Human Machine Interface And the
Safety of Traffic in Europe
Project GRD1/2000/25361 S12.319626

Workshop Brussels 22.03.2005

- HMI and Safety-Related Driver Performance -

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Introduction

On March 22 2005 a final workshop was held at the Volvo premises in Brussels to convey the main results of the project and to invite discussion from the audience. The one-day workshop was opened by the DG-TREN HASTE project officer, Bipin Radia. At the workshop presentations on the HASTE project results were given, two invited speakers addressed the audience, and a round table discussion concluded the day. Chairman was Robert Gifford from PACTS (Parliamentary Advisory Council for Transport Safety, London, UK).

Morning sessions

Rob Gifford, PACTS (Chair)

Opening

Bipin Radia, DG-TREN HASTE Project Officer

Welcome

Oliver Carsten, ITS Leeds (HASTE)

What should criteria for in-vehicle HMI be like?

This presentation can be found as PowerPoint print out in the section “presented material” at the end of this report.

Joakim Östlund, VTI Sweden (HASTE)

WP2: HMI and Safety-Related Driver Performance

This presentation can be found as PowerPoint print out in the section “presented material” at the end of this report.

Discussion

Question: Why is the HASTE focus only on negative effects, what about advantages of In-Vehicle Information Systems (IVISes), e.g., a route navigation system is probably much safer than consulting a paper map while driving

Answer: The HASTE baseline, benchmark, is driving without the system, not a control condition with another potential distracter. However, you could use the test regime also for this type of condition, since the assessment method is independent of the device. The goal is to enable comparisons to be made of one IVIS against another, and to be able to select the better design. The HASTE evaluation should promote good design.

Question: How about the trade off between the primary (driving) task and performance on the secondary (IVIS) task? One would expect participants to be eager to perform well on the secondary task
Answer: The instruction was to drive safely, which they did. The S-IVIS (Surrogate IVIS) in the most difficult condition *had* to be demanding, but participants could prioritise their tasks.

Question: Do the gaze results reflect a tunnel effect in information uptake or could participants just be staring blankly?
Answer: In field experiments it was found that drivers miss speed limit changes, which could reflect a narrowed view. The effect is very relevant, in particular it was found in conditions whilst participants were performing the (non-visual) cognitive task.

Question: What is known about the relation between operating IVISes and accidents?

Answer: there is an indirect relation. Relationships have been shown between increased swerving (SDLP) and the increased chance of being involved in an accident, as the relationships between speed and accidents have been shown. Increased steering activity could be an indirect indication of trying harder. There is not one measure that tells it all, and one should evaluate results on a number of measures and then combine this information.

Question: Were the S-IVIS tasks practiced?
Answer: yes they were, and static (single task) performance was assessed both on the S-IVIS task, and on driving only.

Emma Johansson, VTEC Sweden (HASTE)

WP3, Validation of the HASTE protocol specification

This presentation can be found as PowerPoint print out in the section "presented material" at the end of this report.

Wiel Janssen, TNO Soesterberg (HASTE)

From results to regime: What have we learned?

This presentation can be found as PowerPoint print out in the section "presented material" at the end of this report.

Oliver Carsten, ITS Leeds (HASTE)
What could happen to the HASTE regime

This presentation can be found as PowerPoint print out in the section "presented material" at the end of this report.

Discussion

Question: were any stakeholders/car manufacturers (other than Volvo) consulted?
Answer: no, only within this and other consortia like the ADAM consortium. Results have been exchanged with CAMP.

Question: The rural road in the simulator is recommended for tests. Why is a closed track test not considered, as this can be a safe testing environment, and tests have high validity.
Answer: There is nothing against closed-track testing, but due to there being a lower experimental control (more variability) one would need more participants to obtain meaningful results on closed track tests. Also, the interaction with other traffic has to be set up, and in a simulator this is (repeatedly) available and under control!

Question: Pass/fail criteria are missing in HASTE, but they exist in the US guidelines. Why are these not included?
Answer: HASTE provides the tools to obtain an estimate of the change in risk due to operating an IVIS. For instance: operating a device may give a 10% higher risk of getting off the road. Its use is planned to be analogous to consumer organisation tests: i.e. to

provide a number of plusses and minuses for safety risks. To end up with recommendations similar to the NCAP stars requires more steps, which will be taken, such as giving weights to these sub ratings. It would be good to have a P-NCAP (Primary-NCAP) rating on safety that is as much in demand as the crash NCAP ratings. All car manufacturers wish to obtain four of five stars only, and they advertise with it. The idea is to go down a similar road to NCAP, and to become popular with the public. However, it should not be forgotten that it has taken NCAP 10 years to obtain the position it now has.

