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INTELLIGENT TRANSPORT SYSTEMS TODAY: A EUROPEAN PERSPECTIVE

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Outline

- General issues
- European studies on ITS impact
- Delphi study principles
- Questionnaire design
- Participant characteristics
- Questionnaire results
- Summary and Next steps

General (1/2)

❖ Activity Framework

HUMANIST NoE → www.noehumanist.org
Task Force B "Evaluation of Potential ITS Benefits"

❖ Objective

Identify certain issues related to impact of ITS mainly on Road Safety

❖ Tool

Conduction of a Delphi Study – not to find the truth but the opinion of the people responsible for research, design, application and use of the systems

General (2/2)

❖Intelligent Transport Systems - Definition

Application of advanced sensor, computer electronics, and communication technologies and management strategies – in an integrated manner – in order to increase the safety and efficiency parameters of the transportation system

❖Why ITS?

Anticipate positive impact on:

- Road Safety
- Network Conditions
- Environmental Conditions
- User comfort
- User integration

Studies on ITS impact (1/3)

- **ITS development**

  IDEA → PROTOTYPE → **ASSESSMENT** → MARKET INTRODUCTION

→Assessment methods

→Assessment measures

→Results…

→Are intelligent transport systems a promising means to the future?

Studies on ITS impact (2/3)

- **Impact of Intelligent Speed Adaptation (Várhelyi et. al., 2002)**
  - →Using a wide range of assessment methods
  - →Included elements (interaction) of non-users
  - →Effort to link system impact with accident data
- **Behavioural effects of Lane Departure Warning Systems (Alkim and Korse, 2003)**
  - →Real network study
  - →No behavioural change (no of warnings over time)
  - →Impact on road safety could not be identified – system compensation

Studies on ITS impact (3/3)

- **Prediction of driver drowsiness for fatigue warning systems (Muzet et. al., 2004)**

  →Use of driver simulator

  →Steering grip sensor signals – obj. and subj. sleepiness score

  →Significant correlations BUT differences from participant characteristics → incorporation of individual characteristics into simulation programs is still an issue

- **Impact of Adaptive Cruise Control and Intelligent Speed Adaptation systems (Yannis et. al., 2002)**

  →Use of traffic simulation programs (3 different ones)

  →Results of impact on road safety related to: simulation program, simulation scenario and variables used as assessment measures

Design of the Delphi Study (1/2)

❖General elements of a Delphi study

- Expert opinions recorded through structured and specific way
- Main objective to reach consensus amongst participants
- Conducted in the form of questionnaires

  Step1 Participants receive questionnaires

  Step2 Answers are analysed and comments are taken into account

  Step3 Participants receive updated questionnaires along with their previous answers and the average answers

  Step4 Steps 2 and 3 are repeated until reaching consensus or stability of respondents answers

Design of the Delphi Study (2/2)

❖General principles of design

- Questionnaire
  - → Should not be long
  - → Should be clear, structured and comprehensive
- Expert characteristics
  - → Attention on the type of experts
  - → High drop-out rate between rounds

Questionnaire design (1/2)

❖Objectives → design

- Specific → Choice of IT systems investigated
  - → Anticipation of impact on road safety
  - → Systems for which there is no sufficient evidence but close to the market BUT ALSO "baseline" systems which are already widely used
  - → Different systems in terms of their operation
  - → ISA, ABS, Intersection Warning, Enhanced Navigation, Lateral Control

Questionnaire design (2/2)

