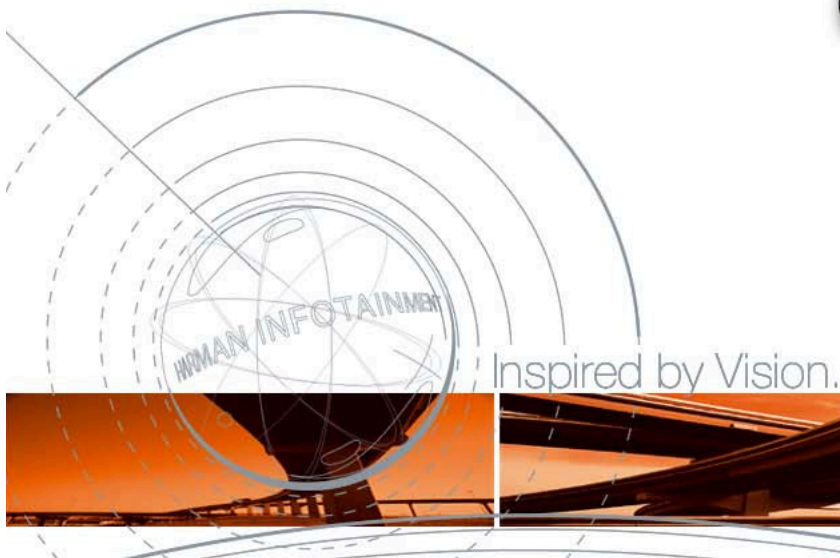


# ESoP: Applicable for Nomadic Devices? Analysis of currently available PND Devices



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## Company Overview

## Development Process Harman/Becker

## Applying ESoP to Nomadic Devices

**Design Goals**

**Installation Principles**

**Information Presentation Principles**

**Interaction with displays and controls principles**

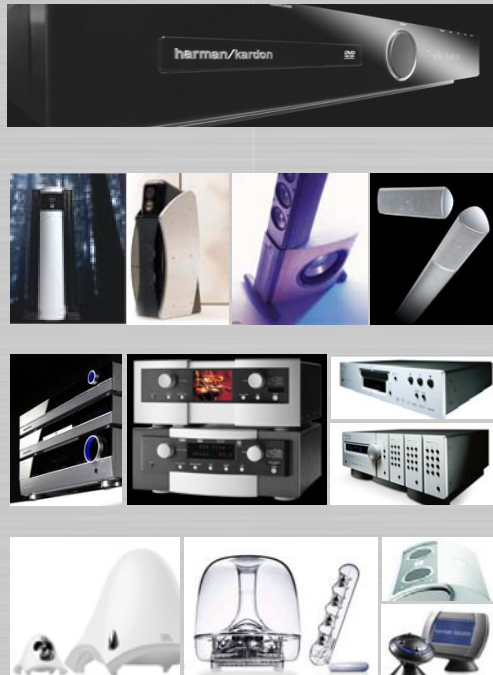
**System behaviour principles**

## Conclusion

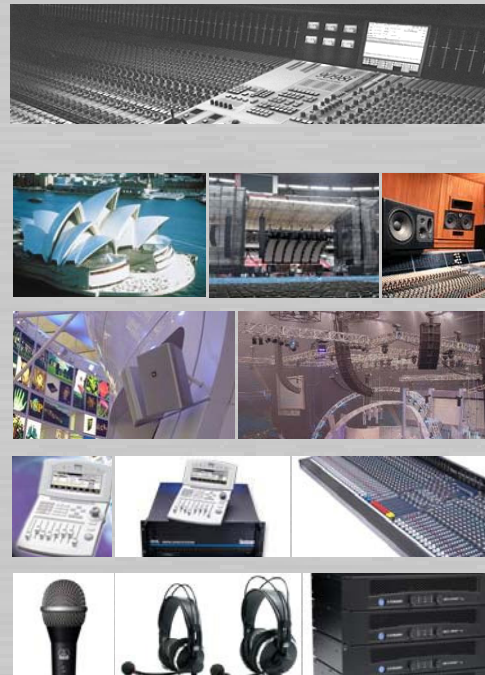


harman international