Question: Can the HASTE evaluation process be applied to future systems?
Answer: yes it can, it is not device dependant. If a future system is developed that makes use of haptic feedback it can be tested with this regime. All sorts of haptic systems might emerge, such as a buttock feedback system (the buttock is currently a “free channel”)!

Afternoon speakers

Mrs Anu Lamberg, Ministry of Transport & Communication, Finland

HASTE - Finnish experiences,
Driver's HMI and Government's role

This presentation can be found as PowerPoint print out in the section "presented material" at the end of this report.

Discussion

Remark: Sometimes it is much better to suppress information. A "windscreen washer low" message can be very disturbing in busy traffic.

Mrs Karin Svensson, Volvo Technology, Sweden

Industry needs & interests

This presentation can be found as PowerPoint print out in the section "presented material" at the end of this report.

Round table discussion

The audience is very much looking forward to the HASTE deliverables and documents, which are or will be all in the public domain very soon. Also, the S-IVIS tasks are not confidential, on the contrary, they have been given to other projects and will be used in other experiments.

HASTE evaluation does not frustrate innovation by regulations, but stimulates innovation and the better design! The discussion continued on the “NCAP-route” that HASTE should follow. HASTE is similar in the sense that one can see that one product (IVIS) is better than the other, and how it affects certain measures. Adding weights to these effects has not been done yet. An additional parameter is the frequency a certain option is used. If the use of an IVIS option is critical to safety but hardly ever used this should be taken into account, just as a frequently used option should receive more weight. It is estimated that it will take 12-18 months to make significant progress in the direction of a toolkit and P-NCAP evaluation. Funding to enable these steps, however, is uncertain. First the final report should consolidate the results and open the dialogue with stakeholders, in particular car manufacturers.

The relationship between accidents and IVIS use was raised again. In Germany the number of IVIS has increased, while the number of accidents have decreased, and that makes it difficult to believe that IVIS can be a threat to traffic safety. Assessing a relationship between IVIS use and accidents is difficult, e.g. a technique used as by Redelmeier & Tibshirani[1] could shed some light on the issue, but it will be difficult as most operation of devices is not logged, and questioning after an accident is prone to a “self-protection” bias. Also, finding no relation between an increased number of IVIS and a reduction of accidents may also be due to other measures taken, such as increased vehicle safety (crash zones, ABS, et cetera).
HASTE uses the precautionary principle, it is better to prevent accidents by encouraging good design than to wait for accidents to happen with bad systems and then establish a relationship between the two. In other words, promote the better design, give those products a market advantage and stay ahead of accidents. The HASTE process is technology independent. It establishes effects of IVIS on *driving*, with a positive look, a focus on allowing and innovation.
A discussion about the use of black boxes arose, which eventually may provide data on these issues. DG TREN has awarded a project to a large consortium on this subject that will focus heavily on the legal issues, and on who has access to data.

In the “100 car study” in the USA it was concluded that visual distraction is the only problem as no proof of cognitive distraction was found. The HASTE experiments have shown that this conclusion is too simplistic. In some of the HASTE studies it was shown that a cognitive task can be very demanding and created a heavy mental load, the example of the elderly drivers approaching a zebra crossing in Helsinki was mentioned.

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[1] Redelmeier, D.A. & Tibshirani, R.J. (1997). Association between Cellular-Telephone Calls and Motor Vehicle Collisions *New England Journal of Medicine, 336,* 453-458

Finally it was stressed that from the literature it is known that there are relationships between behaviour and risks. Relationships between speed, speed variance, lane keeping, headway keeping and accident risk have been found and described. Changes in risk as a result of operating an (S-)IVIS as found in many HASTE studies therefore certainly say something about the changed chances of being involved in an accident.

It is hoped that the HASTE process will not end with the end of the project and some publications, but that the tools developed will be used and that the test regime will evolve into something like an P-NCAP evaluation contributing at a European level.

More about HASTE can be found at: http://www.its.leeds.ac.uk/projects/HASTE

List of participants

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Presented material

HASTE Workshop
Brussels
22 March 2005

What should criteria for in-vehicle HMI be like?

