



## Short report on extra seminar on evaluating combinations of functions or systems

Friday 6 February 2009, Schiphol

The full report is to be found on: <http://www.fot-net.eu/>

### Agenda

|                   |               |   |   |
|-------------------|---------------|---|---|
| MORNING SESSION   | 10:00 - 10:30 | Introduction  | <i>Oliver Carsten - FOT-Net</i>                                   |
|                   | 10:30 - 11:00 | In small groups: selection of functions or systems and the expected interaction between them                |   |
|                   | 11:00 - 11:30 | In small groups: formulation of research questions and hypotheses for a combination of functions or systems |   |
|                   | 11:30 - 12:00 | In small groups: define performance indicators  |   |
|                   | 12:00 - 12:30 | Brainstorm on determining base-lines  |   |
| 12.30 - 13.15     |               | Lunch   |   |
| AFTERNOON SESSION | 13:15 - 13:30 | Conclusions and summary of morning discussions  | <i>Yvonne Barnard - FOT-Net</i>                                   |
|                   | 13:30 - 14:00 | Practical constraints in evaluating combinations of systems and functions                                   | <i>Samantha Jamson - EUROFOT</i><br><i>Stig Franzén - TELEFOT</i> |
|                   | 14:00 - 14:45 | In small groups: brainstorm on solutions for practical problems   |   |
|                   | 14:45 - 15:15 | Presentations from small groups and plenary discussion  |   |
|                   | 15:15 - 16:00 | In small groups: formulation of recommendations   |   |
|                   | 16:00 - 16:30 | Plenary discussion and conclusions  | <i>Oliver Carsten - FOT-Net</i>                                   |

## Participants

Most of the 22 participants were involved in a FOT (euroFOT, SeMiFOT, TSS-FOT Telefot, AOS, Regional FOT InCar (V21), and Naturalistic Driving Studies). Most of the participants came from research institutes, but also from car manufacturers and public authorities.

## Work in small groups

In small groups of three participants (the composition changing with each exercise) the following exercises were made:

1. Selection of functions or systems and the expected interaction between them  
Select 3 functions or systems that are combined in a FOT. List 3-5 possible interactions between the functions/systems when they are installed in a car and used by the driver.
2. Formulation of research questions and hypotheses for a combination of functions or systems  
Look at the list with research questions:
  - Is it positive for the environment?
  - Is it positive for safety?
  - Is it negative for efficiency?
  - Do drivers accept it?
  - What is the market potential?
  - What are the future costs and benefits?Individually: select a research question for 1 system and formulate 3 hypotheses per research question  
In your group: Discuss the hypotheses and the interactions between them; if possible, formulate common research questions and hypotheses  
Individually: write 1-3 notes with conclusions, stick them to the large sheet
3. Define performance indicators  
Take combination of systems/functions plus research questions and hypotheses from group 11 and generate as many performance indicators as possible
4. On the flip-charts write pros and cons of different baseline solutions:
  - Control group with all systems off
  - Several control groups with permutations of systems on and off
  - No baseline
5. Formulate solutions to the problems presented  
**Experimental Design Questions**  
**Baseline**  
What is an appropriate baseline when dealing with multiple systems and functions?
  1. Are we interested in comparing a package of systems to driving with no package?
    - Does that mean the baseline should be no package?

2. Are we interested in the influence of one part of the package?
  - Does that mean the baseline should be the package without System X?
3. What happens if different systems are targeted at different driving environments?
  - Do we then need multiple baselines?

#### **Exposure**

How do we measure and control for exposure to a system or combination of systems?

Is it in:

1. Time elapsed (calendar months)
2. Distance driven
3. Number of alerts or warnings from a warning system

What happens if a driver never activates a system?

What happens if a driver never receives alerts from a system?

- Do we need to carry on until he/she has “experienced” the system?

#### **Counterbalancing or not**

How do we take care of:

1. Learning effects
2. Seasonal effects

6. Formulate recommendations

## **Conclusions about generating hypotheses for combined functions/systems**

Defining hypotheses for combined functions/systems is difficult, complex and time-consuming

Hypotheses formulation requires:

- A clear idea of research questions
- System functioning

Probably it should be advisable to follow a 2 step approach:

- 1) identify/list hypotheses per function (isolated)
- 2) and then move to the combination of functions

There may be unexpected interactions between systems despite entirely different functionalities and purposes. Different functions may “hide” each other’s impacts or emphasize them.

Interactions can be divided into:

- user-related interactions
- technical interactions

More hypotheses may emerge when looking at the combination

Categorizing research questions helps to indicate interactions. Research questions should be broad enough to allow the development of both positive and negative hypotheses.

Research questions depend on the viewpoint of the one who asks them.

