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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

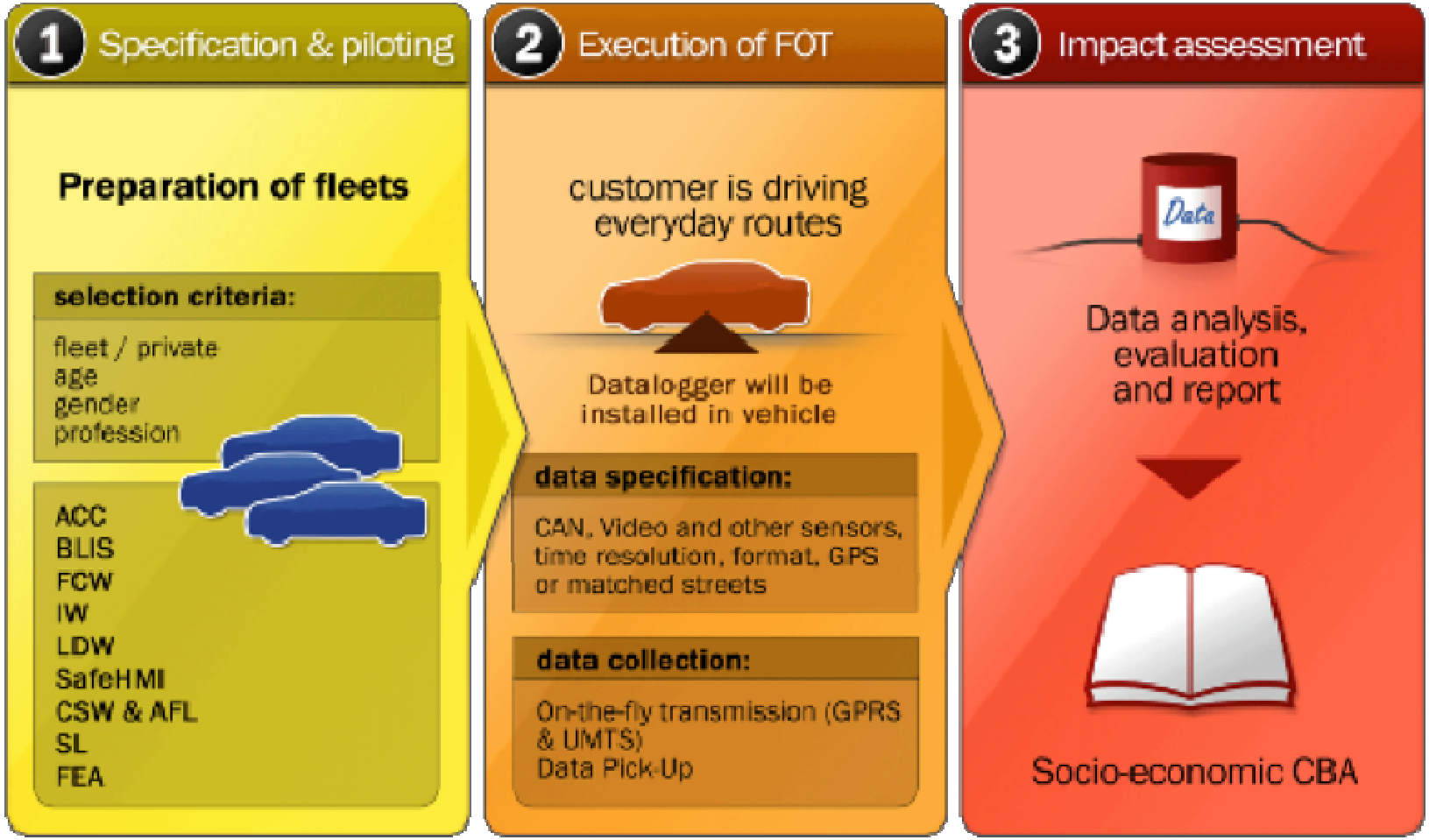
The EuroFot project