Oliver Carsten
Institute for Transport Studies
University of Leeds

Types of Standard

- Product

- Procedural

ISO 9001 Certified

- Performance

Product standards

- Specify physical aspects of system
- Example: home rows of keyboard should be no more than 50mm above desk level
- Advantages:
  - Clear
  - Easy to comprehend
- Disadvantages:
  - Tend to apply only to parts of a system
  - Technology dependent
  - Tend to become outdated

Procedural standards

- Describe process of analysis and testing which a manufacturer must use
- Example: government requirements of suppliers in military purchasing
- Advantage:
  - Can ensure participation of relevant specialists in the design process
- Disadvantages:
  - Require strong certification body (audit)
  - Need large amount of documentation
  - Can slow deployment of new systems

Performance standards

- Specify performance levels of or with a system
- Example: drivers should be able to obtain the information from a display without taking their eyes off the road for more than a certain amount of time
- Advantages:
  - Technology independent
  - Can apply to whole systems
  - Encourage innovative design
- Disadvantage:
  - Require thorough testing, e.g. by test organisations

The HASTE approach

- Performance testing is the best option
- Focus should be on effect of IVIS on the driving task
- 2 major studies:
  1. Does greater secondary task load from an In-Vehicle Information System (IVIS) lead to an identifiably worse performance in the primary task of driving?
  2. How can the methods and indicators developed in (1) be applied to assessing tasks on real systems?

Criteria for a test regime, 1/6

- ***Efficiency***
  - Any unnecessary elaboration or duplication should be removed.

Criteria for a test regime, 2/6

- ***Effectiveness***
  - The sample size (number of tests) needs to be sufficient to reveal differences between good and poor designs.

Criteria for a test regime, 3/6

- ***Reliability***
  - The tests, when repeated at different test sites or with different drivers, should produce similar results.
  - This could argue in favour of using a driving simulator or laboratory environment, because in such an environment it is easier to control the conditions and situations encountered.

Criteria for a test regime, 4/6

- ***Relevance***
  - The criteria being used to assess the IVIS should be related to the safety of the driving task.
  - Poor functionality or usability of a system in aspects that cannot be used while driving, e.g. use of a menu that is locked while the engine is running, might affect the user's impression of a system, but is not safety-relevant.

Criteria for a test regime, 5/6

- ***Comprehensiveness***
  - All important safety implications should be assessed.
  - This argues in favour of using driving in a naturalistic environment, i.e. on real roads, as part of the test regime, since such driving is more likely to reveal unanticipated problems which might not be revealed in the more constrained environment of a simulator.

Criteria for a test regime, 6/6

- ***Safety***
  - Neither the test subject (driver) nor the test administrator (e.g. an observer in a test vehicle) should be exposed to improper risk.

Main parts of project timetable

Jan to June 2002	WP1 Establish experimental protocol
July 2002 to March 2004	WP2 Examine distraction and driving performance with surrogate IVIS
March 2004 to March 2005	WP3 Refine test procedure and apply to “real” IVIS systems

HASTE Workshop
Brussels
22 March 2005

WP2: HMI and Safety-Related Driver Performance

Joakim Östlund, VTI

The objectives of WP2

- Investigate impact of IVIS on driving performance
- Identify **Indicators**
  - Sensitive
  - Reliable
  - Valid
- Develop **Test scenarios**
  - Realistic scenarios
  - Safe enough for attention to IVIS
  - Difficult enough to find effects on driving performance
- Identify advantages
  - simulators
  - laboratories
  - field experiments

Approach

- Surrogate IVIS (S-IVIS)
  - One cognitive, one visual
  - Three S-IVIS levels
- Assessment methods
  - Simulator, Laboratory and Field
- Road
  - Urban, rural and motorway
  - Road complexity level
- “Average” vs elderly drivers
- UK drivers vs Portuguese drivers

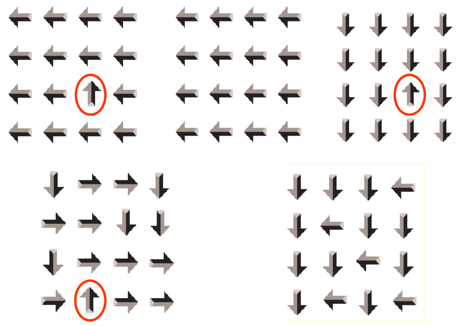
Scope

17 experiments, 527 participants

A standard rural road

- Was included in all simulator and laboratory experiments
- Identical scenario
- Average drivers

