OPERATIONAL RESULTS AND CONCLUSIONS OF THE FOT EXECUTION PHASE OF EUROFOT EUROPEAN LARGE SCALE FIELD OPERATIONAL TEST

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ABSTRACT

During the last three years, the integrated project euroFOT co-financed by the European Commission has been organising the first large scale European Field Operational Test (FOT) evaluating Advanced Driver Assistance Systems (ADAS). More than 950 cars with around 1200 drivers in six countries are currently monitored.

The purpose of the paper is to show and demonstrate the execution of the recommendations, guidelines and actions previously defined for the operation of the Vehicle Management Centres (VMCs), which are responsible for the Field Tests inside euroFOT.

The present paper provides details on the driver and vehicle acquisition procedures and on the installation of the selected data loggers and data acquisition systems into the vehicles underlining the list of lessons learned after having started the experimental phase of the project, in particular regarding some differences between the initial plans and the implemented procedures.

The basis of the paper is the deliverable D5.2 of the Integrated Project euroFOT, a large scale European Field Operational test in which vehicle manufacturers, automotive suppliers, institutes and other stakeholders have joined forces in a "smart drive" to test various intelligent in-vehicle systems across Europe, with the aim of making our road transport safer, more efficient, and more comfortable.

INTRODUCTION

The European Integrated Project euroFOT (FP7) aims to establish a comprehensive, technical, and socio/economic assessment programme for evaluating the impact of intelligent vehicle systems on safety, the environment, driver efficiency. The project is assessing several technically mature systems using vehicles that include both passenger cars and trucks across Europe.
A variety of intelligent vehicle systems (IVS) are being tested on a large scale in real driving conditions. Some 1500 IVS-equipped vehicles will be driven over the course of one year, tested on roads across Europe.

The objectives of the testing are to:

- Assess various aspects of in-vehicle systems, such as their capabilities and performance, and the driver’s behaviour and interactions with those systems
- Gain a better understanding of the short- and long-term socio-economic impact of such systems on safety, efficiency and driver comfort
- Provide early publicity of the systems to the consumer and create wider acceptance of them

The results of euroFOT are expected to be a major contributor to the processes of deploying ICT systems for transport across Europe. The insights gained during the project will help policymakers decide on the right policy framework, and business leaders to make informed decisions on the best way to bring these technologies to the market.

**ORGANISATION OF THE VEHICLE MANAGEMENT CENTRES WITHIN THE PROJECT**

![Figure 1 Operational structure of euroFOT](image-url)
The different Vehicle Management Centres are divided as follows:

French VMC: CEESAR (Renault) with INRETS (LIVIC)

German VMC:
   German VMC – Operation Centre 1: VW/AUDI + FORD + MAN, all with IKA
   German VMC – Operation Centre 2: Daimler (DAI) + BMW, both with IZVW

Italian VMC: Centro Ricerche Fiat (CRF) with Politecnico di Torino (POLI)

Swedish VMC: Volvo Technology (VTEC) + Volvo Cars (VCC), both with Chalmers
LOGGING DEVICES

Many different logging devices had been used:

CTAG datalogger 2 by the French VMC, the German VMC Operation Center 1 (Ford, MAN, VW) (see figure)

Figure 2 CTAG datalogger 2

The German VMC Operation Centre 2 (BMW and Daimler) has decided to develop their own data logger system (see figures)

Figure 3 BMW datalogger unit

Figure 4 BMW datalogger's storage unit
The Swedish VMC decided to use the NexCom VTC6100 which is an automotive grade PC solution (see figure).
DRIVER ACQUISITION

Several different approaches were considered and used:

- Direct customer contact through car dealers (Ford, Italian VMC, French VMC)
- Direct customer contact through fleet operators (VTEC, MAN)
- Direct customer contact proposing car leasing with reduced leasing fee as incentives (Daimler, BMW)
- OEMs own fleet with employees (VCC)

Each solution had advantages and inconveniences: the dealerships of the different car manufacturers provided an efficient way to deal with the recruitment as they are in contact with the customers having the necessary means and experience to deal with them.

LESSONS LEARNED

Development, planning

Tested functions with low market penetration need strong marketing effort since the beginning of the project. This involves direct involvement of the car manufacturer's marketing department: with their direct support the identification of the users is quicker, simpler and more efficient.

OEMs participation is needed while establishing the experimental design and the recruiting policy. As the OEMs and their marketing department have direct information about their customers it is obvious that they can help the Filed Operational Tests' management to identify and to develop the most appropriate methods.

Organisation

The VMC has to be the central element in the project organisation. The VMCs structure gives considerable independence on the execution of the FOT operation. This may also help splitting the project into smaller FOTs (subprojects) which could make sense in cases where each subproject studies one function only or use different methodology or apply different acquisition method.

