



Fahrerassistenz: Trends in der Fahrerakzeptanz
- Kundennutzen, Bekanntheitsgrad und Kaufbereitschaft -

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Garching, 8.4.2008

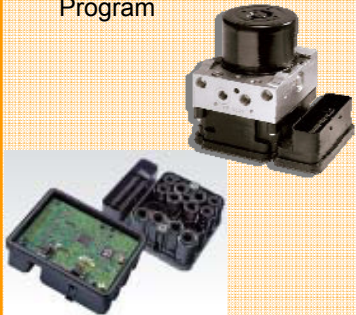
Introduction

Division Chassis & Safety

Chassis & Safety

Electronic Brake Systems

- ▷ Hydraulic-Electronic Control Units (HECU)
 - ABS
 - ESC
- ▷ Software Functions:
 - Adaptive Cruise Control
 - Regenerative Brake System
 - Active Front Steering
 - Hill Start Assist, Hill Descent Control
 - Deflation Detection System
 - Hydraulic Brake Assist
 - Trailer Stability Program



Hydraulic Brake Systems

- ▷ Calipers & Discs
- ▷ Drum Brakes
- ▷ Brake Hoses
- ▷ Boosters
- ▷ Tandem Master Cylinders
- ▷ Electric Parking Brakes
- ▷ Pedal Modules
- ▷ Brake Pressure Regulators



Sensorics

- ▷ Steering Angle & Torque Sensors
- ▷ Wheel Speed Sensors
- ▷ Engine/Transmission Speed and Position Sensors
- ▷ Buckle Switch Sensors
- ▷ Chassis Sensors
- ▷ Sensor Clusters



Passive Safety & ADAS

- ▷ Airbag Control Units (ACUs)
- ▷ Front/Side Satellites
- ▷ Hybrid Gateways
- ▷ Occupant Classification Systems (OCS)
- ▷ Pre Crash Sensors
- ▷ Driver Assistance Systems
 - Radar
 - Lidar
 - Camera



Chassis Components

- ▷ Chassis Electronics (1st tier customers)
- ▷ Electric Power Steering
- ▷ Washer Systems
- ▷ Suspension Systems
- ▷ Chassis Electronics



Introduction

Business Unit Passive Safety & ADAS

Business Segments

Passive Safety



Functions

- Front & rear crash sensing
- Side crash sensing
- Roll over sensing
- Pedestrian protection



Products

- Airbag Control Unit, SPEED platform
- Acceleration Satellites
- Pressure Satellites clipSat
- Crash Impact Sound Sensing (CISS)

Safety Assistance Systems



Functions e.g.

- Adaptive Cruise Control (ACC)
- Blind Spot Detection
- Lane Departure Warning
- Enhanced Night Vision



Products

- Radar Sensors (e.g. 24 GHz, 77 GHz)
- Camera Systems
- Infrared Sensors (e.g. ClosingVelocity Sensor)

Occupant Classification



Functions

- Adaptation of restraint systems as airbags or belt pretensioners to the size and weight of the passenger



Products

- Occupant Classification System (OCS) & Electronic

Product Integration & Validation



Functions

- Crash tests e.g. sledge test
- System engineering
- Advanced development & research
- Passive Safety Systems & Safety Assistance Systems Integration



Layout of survey and questionnaire

Survey motivation

Advanced Driver Assistance Systems

ADAS

Comfort
Informing
Single Sensor
stand alone



2005

2007

2009

2011

Consumer

publicity

acceptance

advantages and
disadvantages

Introduction

Survey

Location of the survey:

IAA in Frankfurt, TÜV-Süd, DEKRA and Donau Einkaufszentrum in Regensburg

boundary conditions/constraints

- ▶ today ADAS market is not fully penetrated (technical and commercial)
- ▶ limited experience of some interviewed persons with ADAS (simulation only)

Goal of the survey:

- ▶ The publicity of ADAS in the public (including sources of information)
- ▶ The individual estimation of the usefulness of ADAS
- ▶ The attitude towards ADAS (advantages, disadvantages and consumer acceptance)

Questionnaire Standardized Interview

Fragebogen IAA September 2007 Marktanalyse Fahrerassistenzsysteme

Was sind Fahrerassistenzsysteme?

Das Fahrzeug sammelt umfassende Informationen über seine Umgebung, wertet diese aus und gibt dem Fahrer eine situative Unterstützung ohne ihm die Verantwortung zu nehmen.

Geschlecht:	<input type="checkbox"/> männlich	<input type="checkbox"/> weiblich		
Alter:	<input type="checkbox"/> 18-25	<input type="checkbox"/> 26-45	<input type="checkbox"/> 46-65	<input type="checkbox"/> ≥ 66