- 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

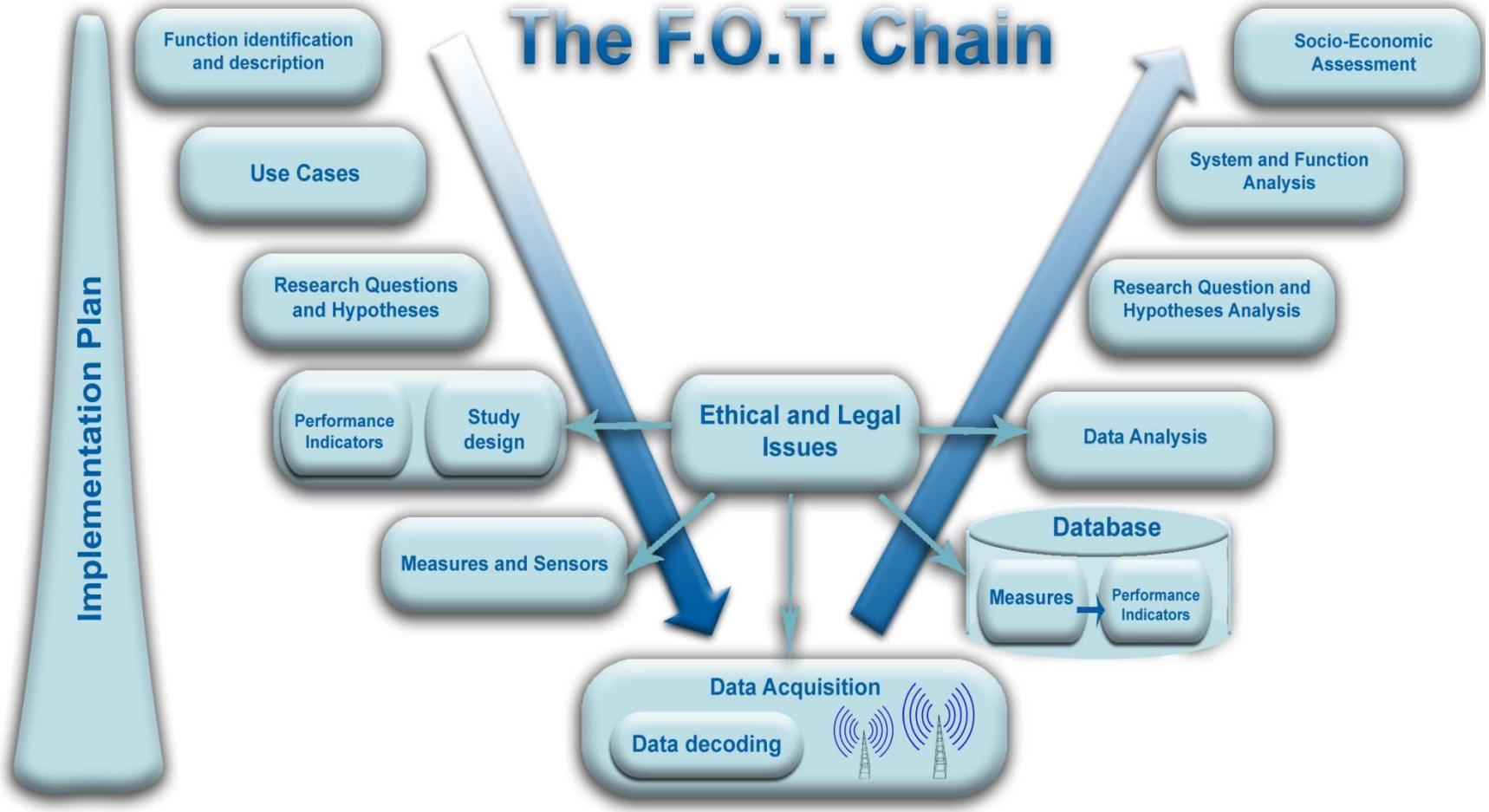
Italian test is focused on Lane Departure Warning, with a large subjective experimental test