The Visual S-IVIS



The Visual S-IVIS in a car

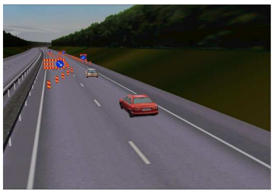
The Cognitive S-IVIS

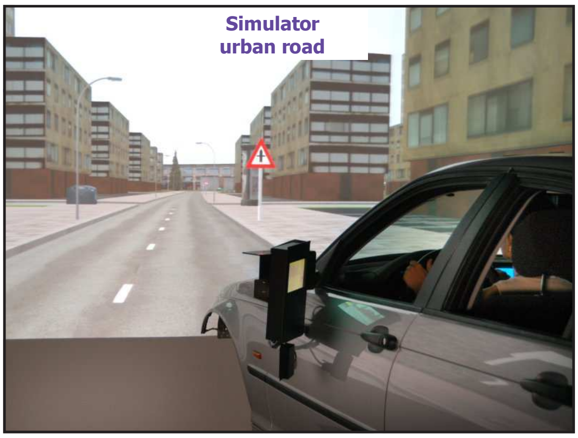
- Count target sounds – separate tally for each one
- 2-4 target sounds
- Max 2 seconds per sound
- 15 sounds – 45 seconds

Road Complexity Levels

- Factors determining road complexity
  - Road curvature
  - Intersections (urban only)
  - Interferring vehicles (sim/lab only)

Simulator motorway





Laboratory, rural road

Selected vehicle measures

- Speed measures
- Headway measures
- Steering control measures
- Lateral control measures
- Physiological measures
- Gaze angle measures
- Self report
- Observer ratings
- S-IVIS performance

Analysis

- Two factorial ANOVA
  - Road complexity
  - S-IVIS difficulty
- Effect of nationality (UK Vs Portuguese)
- Effect of age
- Analysis of each experiment
- Meta analysis including all experiments

Results – Effects of S-IVIS

- Most pronounced effects for the Visual task
- The two task types sometimes had different effects

The Visual Task

- Attention to visual task - Fewer glances straight ahead
- Increased lateral position variation
- (Compensatory) speed reduction …

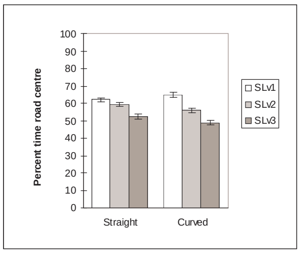
The Cognitive task

- More glances straight ahead
- Decreased lateral position variation
- Indications of decreased headway

Both tasks

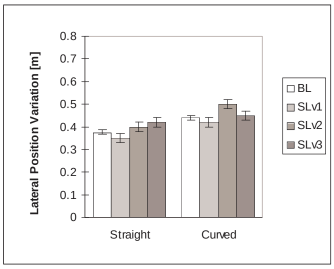
- Decreased self rated driving performance
- Increased steering activity
- Occasional speeding

The drivers looked less on the road centre while attending to the **visual** S-IVIS



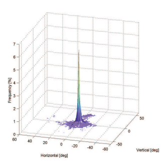
Time eyes on road centre

The lateral control was less stable when attending to the **visual** S-IVIS

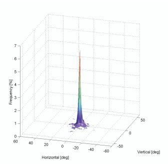


Lateral position variation

The drivers looked more on the road centre while attending to the **cognitive** S-IVIS



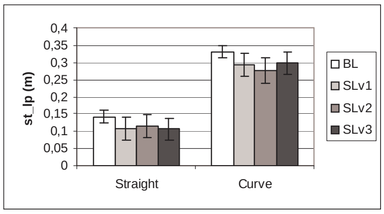
Baseline



Cognitive task

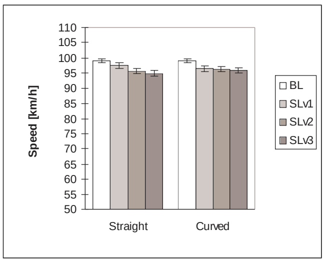
Gaze data distribution

The lateral control was more stable when attending to the **cognitive** S-IVIS



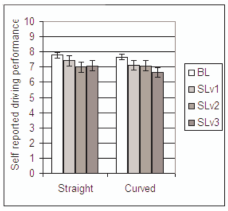
Lateral position variation

The speed decreased when attending to the visual S-IVIS, but not the cognitive

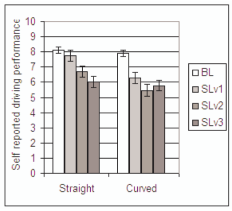


Mean travel speed

Self reported driving performance decreased for both S-IVIS

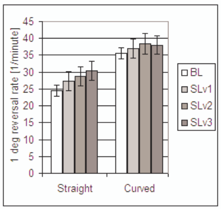


Cognitive

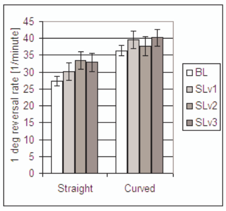


Visual

Steering reversal rate increased for both S-IVIS



Cognitive



Visual

Results - Elderly drivers

- Elderly drivers were worse than average drivers in…
  - managing the trade-off between driving and the S-IVIS
  - driving when attending to the S-IVIS
  - performing the S-IVIS tasks
- Also, elderly drivers were motion sick in the simulator when attending to the visual task