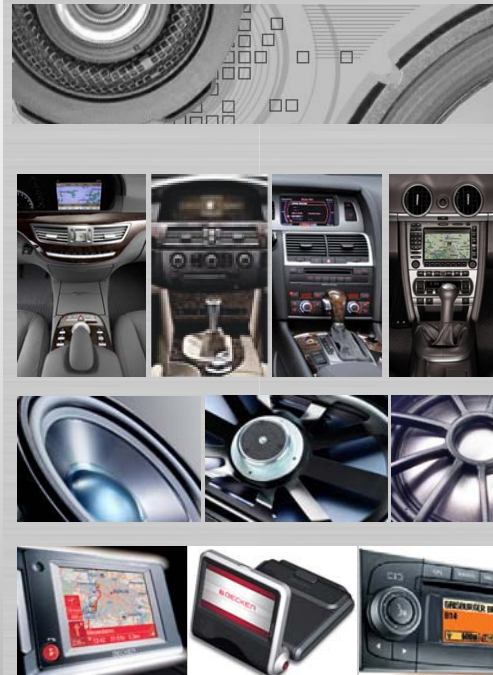
### Consumer Group



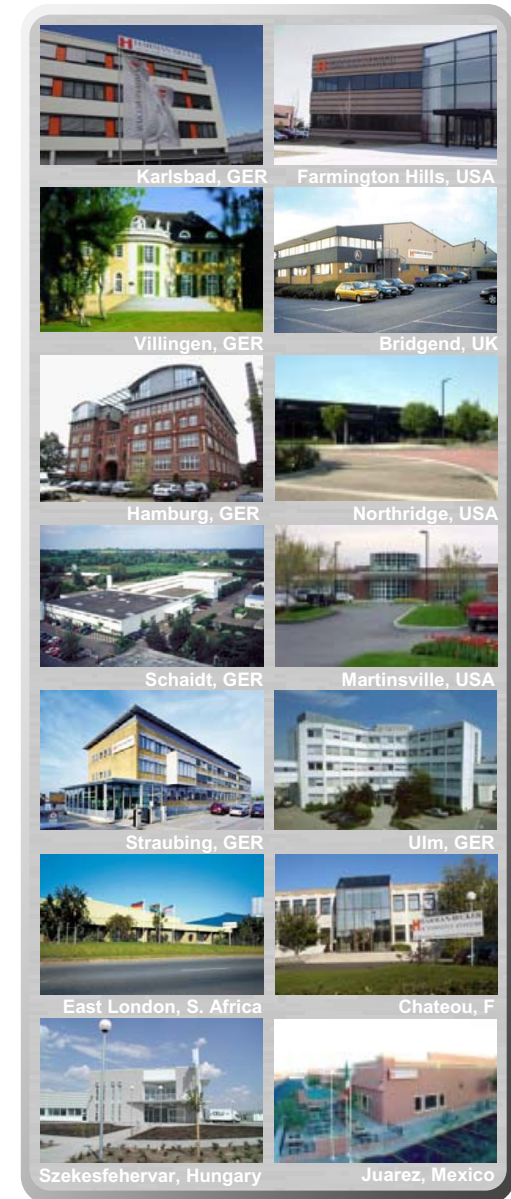
### Professional Group



### Automotive Group



- **Headquartered in Karlsbad (Germany)**
- **7800 employees worldwide**
- **Designs and produces complete state-of-the-art Information, Communication and Entertainment Systems**
- **World leader in Branded Automotive Audio Systems combining World-Class acoustic know-how with high-value brand names**
- **European market leader in high-end Infotainment Systems with Leading-Edge technological advancements**
- **Has dedicated OEM facilities around the world**