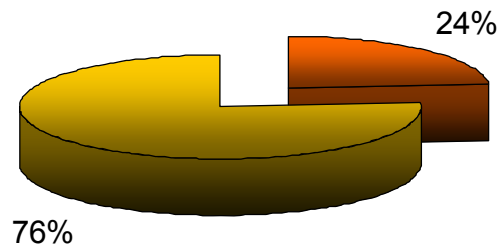
Frage 1:	Welches Fahrzeug fahren Sie? (Fahrzeughersteller und Fahrzeugtyp) <input type="checkbox"/> Kein eigenes Fahrzeug
Frage 2:	Welchen Zustand hatte Ihr Fahrzeug beim Kauf? <input type="checkbox"/> Neufahrzeug <input type="checkbox"/> Jahresfahrzeug <input type="checkbox"/> Gebrauchtfahrzeug
Frage 3:	Wie hoch ist Ihre durchschnittliche Fahrleistung pro Jahr? km/Jahr
Frage 4:	Auf welchen Strecken legen Sie den Großteil Ihrer Fahrleistungen zurück? <input type="checkbox"/> Autobahn <input type="checkbox"/> Landstraße <input type="checkbox"/> Innenstadt
Frage 5:	Zu welcher Tageszeit fahren Sie vorwiegend? <input type="checkbox"/> Tagsüber <input type="checkbox"/> Nachts <input type="checkbox"/> gleichermaßen Tagsüber wie Nachts
Frage 6:	Falls interessiert, durch welche Quellen würden Sie sich über neue Fahrzeugausstattungen informieren? (Mehrfachnennung möglich) <input type="checkbox"/> Presse <input type="checkbox"/> Radio/TV <input type="checkbox"/> Messen <input type="checkbox"/> Bekannte/Freunde <input type="checkbox"/> Internet <input type="checkbox"/> Händler/Probefahrt
Frage 7:	Welche/s Fahrerassistenzsystem/e kennen Sie? <input type="checkbox"/> Adaptive Cruise Control (ACC) (adaptive Geschwindigkeitsregelung) <input type="checkbox"/> Traffic Jam Assist (TJA) (Stauassistent) <input type="checkbox"/> Blind Spot Detection (BSD) (Toter Winkel Erkennung) & Lane Change Assist (LCA) (Spurwechselassistent) <input type="checkbox"/> Lane Departure Warning (LDW) (Fahrspurverlassungswarner) <input type="checkbox"/> Traffic Sign Recognition (TSR) (Verkehrzeichenerkennung) <input type="checkbox"/> Night Vision (NIVI) (Nachtsicht) <input type="checkbox"/> PreCRASH (Notbremsassistent) <input type="checkbox"/> Halbautomatisches Einparken (Parkhilfe)
Frage 8:	Ist Ihr Fahrzeug mit einem bzw. mehreren Fahrerassistenzsystemen ausgestattet? <input type="checkbox"/> Nein <input type="checkbox"/> Ja Welche/s?
Frage 9:	Sind Sie bereits andere Fahrzeuge mit einem bzw. mehreren Fahrerassistenzsystem/en gefahren? <input type="checkbox"/> Nein <input type="checkbox"/> Ja Welche/s?

System:	ACC ¹ (Adaptive Cruise Control)	TSR ² (Traffic Sign Recognition)	NIVI ³ (Night Vision)	TJA ⁴ (Traffic Jam Assist)	BSD, LCA ⁵ (Blind Spot Detection, Lane Change Assist)	LDW ⁶ (Lane Departure Warning)	PreCrash ⁷	Halbautom. Einparken ⁸
Frage 10: Wie nützlich erscheinen Ihnen diese Fahrerassistenzsysteme?								
Besonders nützlich	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sehr nützlich	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Nützlich	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wenig nützlich	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Nutzlos	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Frage 11: Welche Vorteile sehen Sie in diesen Systemen? (Mehrfachnennung möglich)								
Mehr Sicherheit	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mehr Komfort	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mehr Orientierung	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Keine Vorteile	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Frage 12: Welche Nachteile sehen Sie in diesen Systemen? (Mehrfachnennung möglich)								
Unkonzentrierte Fahrweise	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mögliche Ablenkung	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fahrer wird vom System bevormundet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Keine Nachteile	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Frage 13: Würden Sie dieses Assistenzsystem kaufen?								
Ja	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Nein	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Vielleicht (abhängig vom Preis)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Kommentare und Anmerkungen:								