SEVENTH FRAMEWORK PROGRAMME

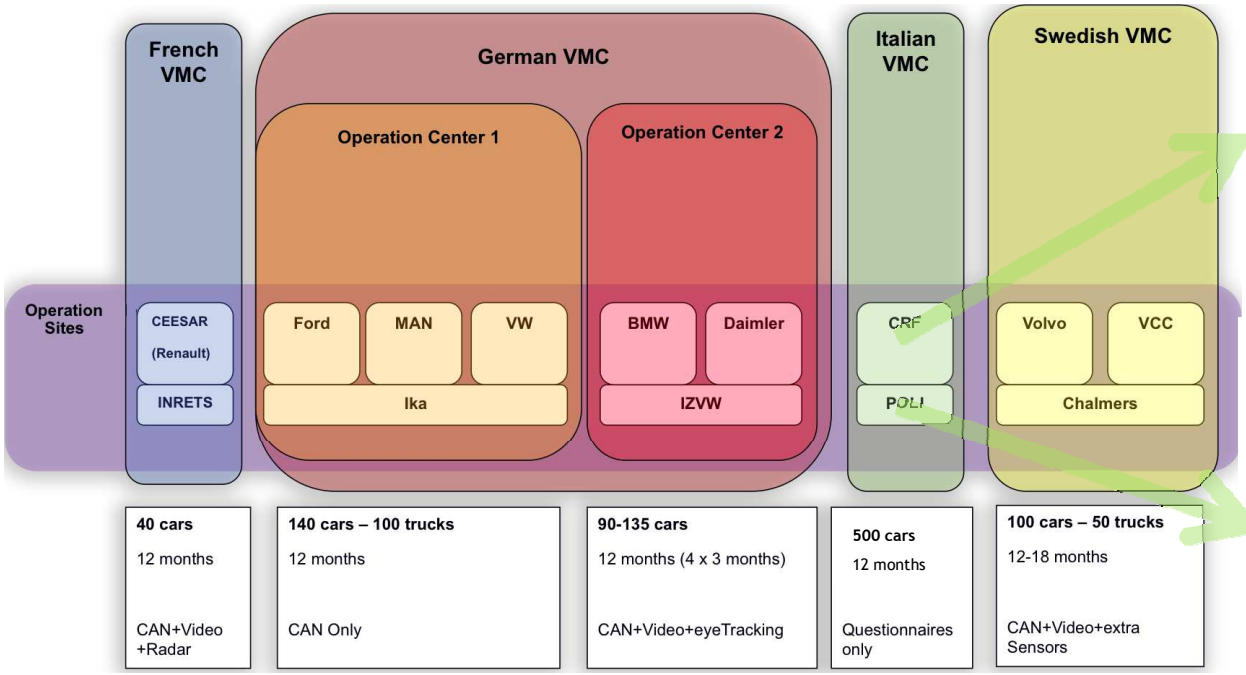
FOT phases


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
Data analysis, evaluation and report
Socio-economic CBA