Regular face-to-face meetings at the VMCs turned out to be a very effective tool to synchronize development and management efforts. In addition to this the meetings help to understand the difficulties in a very heterogenic test environment and provide a common platform of discussion for the consortium members.
Legal and ethical issues

The product's warranty of the automotive manufacturer (is void if a customer connects unauthorized equipment to the vehicle) should be discussed prior the recruitment process to avoid later issues with the participants vehicles. Several months should be planned to clear all issues involving the legal department of the car manufacturers. Once a solution is established by the legal departments these should be implemented and used during the recruitment process. Participants should be informed.

Because of the privacy issue of the video recordings, many drivers had doubts about giving their permission in consent forms. Clear communication is necessary with the recruited drivers explaining the use of the recorded videos and the publication of the results.

The ownership and the future use policy of the gathered data should be defined in very early stage of the project.

Piloting related issues

The piloting phase as one of the most critical part of the project should be scheduled much longer in order to test all aspects of the tests including recruitment procedures, hardware and software issues. It should consider the testing of all FOT related procedures: driver and vehicle recruitment, incentives, questionnaire handling, data gathering and uploading, data pre-processing, equipment installation and de-installation.

Pilot tests must start after most of the technical issues were settled and resolved as well as after having all organizational procedures have been developed and deployed. It is important to understand that the pilot phase should test the whole experimental design of the FOT and not only the physical implementation of the test equipment. Thus the pilots should provide feedback concerning the whole experimental design and the practical issues.

Driver recruitment and vehicle acquisition

The driver recruitment procedure should be made in close cooperation with the marketing and sales departments of the OEMs. They have all the necessary tools and experience to identify and to handle vehicle customers. In addition to these contact materials such as leaflets, brochures, videos for drivers recruiting are very important to maximize response rate and to keep the participants motivated to follow the project until the end of the tests. For this it is very important to communicate the goal of the whole project during the recruitment campaign using the available dissemination materials, communication channels (newspaper articles, TV spots, interactive web sites with news flash service, etc.).

The driver recruitment and the necessary technical modifications on the vehicles should be defined prior the pilot tests as these have big impact on the availability of participants. The pilot will then provide feedback on the efficiency of the selected recruitment methods and the complexity and time consumption need of the technical modification. With the result of the pilot these may be adjusted to better answer to the needs and requirements of the field
operational tests. A solution is to use car manufacturer owned vehicles used by the their employees which made the installation of the test equipment much easier than in case of the customer cars recruited either by the dealerships or by the marketing department of the OEM.

The use of customer vehicles is acceptable only for CAN data logging, because for additional sensors and high-end data logging the effort is too high and the modifications are unacceptable for normal customers. Considering a new vehicle model for field operational test, recently released by OEMs, should only be made if the production vehicles are already available before the pilot phase.

In case of low take rates of features to be tested large efforts are needed to reach geographically widespread participants. Because of the large effort need a multiple approach may be applicable: OEM's market department, fleet operators, dealerships. Contacting big dealerships may be useful to reach lots of customers reducing time of communication and facilitating installation efforts while small dealerships might have more direct contact to motivated customers which may results fewer dropouts.

Common international driver recruitment coordination can however improve sample representativeness for European driving population as a whole.

Financial issues: incentives and the related taxation represent also an important point. Because of the heterogenic legal (and taxation) environment all VMCs had to deal with the incentives payment independently. There was no common solution. Some operation site used reduced leasing fee, some used fuel vouchers, etc. Where incentives are given in cash, tax-regulations have to be considered. Also the amount of work involved to find the appropriate accounting procedure is considerable. In addition to this the planned amount of incentives was not enough motivating it has to be calculated much higher.

The cost of cabling can include connectors which are not available in small quantities, thus rather small parts of a cabling cost much.

**Subjective data gathering**

The subjective data gathering of the FOT is also an essential part providing the vision of the participants on the tested systems. To achieve high answer rate it is very good to duplicate or offer multiple options for filling in questionnaires (i.e. hard copy and electronic copy). It is very important to develop and improve a web-based survey tool for data collection in order to save time and prevent data transcription mistakes. An other way to increase the answer rate is to centralize the subjective data gathering implementing a multilingual data collecting tool which can be is very useful in order to simplify global subjective data collection.

During the preparation of the questionnaires which are to be used in different countries, the translations and related validation should be done from the very first draft.
**Hotline, driver liaison**

During the FOT operation phase the driver contact turned to be crucial: hardware and software issues can be solved quickly if the VMC has proper driver liaison procedure and an organisation implementing these procedures: introducing the “customer care centre” of the dealerships is very recommendable, due to the professional customer handling capabilities.

It is very important to get in touch frequently with drivers, in order to ensure data collection, but this has to be done on case by case, since some driver could be disturbed by this.

**CONCLUSION**

In euroFOT the project was managing a very heterogeneous test environment with many vehicle types, several selected dataloggers, many tested functions and their various combinations. The geographical distribution of the operation sites and as consequence the different legal environments led to a very complex situation to deal with.

The project participants were successfully resolved these issues and are running a large scale field operational test while the experiences and findings will be transformed to recommendations and guidelines which may be eventually used as feedback in the updating process of the FESTA methodology which was the major source of guidelines used.

**REFERENCES**

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