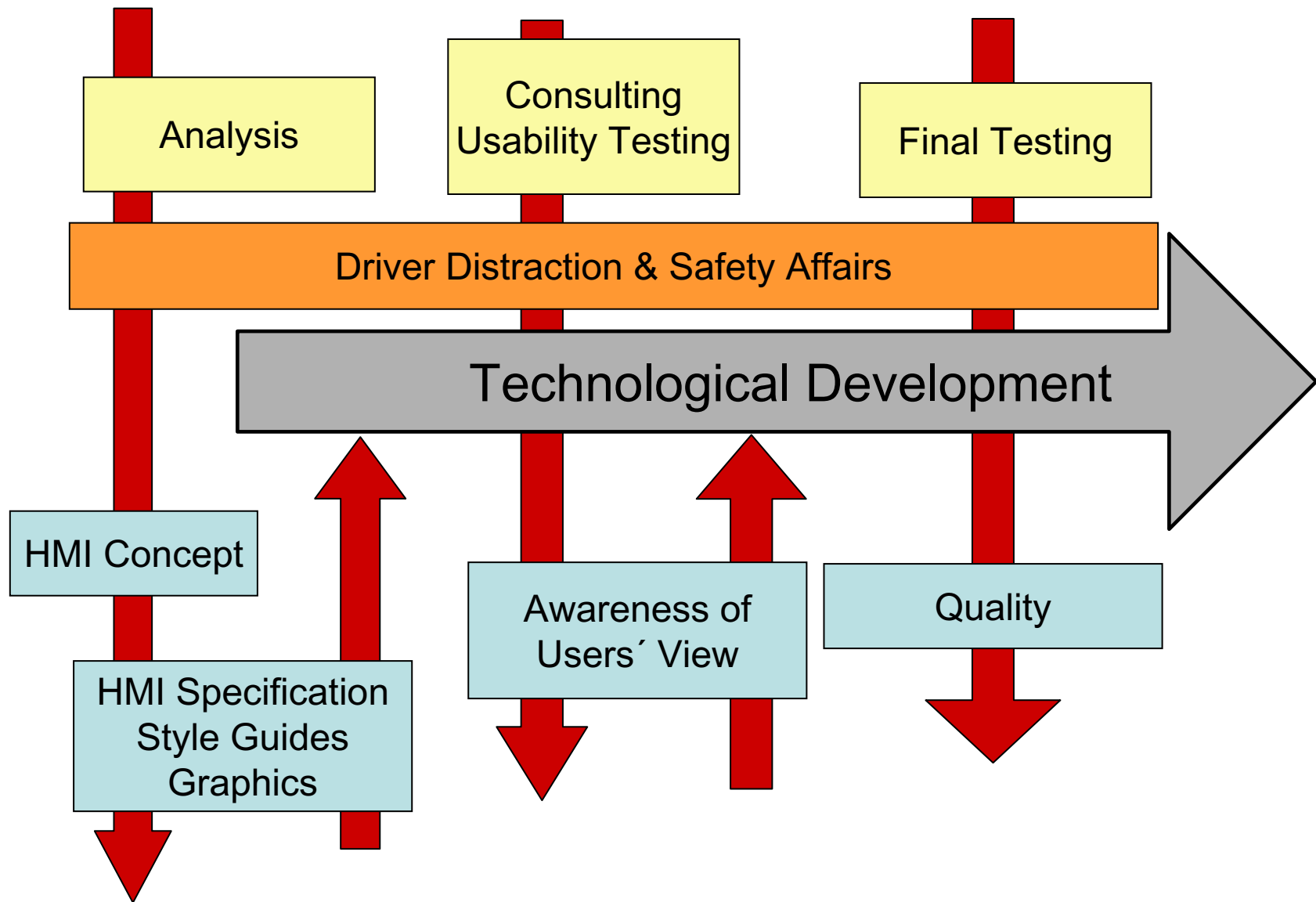


# OEM Projects



# “Nomadic Devices“





- **Originally ESoP was developed for OEM Systems**
- **ESoP refers to other norms and standards also first and foremost developed for fix installed (OEM) systems**
- **Life time cycle**
  - OEM systems: several years
  - Nomadic devices: several months
- **Development time**
  - OEM systems: several years
  - Nomadic devices: several months
- **To test feasibility of ESoP for Nomadic Devices one Becker Navigation system and up to four systems of our competitors had been analyzed**