Field Operational Test



Vehicles Management Centres



CRF CENTRO RICERCHE FIAT

POLITECNICO DI TORINO 1859 1906

UNIVERSITÀ DEGLI STUDI DI MODENA E REGGIO EMILIA

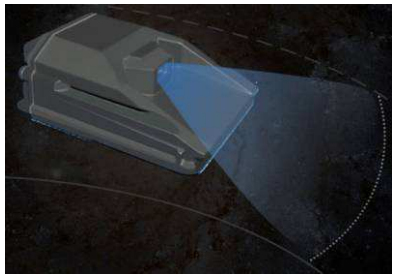
UNIVERSITÀ DEGLI STUDI DI TORINO
ALMA UNIVERSITAS TAURINENSIS

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

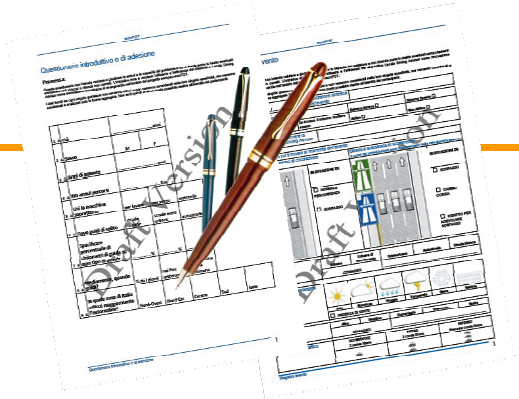
LDW increases night driving

LDW warning leads to an appropriate driver reaction

LDW is well accepted by the driver

LDW acceptance/adoption increases with LDW usage

Questionnaires



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

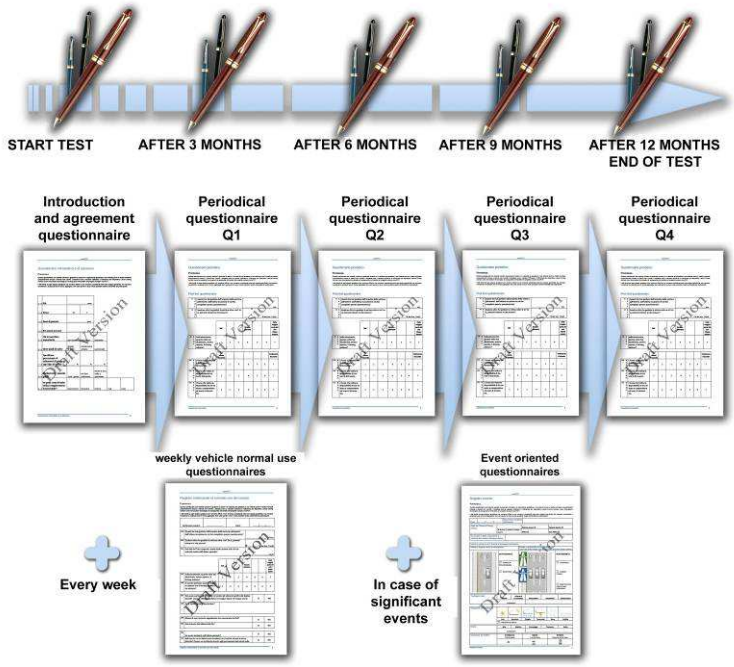
1. After the order but before vehicle availability: driver characteristics and preliminary risk assessment.

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.