Demographic Data

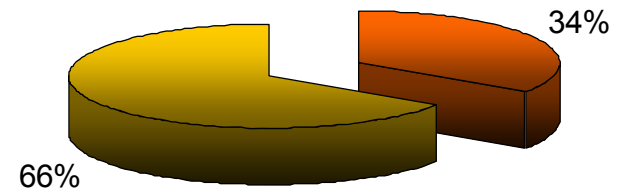
Gender and Age

2005

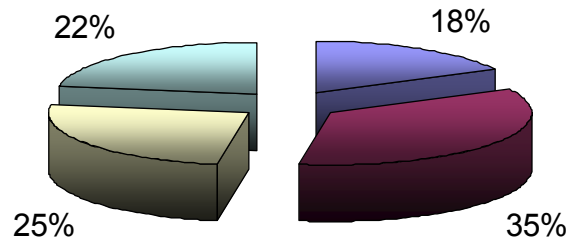


Female Male

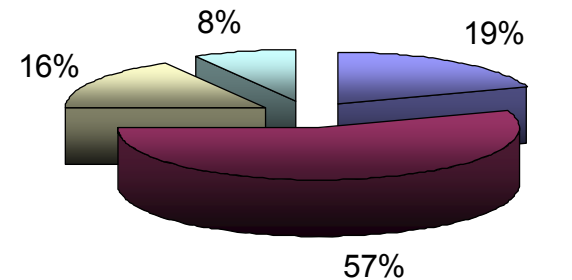
2007



Female Male



18 - 25 26 - 34 35 - 50 > 51

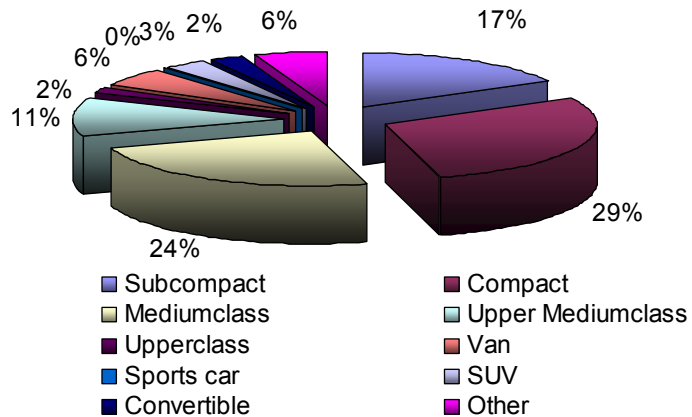


18 - 25 26 - 45 46 - 65 ≥ 66

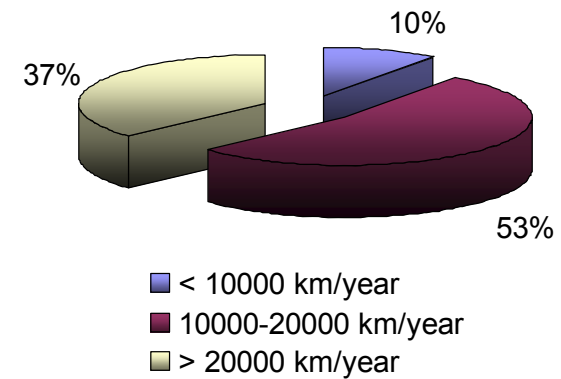
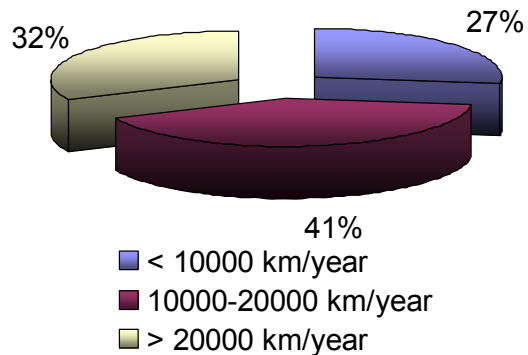
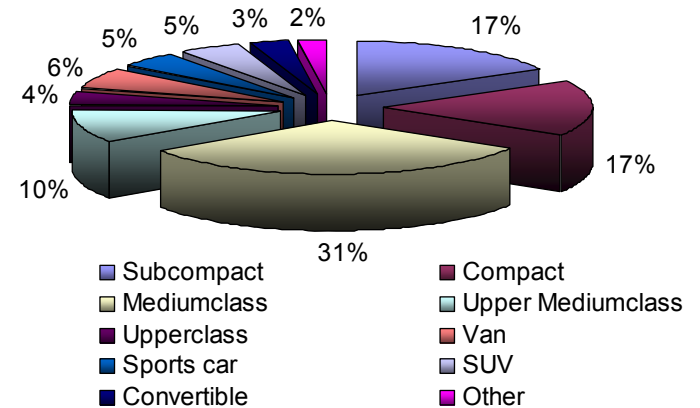
Demographic Data

Vehicle Type and Milage

2005



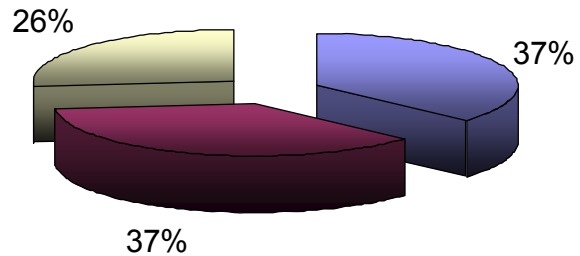
2007



Road Use

Time of Road Use

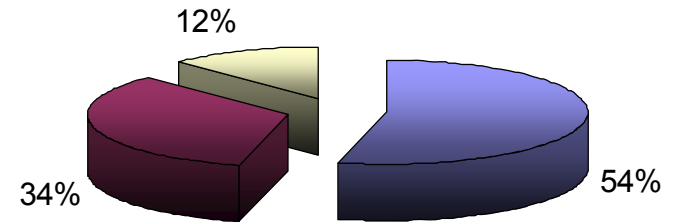
2005



On which type of road do you drive mainly?

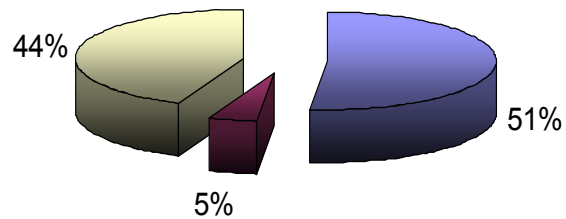
■ Motorway ■ Country road ■ City

2007



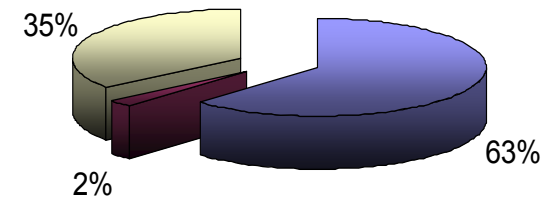
On which type of road do you drive mainly?

■ Motorway ■ Country road ■ City



At which time of day do you drive mainly?