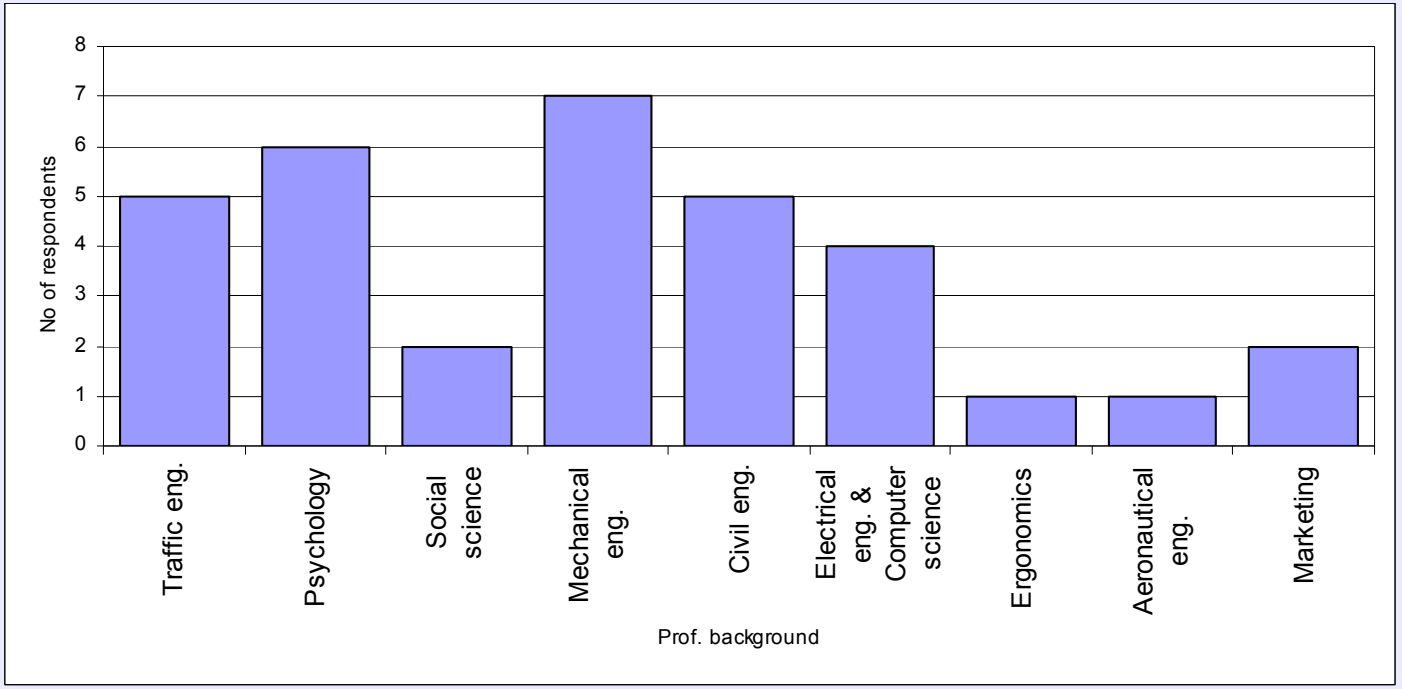
- Road Safety Impact → Questions mainly involve road safety & few general ones

First Part	General questions on the systems
Second Part	Questions on impact elements
Third Part	General conclusive questions and comments
Fourth Part	Questions on participant characteristics

- Clarification on issues → Questions for which there is a variety of answers
- Input on issues → Questions for which not sufficient research has been conducted
- Convenience in receiving and filling-in the questionnaire → Questionnaire at: http://www.noehumanist.org/DelphiStudy

Participants characteristics (1/3)

- Number of participants → 33 (56)
- Variability →Country of work
  - → Profession
  - → Scientific Background



Participants characteristics (2/3)

- Expertise and experience

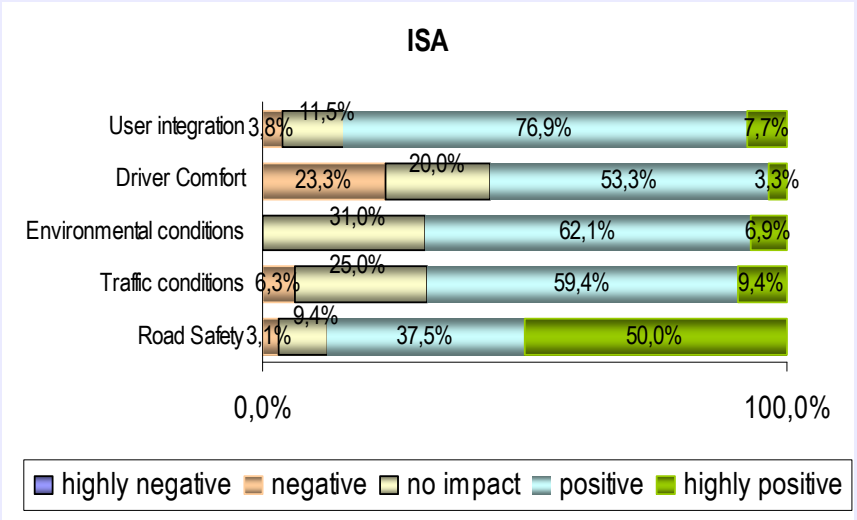
Experience/Systems	ISA	ABS	Intersection Warning	Enhanced Navigation	Lateral Warning
Specialist/Expert	2	3	4	5	4
Knowledge Resulting from minor research	8	8	6	15	8
Knowledge Resulting from reading technical literature	24	19	18	18	21
No knowledge	1	5	5	0	3
Personal experience (system user)	6	21	2	14	2
Laboratory experience (use it only in tests)	9	5	9	11	10
No experience	19	9	21	9	20