Results – UK Vs Portuguese drivers

- Portuguese drivers exhibited riskier driving behaviours than UK drivers

Conclusions

- Visual distraction leads to problems in lateral control
- Cognitive load leads to gaze concentration and possibly also loss of peripheral information
- Rural road was most diagnostic in simulator and laboratory
- Motorway was most diagnostic in field
- Elderly drivers were exhibited very risky while performing S-IVIS tasks
- The field studies gave some information not found in the other experiments
- Some included measures were very sensitive and reliable. Some were not.

Thank you for your attention

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22 March 2005

WP3, Validation of the HASTE protocol specification

Emma Johansson
Volvo Technology

The objectives of WP3

- Application of the methods devised to evaluating real systems
- Recommendation of a draft of a pre-deployment test regime that is both cost effective and possesses the validity to predict performance

The objectives of WP3

- The safety indicators should be
  - Sensitive
  - Reliable
  - Valid

The objectives of WP3

- Since one of the ambitions in HASTE has been to create a test regime as cost effective as possible the experimental set up in WP3 was greatly reduced, based on the results in WP2, with regard to:
  - No. of participants
  - Scenarios
  - Measures

Dimensions

- 4 real In-Vehicle Systems
  - PDA, navigation systems, simulation of a traffic information system
  - Systems assessed on task level
- Assessment methods
  - Simulator, Laboratory and Field
- Road
  - Rural: Laboratory and Simulators
    - Curved and Straight sections
  - Motorway: Field

Scope

- 7 test sites
- 13 experiments
- Approx. 15-20 participants in each experiment

	LABORATORY	SIMULATOR	FIELD
MINHO	C		
LEEDS	B	B	B
T. CANADA		A, D	
VTT			A, C
VOLVO			A, B
TNO		B	
VTI		A, B	

A-priori ranking

- For each system the tasks were a-priori divided into overall complexity level. This ranking was based on number of modalities, number of button presses and manual difficulty level.

Ex. System A

Description	Modality	Task
Route guidance message incl. arithmetic info.	Auditory	1
Route guidance message incl. arithmetic info. – more information than 1	Auditory	2
Route guidance message incl. spatial info. (turn by turn instructions)	Auditory	3
Route guidance message incl. spatial info. (turn by turn instructions) – more information than 3	Auditory	4
Alter volume	Visual-Manual	7
Change one item in map setting	Visual-Manual	8
Change several items in map settings	Visual-Manual	9
Destination entry – City*	Visual-Manual	5
Destination entry – City, Street*	Visual-Manual	6

* Two out of the nine tasks removed in the field experiments.

Measures

- The most promising measures from WP2
- The Peripheral Detection Task was added as a surrogate to the critical events in WP2

Analysis

- Same ANOVA as in WP2
  - Road complexity
  - Tasks
- Analysis of each experiment
- Meta analysis including all experiments

Results – Effects of Secondary Tasks

- Similar to our results in WP2, the effects from our WP3 experiments are more pronounced for the visual and visual-manual tasks
- Again, somewhat different effects for auditory vs. visual content in tasks. Lack in WP3 – not enough auditory/cognitive tasks

WP 3 results → Test Regime

- A recipe for the user (researcher, system engineer, human factors specialist) on how to conduct his/her safety assessment with regards to:
  - Test environment
  - Scenarios
  - Experimental design
  - Dependent measures
  - Safety criteria

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From results to regime: What have we learned?

Wiel Janssen
TNO Human Factors

Grasping what a set of some 30 experiments has told us

- Applying statistical meta-analysis
- So that we obtain robust results on sensitivity, reliability, and consistency of effects, and their links to safety
- Always in terms of IVIS difficulty level, relative to baseline; and of its modality (vis/vis-man/cogn)

Results of meta-analysis: effect sizes and task type

	Vis	Vis-man	Cogn	
Subj_R	-2.19	-2.49	-0.97	Of own perf.
MN_SP	-0.62	-0.84	-0.54	Mean speed
HI_ST	0.84	0.88	0.71	High-freq. steering
U_HWT	0.98	1.00	0.91	Min. time headway
PDT_HIT	-0.54	-0.84	-0.53	% Correct to PDT
PDT_RT	0.81	0.82	0.60	RT to PDT
PR_C	-2.74	-1.94	0.65	% in center

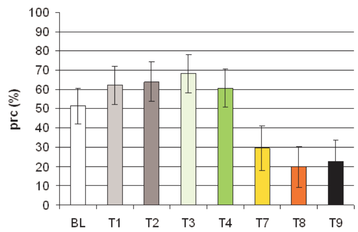
(NB: 0.20 = small, 0.50 = medium, 0.80 = large)

So which one(s) to select?