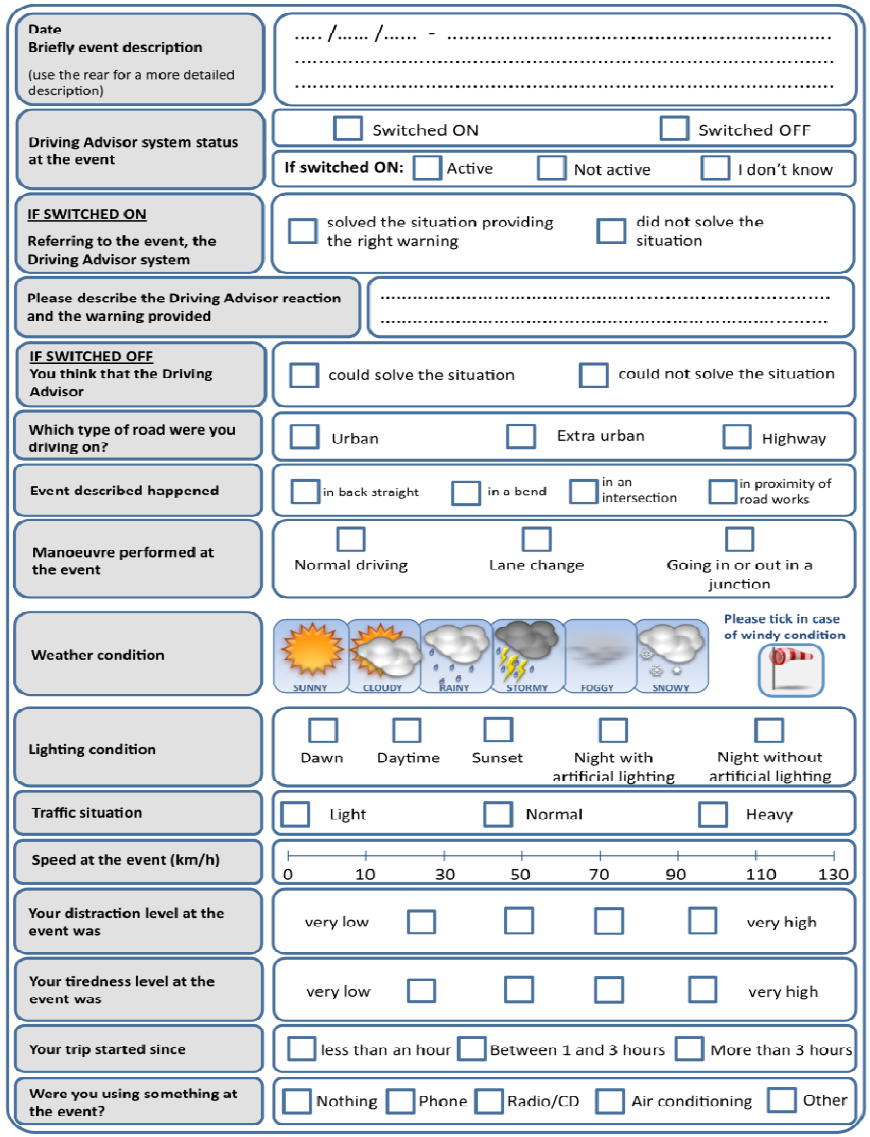


Event register

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.