■ At day ■ At night ■ At day and at night



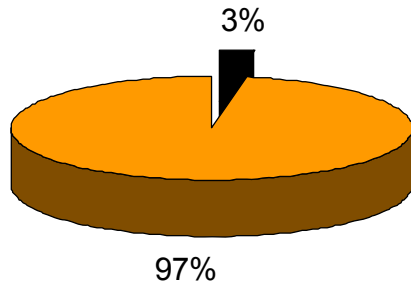
At which time of day do you drive mainly?

■ At day ■ At night ■ At day and at night

Vehicles equipped with ADAS

Experiences with ADAS

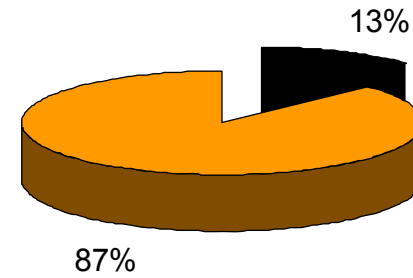
2005



Do you find any of those ADAS in your own car?

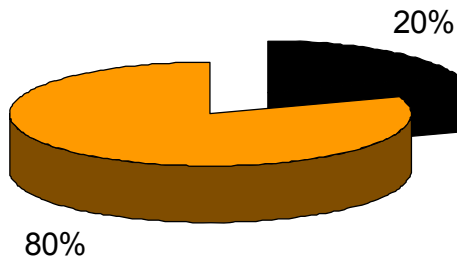
■ Yes ■ No

2007



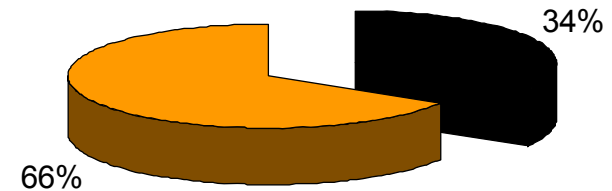
Do you find any of those ADAS in your own car?

■ Yes ■ No



Did you already drive a car equipped with an ADAS?

■ Yes ■ No



Did you already drive a car equipped with an ADAS?

■ Yes ■ No



Usefulness of the systems
Consumer Acceptance
Advantages and disadvantages of the systems

Overview

How **useful** do these Advanced Driver Assistance Systems appear to you?

- ▶ Extremely useful
- ▶ Very useful
- ▶ Useful
- ▶ Less useful
- ▶ Useless

Which **advantages** do you see in these systems?