- That's what we want your opinion on
- (We have our own)
- Luckily enough, there is a lot to choose from
- Is pre-classification of system useful, so to tune selection?

Results: Percent Road Centre

- Example from Volvo's field results on System A
- Task 1-4: auditory, the others: visual-manual



Summary

	Strengths	Weaknesses	Opportunities	Threats
Subjective Rating (Subj_R)	Fast, cheap	Subjective, perceptions of driving performance may not be the same as actual performance	Different rating scales can be developed	Manipulation of data from instructions to participants
Mean Speed (MN_SP)	Easy signal to measure, on-road/sim	Safety interpretation of speed effects - speeding vs slowing down. Speed needs to stabilize to normal level again between tasks.		Slowing down may not be a relevant criterium for classification as unsafe.
Steering (HI_ST)	Easy signal to measure, on-road/sim, relevant			May reflect increased effort or sensitivity to steering error and not necessarily represent a threat to traffic safety.

Summary

	Strengths	Weaknesses	Opportunities	Threats
Minimum Headway (U_HMT)	Relevant	Needs lead vehicle, needs distance sensor	Different rating scales can be developed	Resource demanding in real traffic
Percent road centre (PRC)	Measures perceptual performance, relevant, high face validity, easy to calculate (much easier than glance measures)	Currently expensive hardware, Not calculated in all studies (Haste), needs eye tracker	Can be developed as inexpensive, easy to use tool. Can easily be used in product development.	
Peripheral Detection Task (PDT_RT; PDT_HIT)	Measures perceptual performance and reaction time, relevant, high face validity, easy to calculate	Somewhat intrusive, may effect other measures, Not calculated in all studies and not sufficient statistical reliability (Haste)	Can be augmented with other event detection stimuli	

Practicalities for a regime

- For design stage as well as final assessment
- Number of subjects: only 10-15
- Age between 25 and 50, M&F, sufficient driving experience (10 k annually, at least 5 yrs licence)
- Environment: at least medium-range simulator; rural road type
- Duration per task: about 10 min
- A single baseline ride is required (10 min)
- So full evaluation per system will take about 2 days, not including overall set-up

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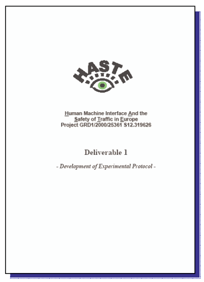
What could happen to the HASTE regime

Oliver Carsten
Institute for Transport Studies
University of Leeds

Choices

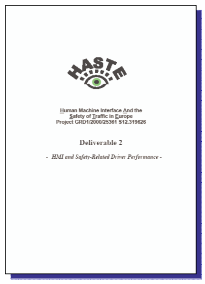
1. HASTE outputs remain as research
2. Enforced by legislation
   a. EU
   b. National
3. Issued as Commission Recommendation
4. Adopted voluntarily perhaps backed up by ISO
5. Used as consumer information (P-NCAP)

Research


Human Machine Interface And the
Safety of Traffic in Europe
Project GRD1/2000/25361 S12.319626

Deliverable 1

- Development of Experimental Protocol -


Human Machine Interface And the
Safety of Traffic in Europe
Project GRD1/2000/25361 S12.319626

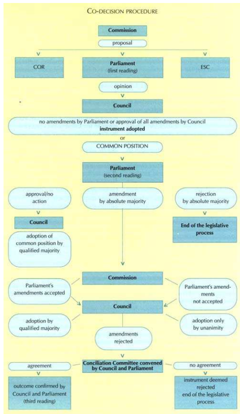
Deliverable 2

- HMI and Safety-Related Driver Performance -

Legislation

- An eventual EU directive was perhaps the original HASTE vision
- *But:*
  - Sets only a minimum threshold
  - Question of which systems have to be tested:
    - »PDAs?
    - »Mobile phones?

Legislation



Commission Recommendation

- Effectiveness?

Voluntary adoption

By whom:

- ACEA?
- CLEPA?

P-NCAP

- Currently vehicles are rated on secondary safety (protection of occupants and pedestrians)
- Plans to add rating on primary safety
- Subgroup on Ergonomics and Driver Assistance

Consumer information — issues

- Pros
  - Allows a range of scores, not just pass/fail
  - Any device (or feature of a device) could be assessed
- Cons
  - Not legally binding
  - Who pays the cost of testing?
  - Would consumers pay attention?