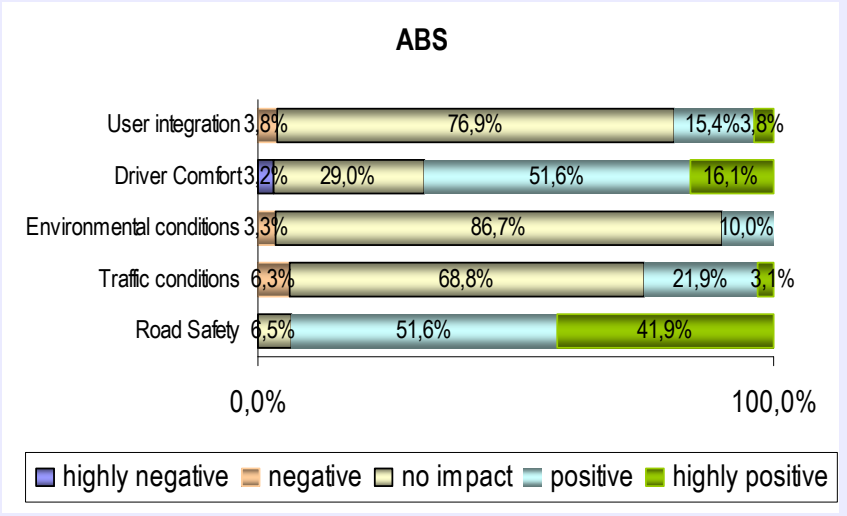
Participants characteristics (2/3)

- Expertise
  - → Majority of respondents' expertise from technical literature
  - → Enhanced navigation significant number resulting from minor research (probably on navigation functions)
  - → Few respondents have no knowledge on systems
- Experience
  - → Majority of respondents users of ABS
  - → Around 30% of respondents lab experience on all systems except ABS
  - → Significant amount of respondents no experience on ISA and Lateral Warning

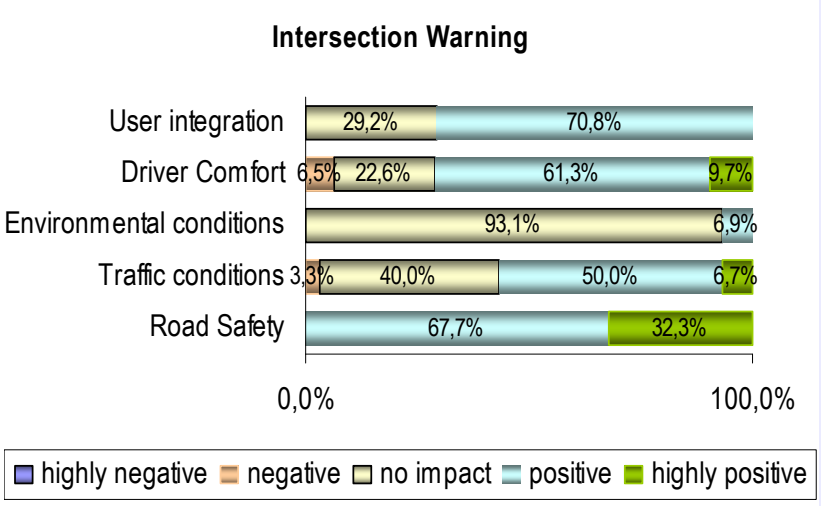
Questionnaire Results –
System importance (1/4)