- ▶ More safety
- ▶ More comfort
- ▶ More orientation
- ▶ No advantages

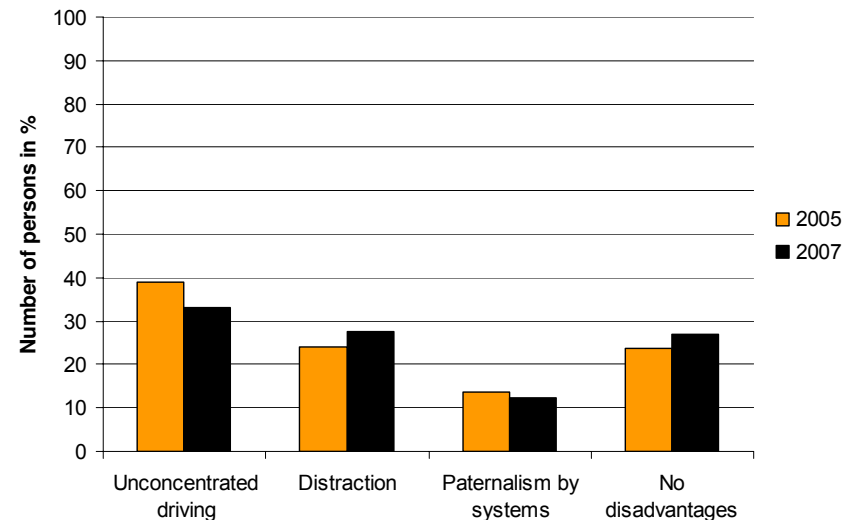
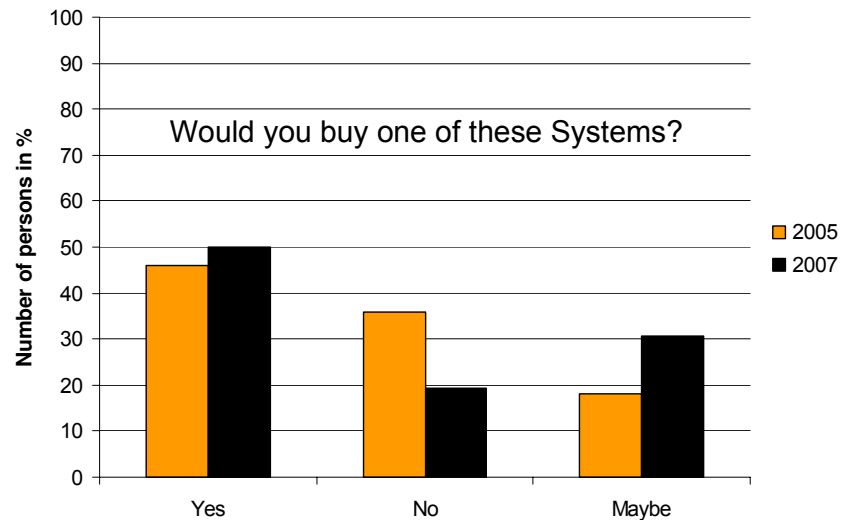
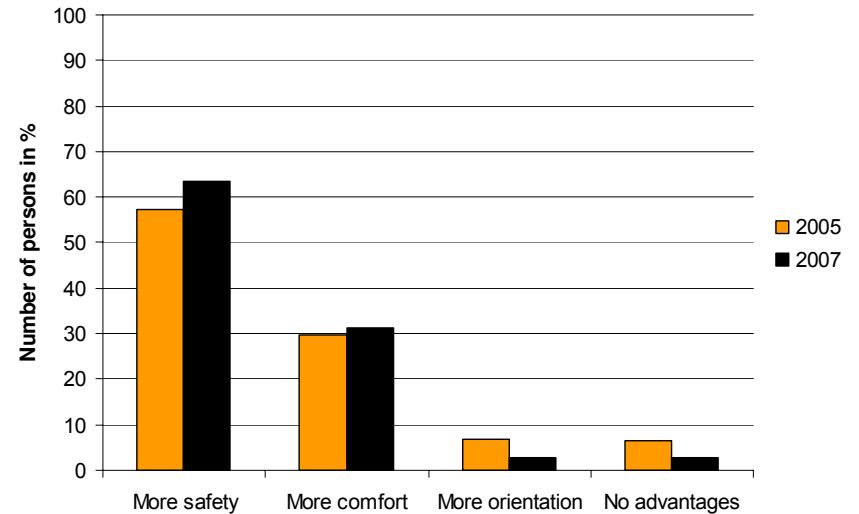
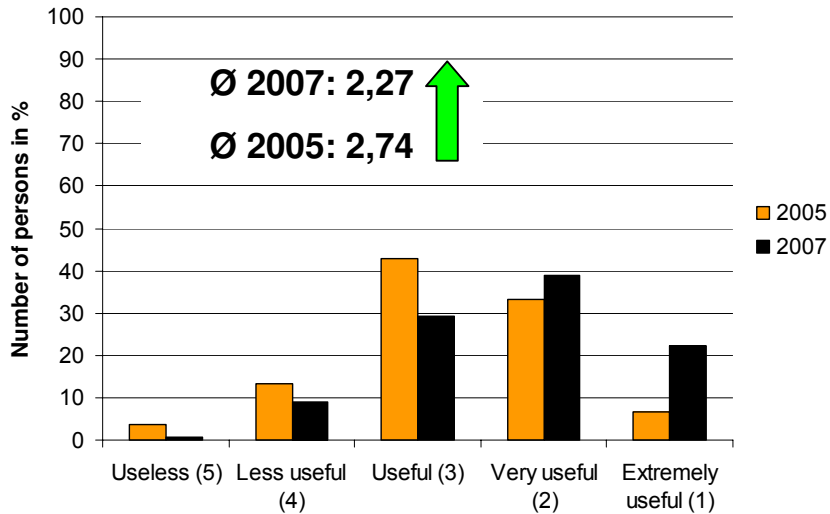
Would you **buy** one of these Advanced Driver Assistance Systems (->acceptance)?

- ▶ yes
- ▶ no
- ▶ Maybe (depends on price)

