A SUBJECTIVE FIELD TEST ON LANE DEPARTURE WARNING FUNCTION - EUROFOT

Gianfranco Burzio, Roberto Tadei, Leandro Guidotti

Centro Ricerche Fiat, Politecnico di Torino, Univ. Modena-Reggio Emilia
The EuroFot project

- Perform multiple coordinated tests of Intelligent Vehicle Systems with ordinary drivers in real traffic
- Investigate performance, driver behaviour and user acceptance
- Assess the impacts on safety, efficiency and the environment, based on road data

Italian test is focused on Lane Departure Warning, with a large subjective experimental test
FOT phases

1. Specification & piloting
   Preparation of fleets
   - Selection criteria:
     - Fleet / private age
gender
profession
   - ACC
BLIS
FCW
IW
LDW
SafeHMI
CSW & AFL
SL
FEA

2. Execution of FOT
   - Customer is driving everyday routes
   - Datalogger will be installed in vehicle
   - Data specification:
     - CAN, Video and other sensors, time resolution, format, GPS or matched streets
   - Data collection:
     - On-the-fly transmission (GPRS & UMTS)
     - Data Pick-Up

3. Impact assessment
   - Data analysis, evaluation and report
   - Socio-economic CBA
Field Operational Test

The F.O.T. Chain

Implementation Plan

Function identification and description

Use Cases

Research Questions and Hypotheses

Performance Indicators

Study design

Measures and Sensors

Data Acquisition

Data decoding

Ethical and Legal Issues

Database

Socio-Economic Assessment

System and Function Analysis

Research Question and Hypotheses Analysis

Data Analysis

Measures

Performance Indicators

Transport Research Arena Europe 2010, Brussels
The Lane Departure Warning function

The Lane Departure Warning (LDW) is available as optional on the new Lancia Delta and provides the feedback to the driver through a torque applied on the steering wheel as soon as the driver is going close or overcome a lane border unintentionally.

No warning is issued if the turn indicator has been activated or if the manoeuvre is clearly intentional.

The device warns also the driver, acoustically, when it detects that he/she has not the hands on the steering wheel.
**Hypothesis to be verified**

LDW decreases/mitigates lateral incidents, near-crashes, and accidents
LDW influences lateral driving performance
LDW increases the use of turn indicators in lane change situations
LDW increases usage more and more over time
LDW increases night driving
LDW warning leads to an appropriate driver reaction
LDW is well accepted by the driver
LDW acceptance/adopteron increases with LDW usage
Questionnaires

Five questionnaires are planned for customers of new Lancia Delta with Driving Advisor:

1. After the order but before vehicle availability: driver characteristics and preliminary risk assessment.

2. After few weeks of vehicle use, initial feedback.

3, 4. After periods of use of the vehicle, three months.

5. Final questionnaire, new risk assessment.

Customer could also report specific events, when the device has been useful (or not) to avoid dangerous situations.
**Event register**

Used to allow subjects to easily inform about important “events” happened during the use (or not) of the LDW.

It is asked to keep this module (a small book with several copies of them) in the car, and to compile the module as soon as possible after the event.

The module is very simple and could be filled in less then a minute.
# Field Test Plan

**Pilot test:** 10-20 customers  
**Test group:** 250-350 customers  
**Control group:** 150-250 customers (Lancia Delta w/out LDW)

<table>
<thead>
<tr>
<th>Activity</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Draft Questionnaires</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pilot Test</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Final Questionnaires</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Customers selection</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Field Test</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Questionnaires Analysis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Results</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Transport Research Arena Europe 2010, Brussels
## Pilot test

<table>
<thead>
<tr>
<th><strong>Piloting tests start</strong></th>
<th>October 2009</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of vehicles in Piloting tests</strong></td>
<td>10 vehicles with LDW. 10 vehicles without LDW as piloting Control Group.</td>
</tr>
<tr>
<td><strong>Piloting drivers recruited from</strong></td>
<td>New owners of Lancia Delta equipped with Driving Advisor optional feature (LDW system).</td>
</tr>
<tr>
<td><strong>Duration of Piloting test</strong></td>
<td>3 months. Submission of introduction questionnaire and some periodical questionnaires to test core items.</td>
</tr>
</tbody>
</table>
Outcome of the pilot test

- Questionnaires validation
- Understandability and Comprehension
  - on items wording
  - on translation
- VMC procedures setup
- Online tool setup
- Incentives
Database tool

- For questionnaire analysis a specific tool has been developed
- Answers are “digitalised” by Eurofot operators
- The same tool will be used for several VMC activities, for example reminders
Limesurvey tool

- The same tool could be used by the subject to answer to the questionnaires directly online.
- This will reduce the possibility of errors, since the answers are directly entered in the database.
- Also reminder activities will be simpler (by email).
- This tool has been extended also to another FOT.
Status of the FOT (May 2010)

- After few months about 250 customers have been contacted
- About 150 have accepted to participate to the FOT
- Others 500 will be contacted to be part of the control group (without the system, target 150-200)
- Extension to IVECO STRALIS drivers under consideration (German market, about 300 potential subjects)
Conclusions

Understand the impact of LDW with respect to several aspects:

- perceived safety;
- usefulness;
- acceptance;
- comfort;
- driving behaviors;
- subjective mental workload.

Given the huge sample to be collected (500 drivers, 2500 questionnaires), this assessment would offer to OEM’s, stakeholders and researchers the possibility to consider the results of this analysis extendable to the drivers’ universe as a whole.
Thanks for the attention

Gianfranco Burzio
European Network Product Research
Centro Ricerche Fiat
gianfranco.burzio@crf.it

Joint work with:

Guido Perboli, Roberto Tadei - Politecnico di Torino

Leandro Guidotti, Roberto Montanari, Francesco Tesauri
Università di Modena e Reggio Emilia

Renato Miceli, Michele Settanni - Università di Torino