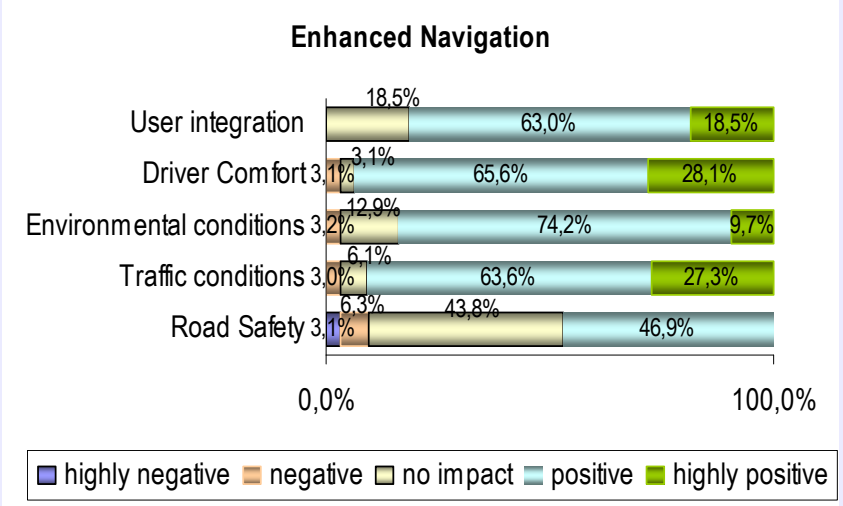
- Impact parameters
  - Road safety
  - Traffic conditions
  - Environmental conditions
  - Driver Comfort
  - User Integration

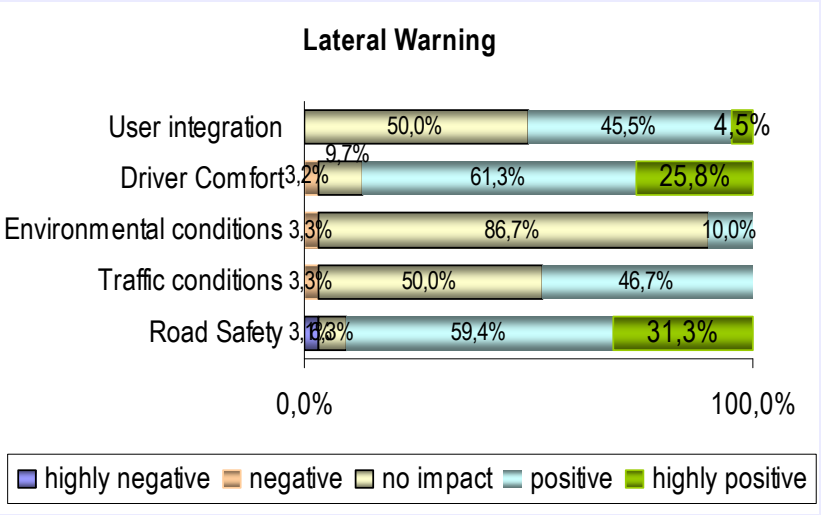




Questionnaire Results -
System importance (2/4)



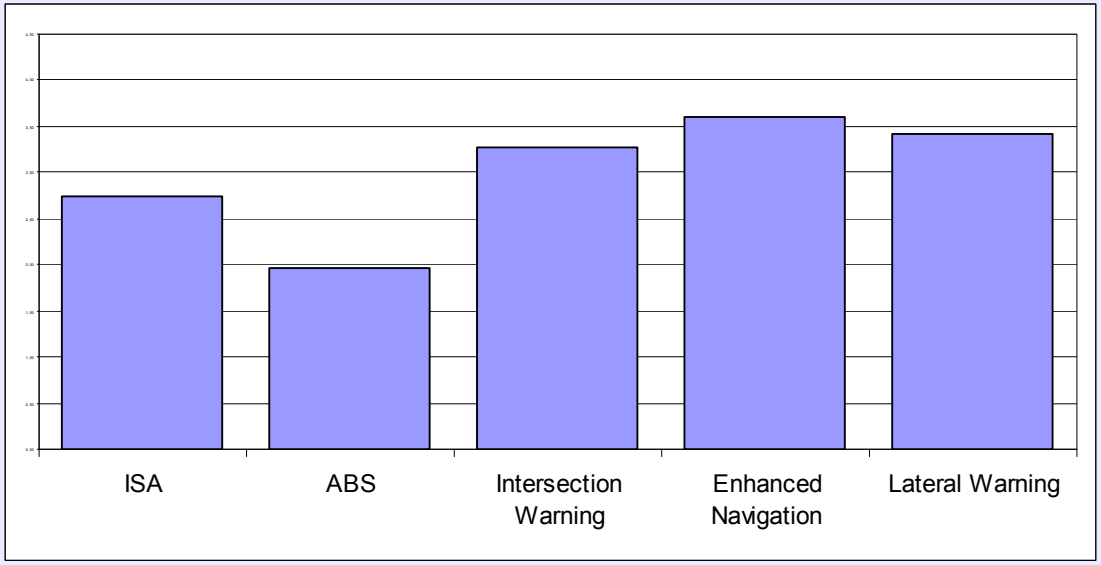




Questionnaire Results –
System importance (3/4)