<b>Design Goal I</b> (Do rising of hazardous behaviour)	<b>Passed</b>
<b>Design Goal II</b> (Driver's attention compatible to driving task)	<b>Passed</b>
<b>Design Goal III</b> (No distraction or visual entertainment of driver)	<b>Passed</b>
<b>Design Goal IV</b> (No increasing of hazardous behavior)	<b>Passed</b>
<b>Design Goal V</b> (External consistency)	<b>Passed</b>

<b>Installation Principle I</b> (securely fitted)	<b>Passed?</b>
<b>Installation Principle II</b> (driver's view)	<b>Passed</b>
<b>Installation Principle III</b> (obstructing controls)	<b>Passed</b>
<b>Installation Principle IV</b> (close to line of sight)	<b>Passed</b>
<b>Installation Principle V</b> (no glare or reflections)	<b>Action Required</b>

**System should be located and securely fitted in accordance with relevant regulations, standards... - Passed?**

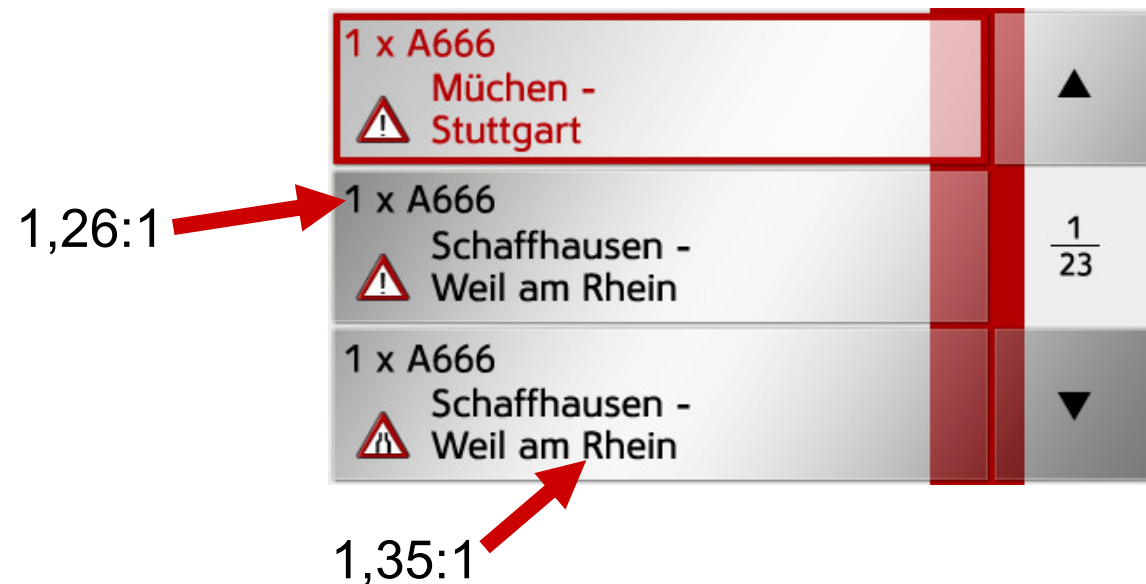
- **Most windshield mountings are stable**
- **Detailed test procedure not provided by ESoP**
- **Known weak point is the combination of airbag and some mounting positions for nomadic devices**