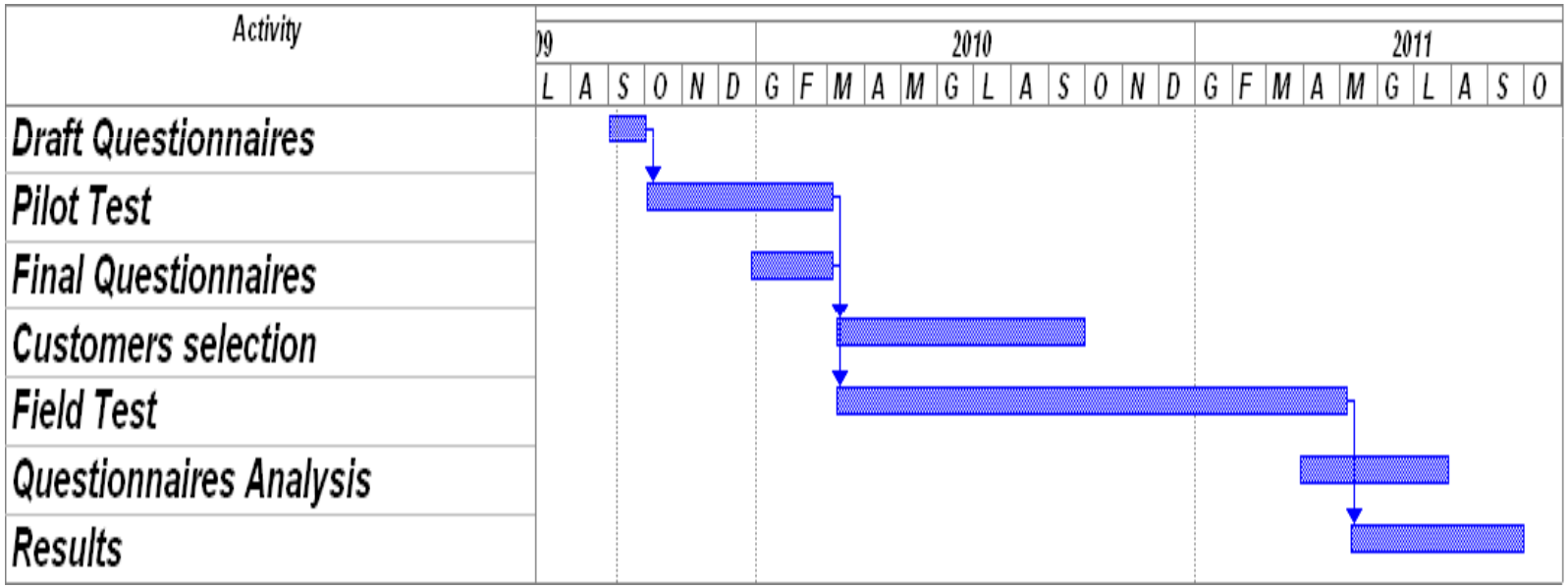
Date **Briefly event description** (use the rear for a more detailed description)	..... /..... /..... - ....
Driving Advisor system status at the event	☐ Switched ON ☐ Switched OFF **If switched ON:** ☐ Active ☐ Not active ☐ I don’t know
IF SWITCHED ON **Referring to the event, the Driving Advisor system**	☐ solved the situation providing the right warning ☐ did not solve the situation
Please describe the Driving Advisor reaction and the warning provided	....
IF SWITCHED OFF **You think that the Driving Advisor**	☐ could solve the situation ☐ could not solve the situation
Which type of road were you driving on?	☐ Urban ☐ Extra urban ☐ Highway
Event described happened	☐ in back straight ☐ in a bend ☐ in an intersection ☐ in proximity of road works
Manoeuvre performed at the event	☐ Normal driving ☐ Lane change ☐ Going in or out in a junction
Weather condition	SUNNY CLOUDY RAINY STORMY FOGGY SNOWY **Please tick in case of windy condition**
Lighting condition	☐ Dawn ☐ Daytime ☐ Sunset ☐ Night with artificial lighting ☐ Night without artificial lighting
Traffic situation	☐ Light ☐ Normal ☐ Heavy
Speed at the event (km/h)	0 10 30 50 70 90 110 130
Your distraction level at the event was	very low ☐ ☐ ☐ ☐ very high
Your tiredness level at the event was	very low ☐ ☐ ☐ ☐ very high
Your trip started since	☐ less than an hour ☐ Between 1 and 3 hours ☐ More than 3 hours
Were you using something at the event?	☐ Nothing ☐ Phone ☐ Radio/CD ☐ Air conditioning ☐ Other

Field Test Plan

Pilot test: 10-20 customers

Test group: 250-350 customers

Control group: 150-250 customers (Lancia Delta w/out LDW)

