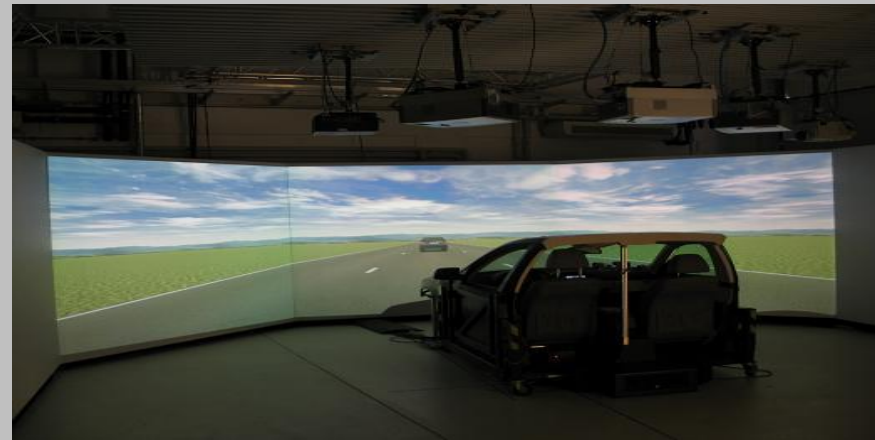
Driving simulator

Lane keeping + time headway

Eye tracking

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Conclusion.

1. HMI has a **high strategic relevance** for BMW.

2. BMW takes responsibility by **actively contributing to research**, standards and self-commitments and by **introducing innovations** on HMI.

3. Guidelines and Standards **should facilitate good HMI design** and not prevent technical innovations.

4. BMW takes into account the **European (ESoP) as well as the American HMI-guidelines (AAM)** as basic requirements for HMI.

5. BMW applies a set of **state-of-the-art methods** along the vehicle development process to design, evaluate and optimize the HMI.

Dealing with driver distraction.
Conclusion.

6. **Task-based criteria** are used in order to optimize the **efficiency of interaction**, which is relevant to customer acceptance.

7. In the context of **safety**, the **compatibility between the driving task and the secondary task** has the highest priority for BMW.

8. In view of the fastly increasing use of devices not specifically designed for being used while driving, **HMI guidelines may only become effective for traffic safety, if all system types are developed to the same standards** independent of their functionality and degree of integration.

9. Good HMI-design is not sufficient – drivers need to be **informed / educated** to use all types of systems in a **responsible** way.