### **Solution:**

**Short term: Define test procedure which easily can be tested – preferably without need of a crash test**

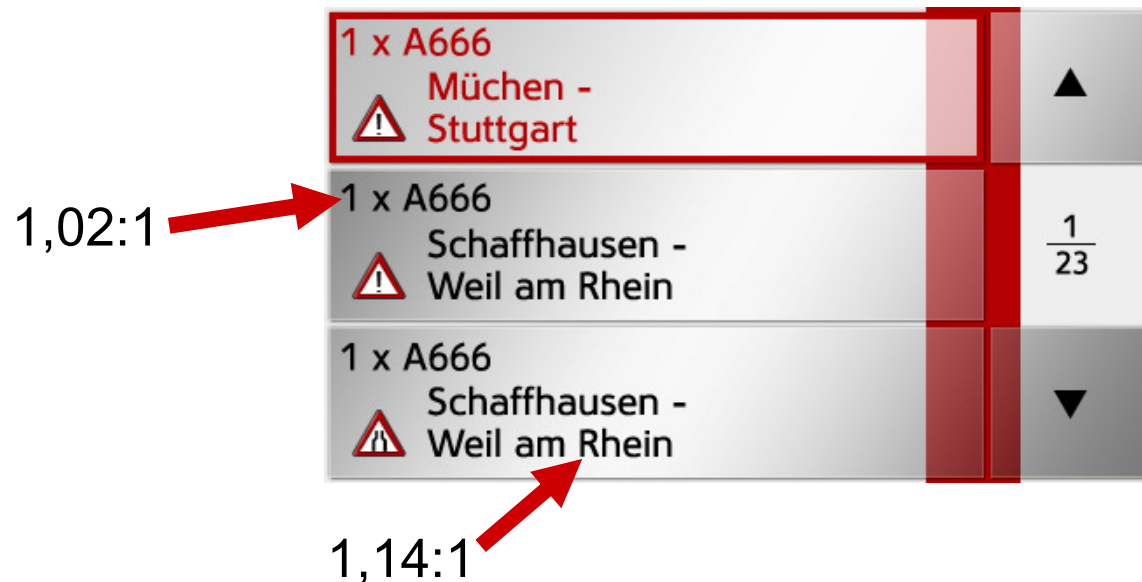
**Long term: Common interface in all cars provided by car manufacturers**

- Luminance contrast for day conditions based on ISO 15008 is 3:1
- Measured value for Becker reference system is from 1,26:1 to 1,35:1
- Maximum value for used display is 2,7:1 (black and white)
- Competitor's systems have similar values



1 x A666 München - Stuttgart	▲
1 x A666 Schaffhausen - Weil am Rhein	$\frac{1}{23}$
1 x A666 Schaffhausen - Weil am Rhein	▼

- Luminance contrast for sunlight conditions based on ISO 15008 is 2:1
- Measured value for Becker reference system is from 1,02:1 to 1,14:1
- Maximum value for used display is 1,2:1 (black and white)
- Competitor's systems have similar values



1 x A666 München - Stuttgart	▲
1 x A666 Schaffhausen - Weil am Rhein	$\frac{1}{23}$
1 x A666 Schaffhausen - Weil am Rhein	▼

- **Technical problem areas:**
  - Antireflective coatings to be improved
  - Touch screen foil absorbs brightness
  - More brightness is necessary to increase luminance contrast
  - Brighter displays would consume more power
  
- **Financial problem areas:**
  - Antireflective coating, brighter display and increased battery could increase the price by €20 or more
  - Significant increase of costs since Nomadic devices start at €100

<b>Information presentation principle I</b> (Visual information with a few glances)	<b>Not Applicable</b>
<b>Information presentation principle II</b> (agreed standards for legibility, icons, words...)	<b>Action Required</b>
<b>Information presentation principle III</b> (appropriate, timely information presentation)	<b>Passed</b>
<b>Information presentation principle IV</b> (Prioritizing of information)	<b>No relevance</b>
<b>Information presentation principle V</b> (no distraction by sound)	<b>Passed</b>

Visual displayed information can be caught with a few glances without affecting driving - **Not Applicable**

- Refers to ISO15007-1 and ISO15007-2
- ISO15007 cannot practically be used
- Short developmental periods of a few months for a PND device are different of OEM developmental periods of several years

**Solution: allow inspections as long as other methods like the Lane Change Test are not fully developed**

## Font Size – Action Required

- Assumption: Maximum viewing distance 900 mm
- For all tested systems, font size is much smaller than described in ISO15008
- ISO15008 (2003) font size (acceptable): 4,7 mm
- ISO15008 (draft 2007) font size (acceptable): 4,2 mm