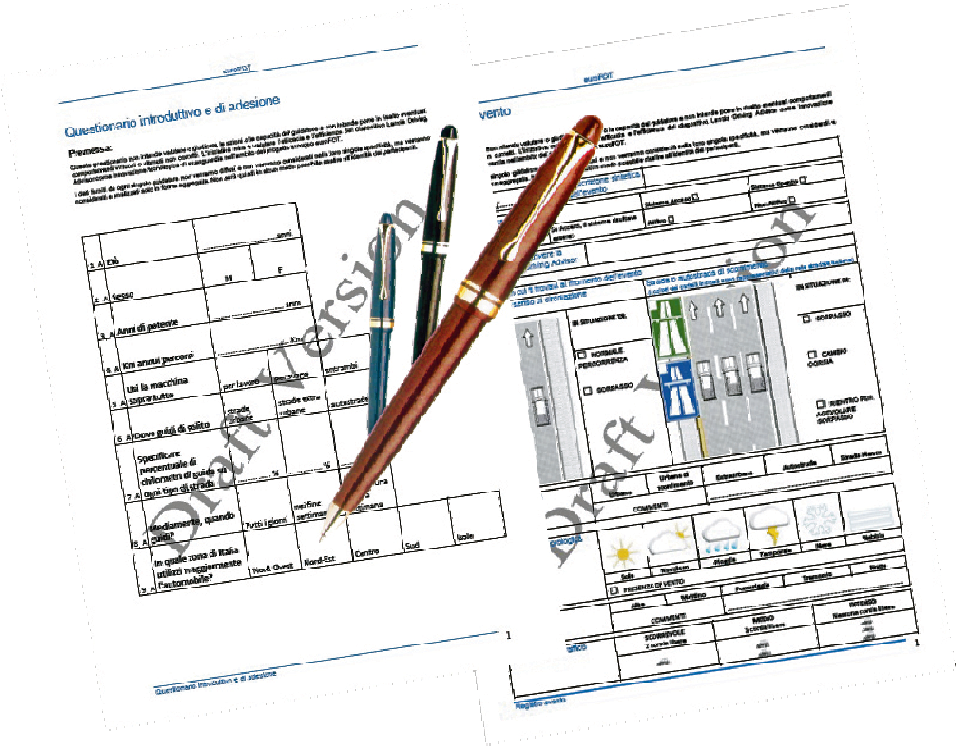


Pilot test

Piloting tests start	October 2009
Number of vehicles in Piloting tests	10 vehicles with LDW. 10 vehicles without LDW as piloting Control Group.
Piloting drivers recruited from	New owners of Lancia Delta equipped with Driving Advisor optional feature (LDW system).
Duration of Piloting test	3 months. Submission of introduction questionnaire and some periodical questionnaires to test core items.