- Results
  - All five systems are expected to contribute positively to road safety (intersection warning only positive impact)
  - ABS and ISA most promising
  - Systems score differently in different categories
  - Negative impact anticipated on driver comfort by ISA

- Systems rating
  - Road safety
  - Acceptability Issues



Questionnaire Results –
System importance (4/4)

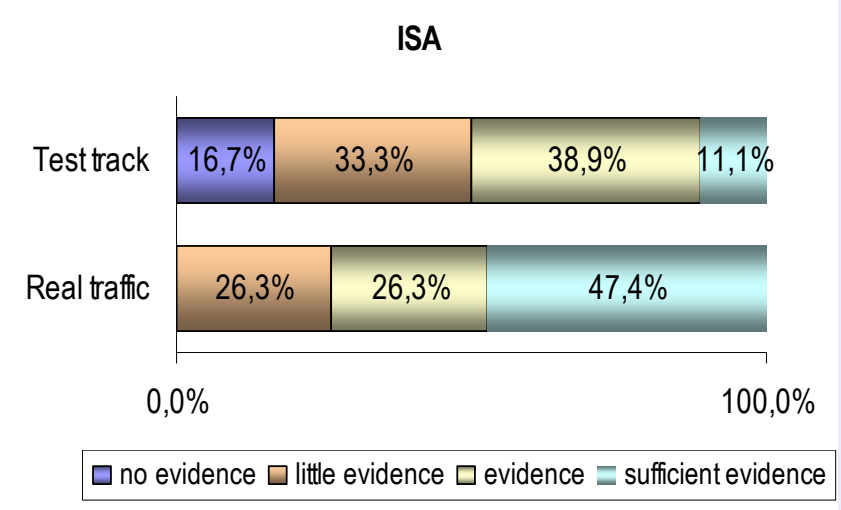
Systems application

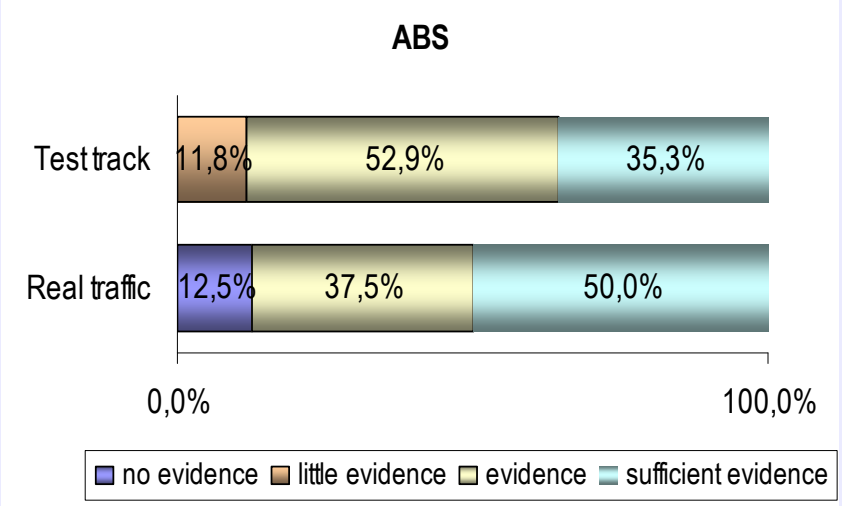
Development/Systems	ISA	ABS	Intersection Warning	Enhanced Navigation	Lateral Warning
In their current level of development	6	32	1	12	3
Following a few more impact studies	11	1	7	10	10
With some further development	9	1	24	9	18

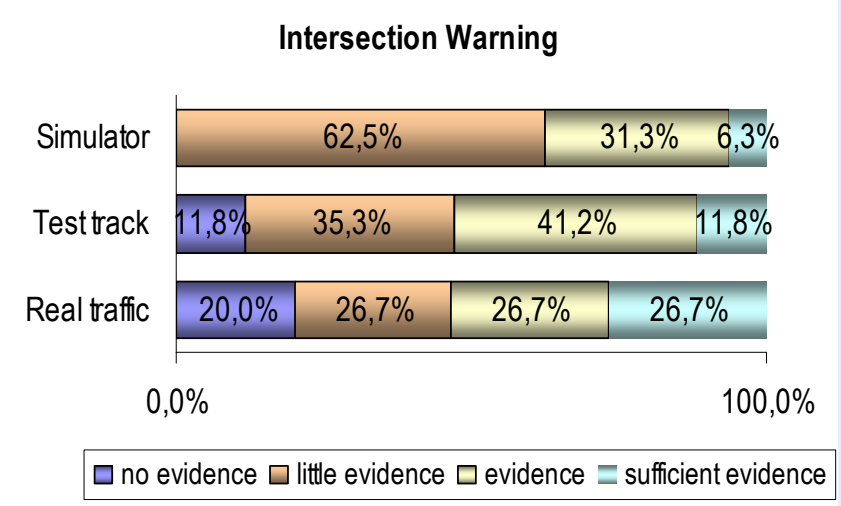
- 20% (7) of experts that ISA should not be part of standard vehicle equipment, 3% (1) for intersection warning, 6% (2) enhanced navigation
- 2 respondents believe that more research is needed on ABS