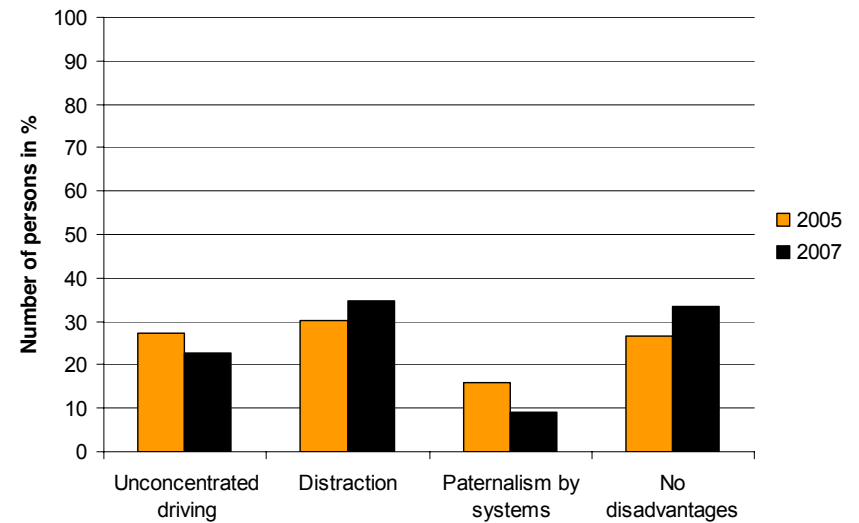
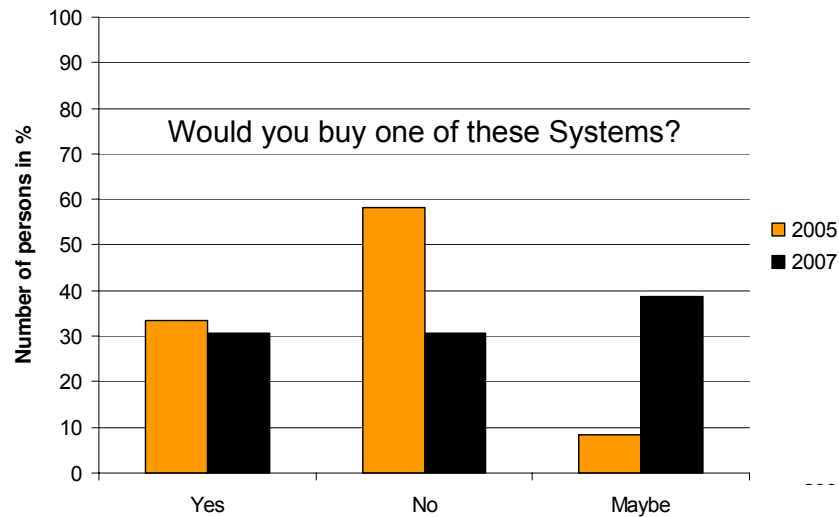
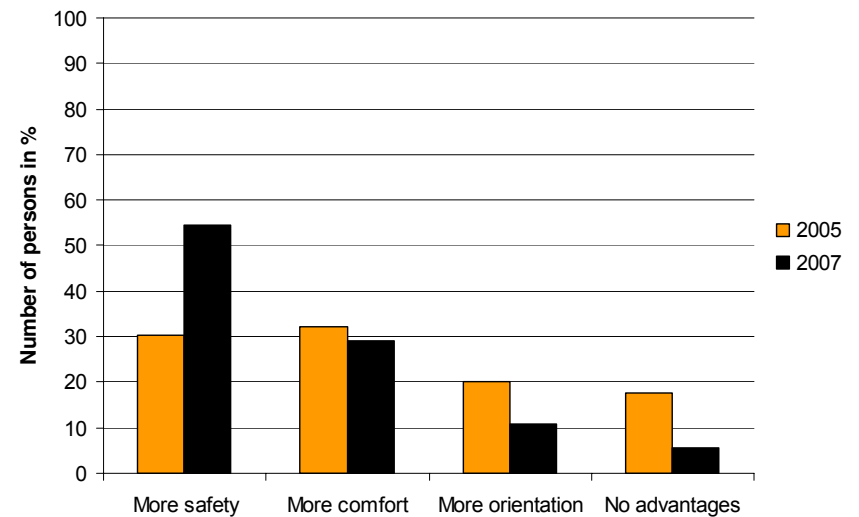
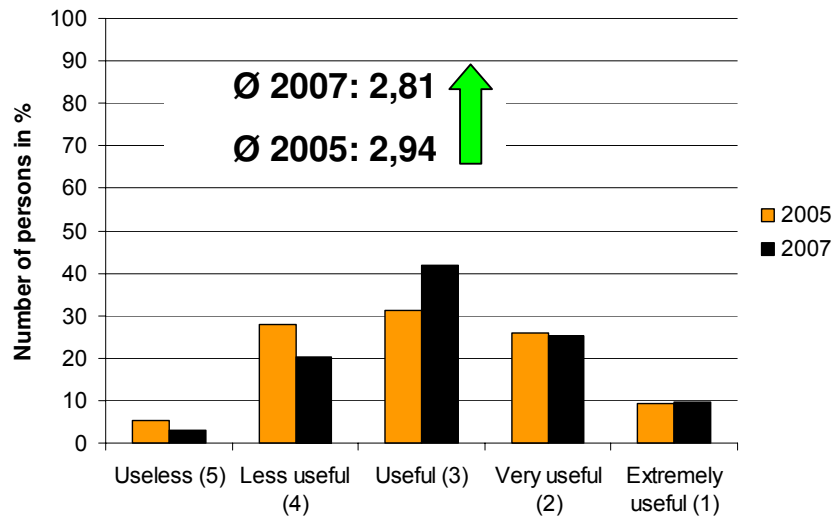
Which **disadvantages** do you see in these systems?

- ▶ Unconcentrated driving
- ▶ Distraction
- ▶ patronized by systems
- ▶ No disadvantages