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HASTE - Finnish experiences

Driver's HMI and Govmnt role

Anu Lamberg

Senior Adviser

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Background

- The aim of HASTE was to develop methodologies and guidelines for the assessment of In-Vehicle Information Systems (IVIS).
- There are many standards and guidelines available:
  - In Europe, European Statement of Principles on Human Machine Interface for In-Vehicle Information and Communication Systems as well as TRL safety Checklist for the Assessment of in vehicle information systems.
  - In the U.S., SAE standards, Battelle Guidelines and UMTRI Guidelines.
  - In Japan, JAMA Guidelines.

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Background (2)

- However, the guidelines are too general for the practical work of the industry and traffic safety authorities.
- *The safety relevance of the behavioural indices remains unclear as in almost all cases no proven explicit relationships exist between current HMI indices and accident risk.*

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HASTE approach

- The area of the project was significant and timely - the car has become a potential home to many different types of new systems.
- *There were clear societal needs associated with this project.*

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The objectives of the project were extremely challenging

- To identify and explore relationships between traffic scenarios in which safety problems with an IVIS are more likely to occur
- To explore the relationships between task load and risk in the context of those scenarios
- To understand the mechanisms through which elevated risk may occur in terms of distraction and reduced Situation Awareness
- *To identify the best indicators of risk (accident surrogates)*
- *To apply the methods devised to evaluating real systems*
- *To recommend a pre-deployment test regime that is both cost effective and possesses the validity to predict performance*
- *To recommend an approach for the preliminary hazard analysis of an IVIS concept or design.*
- *To review the possible causes of IVIS safety hazards, including those related to reliability, security and tampering.*

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Results

- HASTE produced a number of important and significant results.
- The results are theoretically and methodologically interesting and should be distributed to be dimlpemented and further developed.
- At the same time, they have practical relevance.
- However, further research and steps are needed to identify quantitative relationships between task load and road traffic risk.

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Finland's role in HASTE

- VTT contributed to the project with extensive field studies.
- The field studies were conducted in three environments, i.e. in urban and rural areas as well as on motorways.
- Both average and elderly drivers were included in the studies.
- The studies produced valuable results, e.g. about the effects of IVIS in urban areas.
- Tool to improve traffic safety in MS Finland and ...

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Government's role and the effects of IVIS

- In-vehicle information and communication systems are designed to improve traffic safety and efficiency – ARE THEY?
- However, it has been recognised that there are potential negative safety effects,
- Knowledge is neede
- From the point of view of the road safety authorities, there is an urgent need for a research-based set of performance standards for in-vehicle human machine interfaces + other steps.

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Government's role and the effects of IVIS

- Awareness rising among all stakeholders: authorities, manufactures
- Public opinion
- Legislation on EU and MS level
- Competition between public transportations and private cars: travelling, working, entertainment
- etc
- THANK YOU!

INDUSTRY NEEDS & INTERESTS
- HASTE FINAL WORKSHOP -

KARIN SVENSSON
VOLVO TECHNOLOGY

BRUSSELS

AGENDA

Introduction
- problem to solve
- challenge
- aim for in-vehicle information systems

Background
- user centered design approach
- iterative and cost efficient development process
- development process
- test environment

Industry needs & interests
- aim of HASTE
- key problems
- requirements on test regime
- requirements on measurements
- what is needed to achive this?

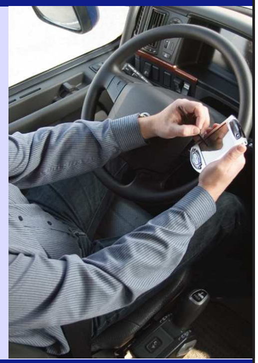
Conclusions

INTRODUCTION

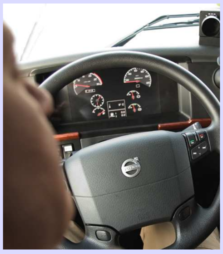
PROBLEM TO SOLVE

CHALLENGE

- Increasing number of functions
  - customer/market push
  - technology push
  - independent systems
  - increased number of functions have both positive and unwanted effects
- Stressful working/driving situation
  - traffic congestion
  - increasing demand on high productivity
- Driver overload