Hypotheses about combined effects influence the experimental design. Comparison situations may increase/change when more than 1 system is available. Use of long term support may influence use expectations. Long term effects seem to be important, but difficult to specify (and to measure).

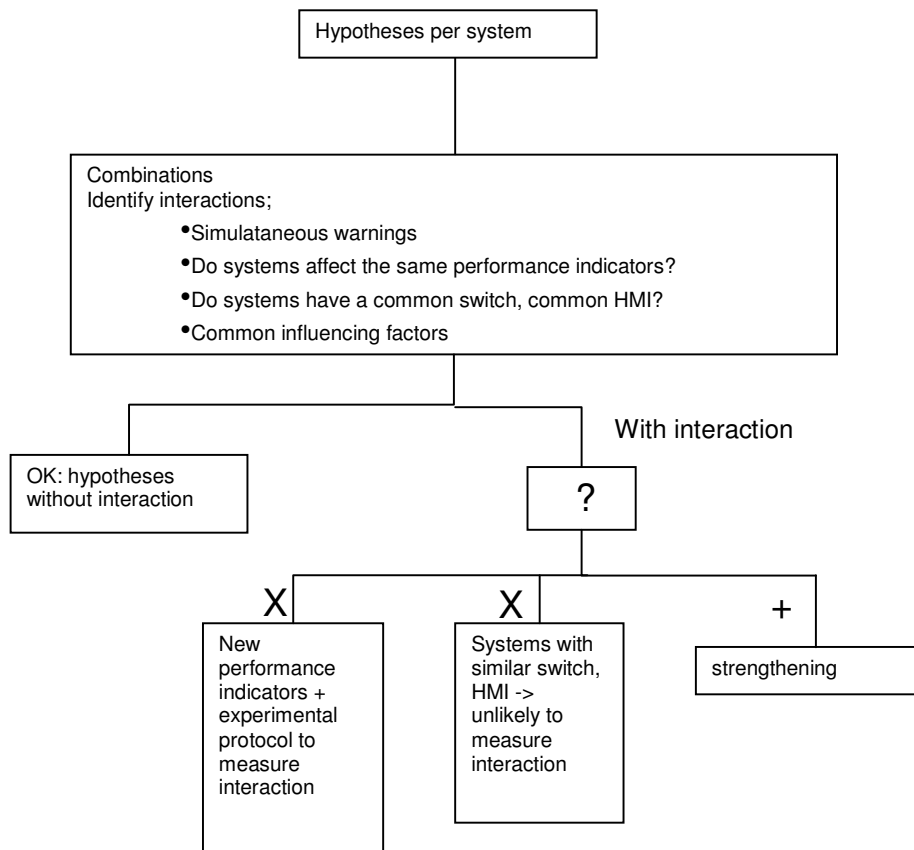
## **A selection of conclusions on the baseline problem**

We discussed different options about the problem on how to establish a baseline in FOTs. The first option was to have a control group with all systems off. Advantages identified were that this allows for a good and easy basis for comparison between groups and brings robust results. Some disadvantages are that it is hard to find a representative control group, which also drives in similar conditions, and that it may be hard to keep this group motivated and be sure that the systems are really off all the time. Another option is to have no baseline at all. Some advantages are that the FOT becomes easier, quicker and cheaper to perform, but some disadvantages are that it is impossible to assess the impacts of the systems/functions. The third option was having several control groups with permutations of systems on and off. Advantages are that this option brings more information, the different interactions may be measured, and the effects of different systems can be separated and (in)compatibilities identified. However, disadvantages are that the FOT will need more resources and becomes more complex. Some alternatives for these options are: comparing experimental groups of drivers with the different combinations with one group that has the possibility to put systems on and off, having a group with the permutations of systems off and on over time, using data from other studies to get information about some of the effects, and using data from naturalistic driving studies as a baseline.

## **Recommendations**

When deciding what tests to do in a FOT, what experimental set-up to follow and what hypotheses to test, it is necessary to find the right balance between:

- Costs and price
- Science and practicality
- Research questions and hypotheses and combinations
- Prioritizing of research questions and hypotheses
- Detailed analysis of hypotheses, events and performance indicators
- Combine the hypotheses of the single systems to generate those for the bundle of applications
- Test development of a first “rough” experimental design; iterative process in order to improve the rough design during the next steps (loops) -> FOT-loop



## Conclusions

The day was interesting and highly interactive. Work in the small groups of three participants, in changing combinations, was intensive. Participants rated the sessions as good and useful. Many of them want to apply the results in their own FOT.

Although the topic of evaluating combined systems/functions is a complex one, we succeeded in coming up with ideas for approaches and recommendations to address the challenges. Although, as one participant noted on his or her evaluation form: "One always wants more answers". The outcomes of this day will be reflected later on in the FOT-Net project in the form of an addition to the FESTA methodology.