System	Common Font Size	Smallest Font Size
Becker reference system (4,3" display)	3,2mm	2,4 mm
Reference system 1 (4,3" display)	2,8 mm	2 mm
Reference system 2 (2,7" display)	1,8 mm	1,2 mm
Reference system 3 (4,3" display)	3,0 mm	2,0 mm
Reference system 4 (4,8" display)	2,7 mm	2,2 mm

- ISO15008 (draft version with smaller font size) can be adapted to Nomadic Devices with screen size 4,3" and up
- For smaller displays, especially very small devices like cellular phones correct use of ISO15008 is not feasible

### **Solution:**

- **For medium sized screens and up: increase font size**
- **For small screens: prohibit inputs while driving?**

<b>Displays and controls interaction Principle I</b> (One Hand on the steering wheel)	<b>Passed</b>
<b>Displays and controls interaction Principle II</b> (No long uninterruptible system interaction)	<b>Passed</b>
<b>Displays and controls interaction Principle III</b> (Resuming of interrupted sequences)	<b>Passed</b>
<b>Displays and controls interaction Principle IV</b> (No time critical responses necessary)	<b>Passed</b>
<b>Displays and controls interaction Principle V</b> (No adverse impact on primary driving controls)	<b>Passed</b>
<b>Displays and controls interaction Principle VI</b> (Driver can control loudness of auditory information)	<b>Passed</b>
<b>Displays and controls interaction Principle VII</b> (System's response clearly and predictable)	<b>Action Required</b>
<b>Displays and controls interaction Principle VIII</b> (Capability to switch off dynamic information)	<b>Action Required</b>

**Response Time – control activation level – Action Required**

- A response time of 250 ms is required on the control activation level
- All tested systems achieved this requirement in most situations
- All tested systems failed this requirement in some situations

System	Maximum Response Time
Becker reference system	640 ms
Reference system 1	400 ms
Reference system 2	840 ms

- **Solution: Improve response time where necessary**

None-safety related, dynamic information to be switched off while driving– **Action Required**

- At all tested systems use a combination of map and turn-by-turn information
- Map cannot be switched off

**Solution: Introduce turn-by-turn navigation – as available by most OEM systems- or voice guidance**

<b>System Behaviour Principle I</b> (No visual distracting information while driving)	<b>Not Applicable</b>
<b>System Behaviour Principle II</b> (No interference with primary driving task)	<b>No relevance</b>
<b>System Behaviour Principle III</b> (Use of functions not suitable while driving)	<b>Action Required</b>
<b>System Behaviour Principle IV</b> (Information about status and malfunction)	<b>Passed</b>

**No visual distracting information like TV or Video available while driving – Not Applicable**

- It cannot securely be detected if a system is in motion or not (coverage of GPS signal in tunnels or in narrow streets with tall houses) since no speed signal is available
- It is not possible to detect if Nomadic Device is used by a driver or not
- Some Systems can be used in the front to entertain the kids
- Some systems are built for multi purpose use (e.g. TV, Video, Games and Navigation)

**Solution: Allow exception in ESoP for Nomadic Devices as long as no other solution is available. Exception could include locking distracting information as long as navigation is switched on**

### Use of functions not suitable while driving– **Action Required**

- It cannot securely be detected if a system is in motion or not – preferred solution of locking function while vehicle is in motion is not possible
- Adequate warnings, e.g. before entering a Video menu, are not implemented by most currently available systems

**Solution: Introduce clear warnings for functions not intended to be used while driving**

- **Currently available systems fulfill ESoP in most areas**
- **To comply to some principles of ESoP, more effort is necessary by all Nomadic Device manufacturers**
- **Two principles should be adapted since the current version of ESoP is not applicable for Nomadic Devices**
  - Information presentation principle I – method is too complex
  - System behaviour principle I – no speed signal available

# Thank You

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