AIM FOR IN-VEHICLE INFORMATION SYSTEMS

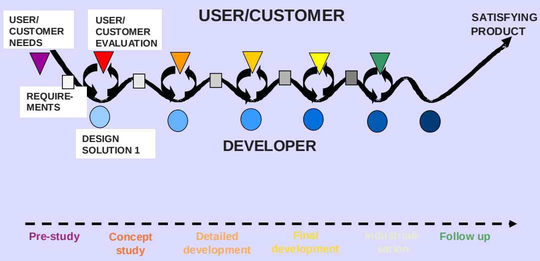


✓ Safe
✓ Reliable
✓ Efficient
✓ High usability
✓ High acceptance

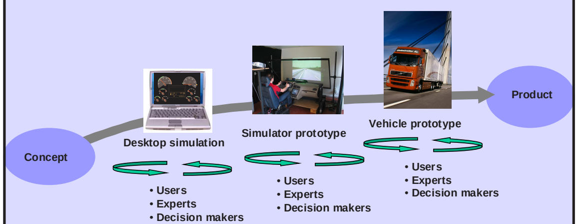
A development process which supports this!

BACKGROUND: DEVELOPMENT PROCESS

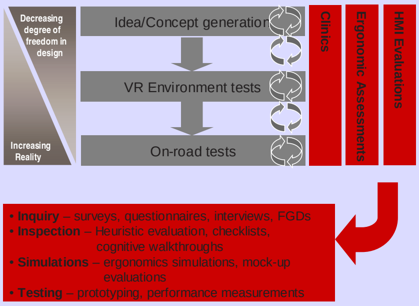
USER CENTRED DESIGN APPROACH



ITERATIVE AND COST EFFICIENT DEVELOPMENT PROCESS



DEVELOPMENT PROCESS



TEST ENVIRONMENT

INDUSTRY NEEDS AND INTERESTS

AIM OF HASTE

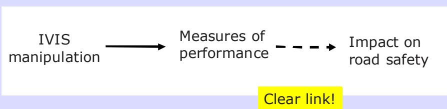
- To develop ***methodologies and guidelines*** for the assessment of In-Vehicle Information Systems (IVIS).
- To present an outline for a ***test regime*** which could be used both throughout the ***design process*** at IVIS manufacturers as weel as in later stages for ***final verification and ceritification***.
- Ideally, the test regime would ***specify methods and tools which would***:
  - ✓ Be technology independent
  - ✓ Have safety-related criteria
  - ✓ Be cost effective
  - ✓ Be appropriate for any system design
  - ✓ Have been validated through real-world testing

KEY PROBLEMS

1. Proliferation of methods, tools and performance metrics

- no consensus on when to use which method, tool and performance metric
- difficult to compare results from different studies
- HMI evaluation studies are costly and requires strong expertise

2. How to infer safety effects from measures of performance



REQUIREMENTS ON TEST REGIME 1(2)

Should support assessment at different stages of development

Formative: Goal to improve design

Summative: Verification, certification

Should allow for testing of different hypotheses

Should take into account system characteristics

REQUIREMENTS ON TEST REGIME 2 (2)

Should be associated with an agreed set of design guidelines (e.g. ESoP)

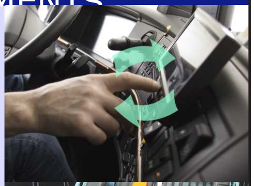
Should specify safety criteria

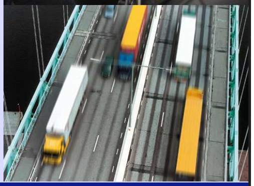
Should be cost-efficient and easy to use

No ”pass or fail” criteria!

REQUIREMENTS ON MEASUREMENTS

- ✓ high validity
- ✓ high reliability
- ✓ sensitive
- ✓ cost efficient
- ✓ simple to use





WHAT IS NEEDED TO ACHIVE THIS?

Better understanding of the effects of individual and combined in-vehicle systems on workload and performance

Better understanding of how driver errors cause accidents
- Not enough to say that 95% of accidents are caused by driver error…
- Difficult to infer the detailed causal chain from accident databases
- Promising approaches
  - In-depth on-site accident studie & incident and conflict analysis (e.g. Swedish national project ”Factors Influencing the Causation of Accidents and Incidents”)
  - Naturalistic field studies (e.g. US 100-car study)

CONCLUSIONS

CONCLUSIONS

Solid, structured and broad review of possible measurements

Positive to the development of cost-efficient and easy-to-use assessment methodologies

Reluctant to pass/fail criteria

Vehicle manufacturers are active in delivering easy to use and safe IVIS

FUTURE WORK AND NEEDS

Continue development of cost efficient and easy to use measurements

Continue development of “final” test regime

to use during development and for verification/certification

better understand the links between criteria and traffic safety

Continue work in i.e. AIDE and ISO groups

THANKS FOR YOUR ATTENTION!