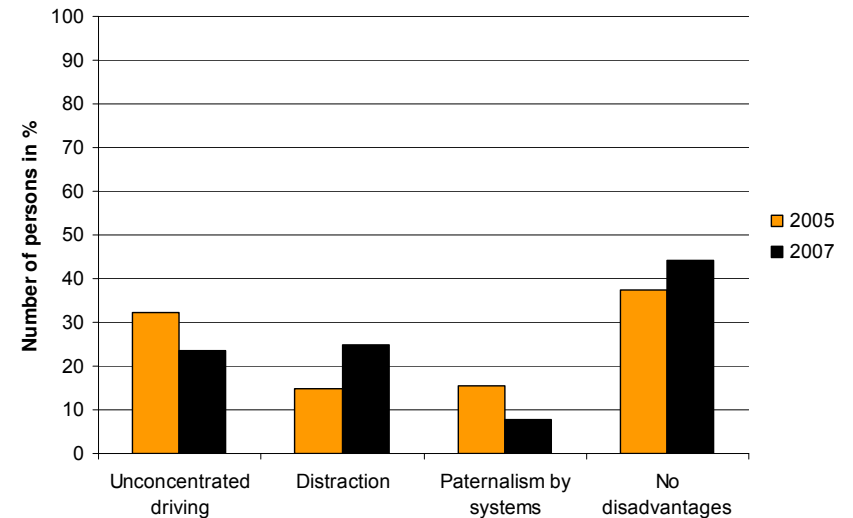
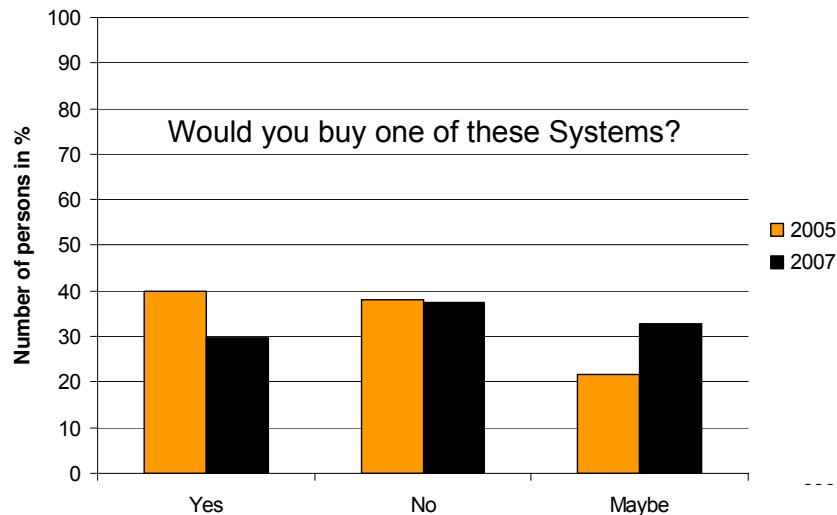
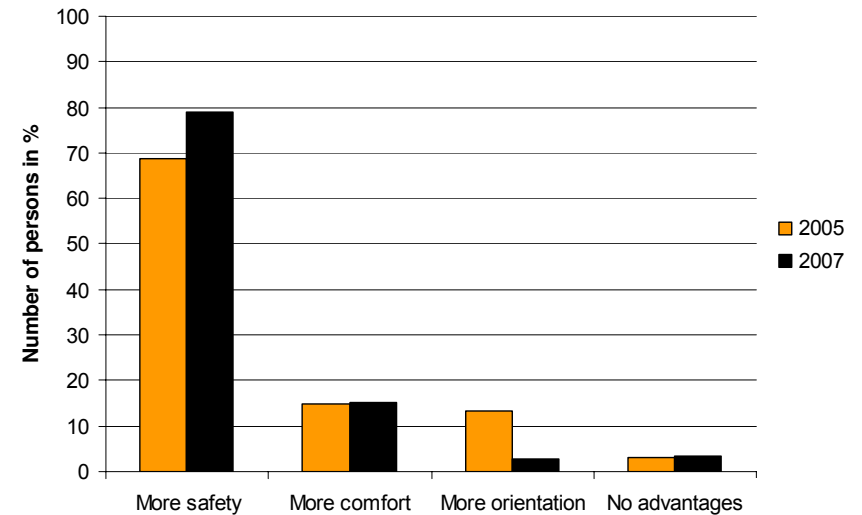
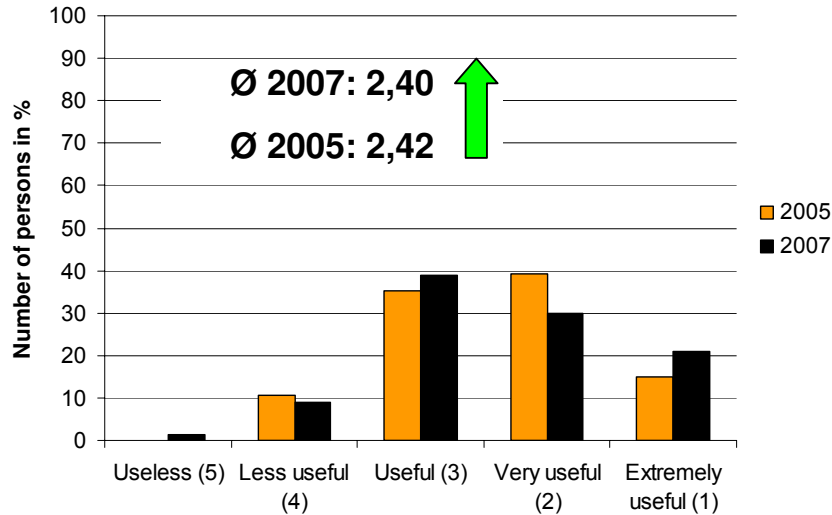
Adaptive Cruise Control