Questionnaire Results –
Gaps in knowledge (1/3)

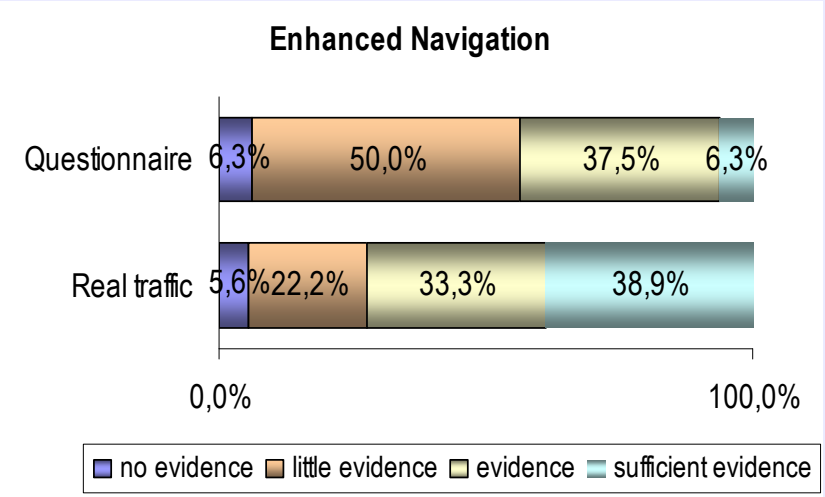
Amount of evidence available from the most appropriate types of studies

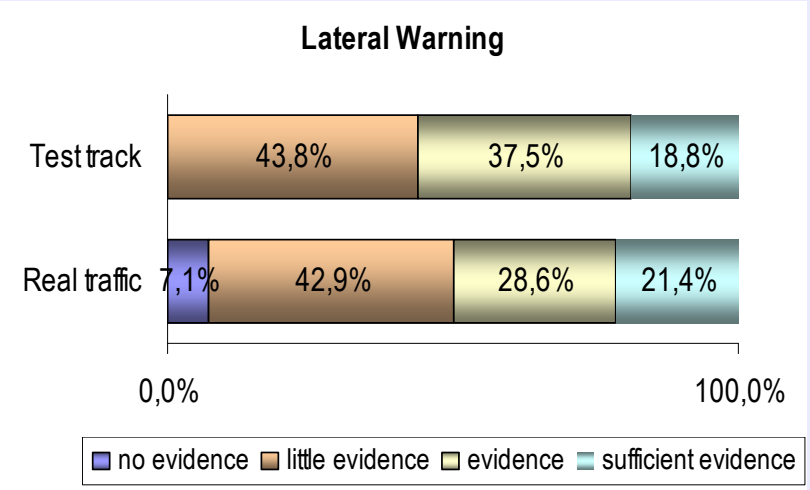






Questionnaire Results –
Gaps in knowledge (2/3)





- Available Evidence
  - ABS → sufficient amount
  - ISA → good amount
  - Intersection warning → Further research needed
  - Enhanced navigation → Further research needed
  - Lateral Warning → Further research needed

Questionnaire Results –
Gaps in knowledge (3/3)

- "No opinion" answers
  - – Relationship between penetration rates and impact
  - – System side effects
  - + Appropriate types of studies for each system (except ABS)

Summary and Next steps

- ✓ Preliminary results of Delphi study
- ✓ Diversity between answers
- ✓ Some general trends appear
- ✓ Gaps in knowledge are evident from the 1st Round

❖ **Further analysis**

→ Link answers with expertise and participant characteristics
→ Link system importance with willingness to pay
→ Link answers with results from studies on the impact of ITS
→ Conduct Round 2 of the Delphi Study

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