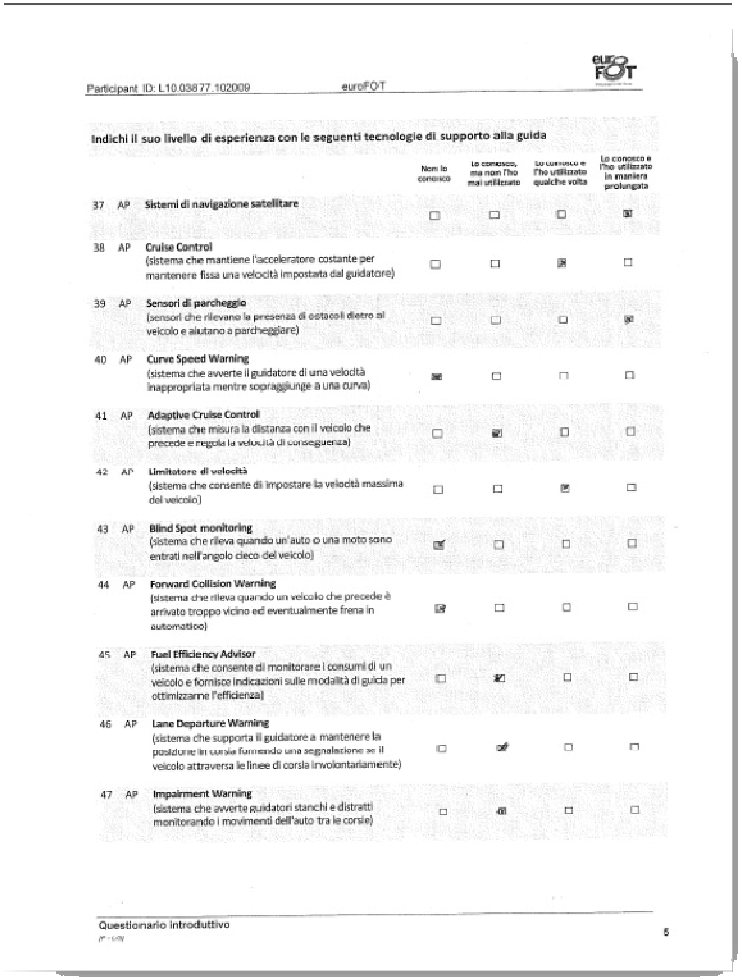
Outcome of the pilot test

- 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



Participant ID: L10 038 77 102009 euroFOT

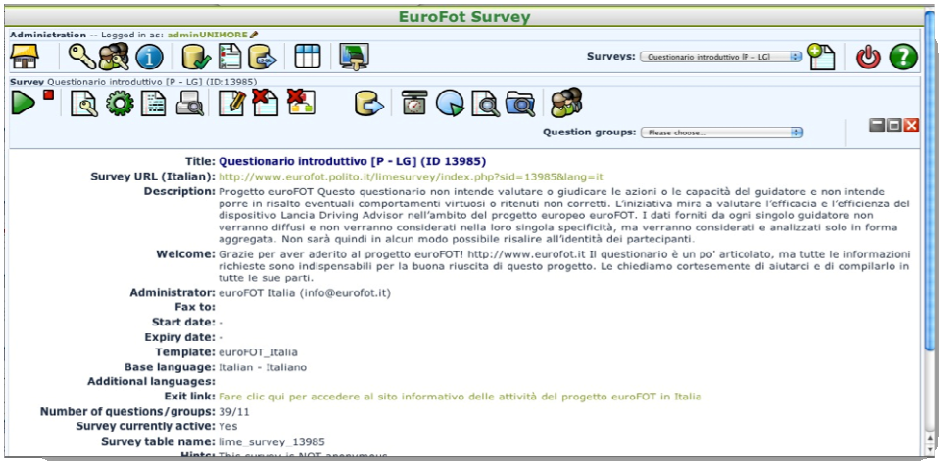
Indichi il suo livello di esperienza con le seguenti tecnologie di supporto alla guida

			Non la conosco	Lo conosco, ma non l'ho mai utilizzato	Lo conosco e l'ho utilizzato qualche volta	Lo conosco e l'ho utilizzato in maniera prolungata
37	AP	**Sistemi di navigazione satellitare**	☐	☐	☐	☒
38	AP	**Cruise Control** (sistema che mantiene l'acceleratore costante per mantenere fissa una velocità impostata dal guidatore)	☐	☐	☒	☐
39	AP	**Sensori di parcheggio** (sensori che rilevano la presenza di ostacoli dietro al veicolo e aiutano a parcheggiare)	☐	☐	☐	☒
40	AP	**Curve Speed Warning** (sistema che avverte il guidatore di una velocità inappropriata mentre sopraggiunge a una curva)	☒	☐	☐	☐
41	AP	**Adaptive Cruise Control** (sistema che misura la distanza con il veicolo che precede e regola la velocità di conseguenza)	☐	☒	☐	☐
42	AP	**Limitatore di velocità** (sistema che consente di impostare la velocità massima del veicolo)	☐	☐	☒	☐
43	AP	**Blind Spot monitoring** (sistema che rileva quando un'auto o una moto sono entrati nell'angolo cieco del veicolo)	☒	☐	☐	☐
44	AP	**Forward Collision Warning** (sistema che rileva quando un veicolo che precede è arrivato troppo vicino ed eventualmente frena in automatico)	☒	☐	☐	☐
45	AP	**Fuel Efficiency Advisor** (sistema che consente di monitorare i consumi di un veicolo e fornisce indicazioni sulle modalità di guida per ottimizzarne l'efficienza)	☐	☒	☐	☐
46	AP	**Lane Departure Warning** (sistema che supporta il guidatore a mantenere la posizione in corsia fornendo una segnalazione se il veicolo attraversa le linee di corsia involontariamente)	☐	☒	☐	☐
47	AP	**Impairment Warning** (sistema che avverte guidatori stanchi e distratti monitorando i movimenti dell'auto tra le corsie)	☐	☒	☐	☐

Questionario introduttivo

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 tools 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