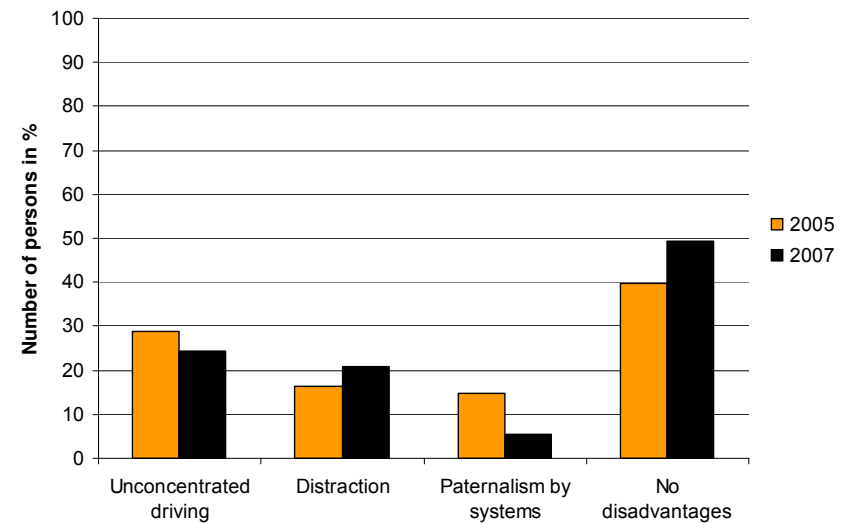
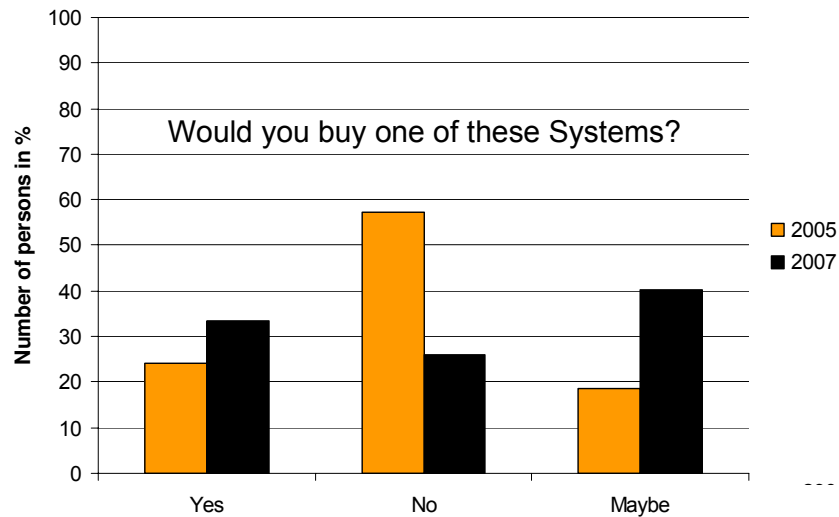
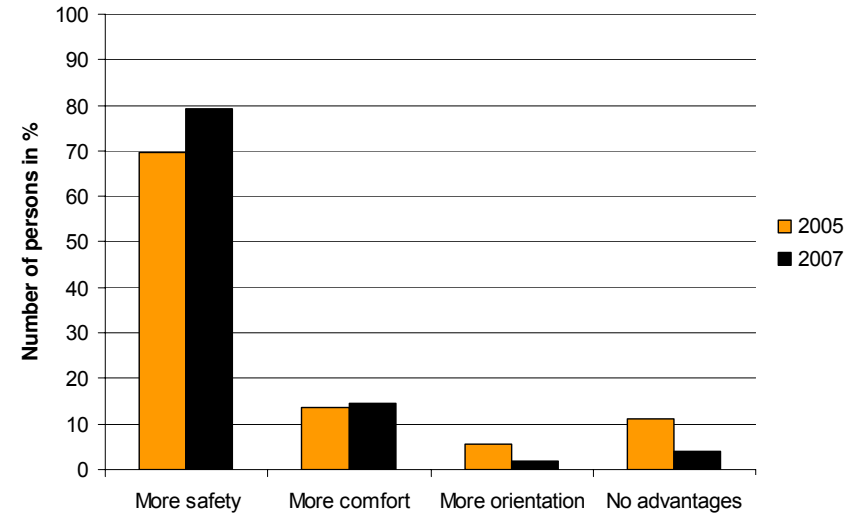
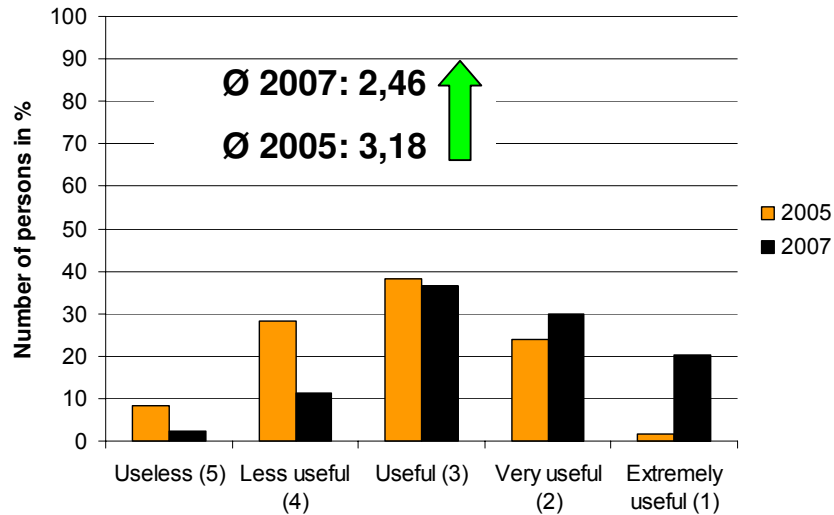
Traffic Sign Recognition



Blind Spot Detection, Lane Change Assist



Lane Departure Warning



Conclusion

Publicity

- ▶ Highest name recognition for systems already in the market:
Adaptive Cruise Control and Semiautomatic Parking
- ▶ Increasing publicity of the systems
- ▶ Increasing number of cars equipped with Advanced Driver Assistant Systems:
3 % in 2005 -> 13 % in 2007
- ▶ Increasing experience with ADAS
20 % in 2005 -> 34 % in 2007

Usefulness

- ▶ Highest usefulness for preCrash and ACC

Advantages

- ▶ ADAS still can't be separated in Comfort-Systems and Safety-Systems, but trend to Safety-Systems