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Report on eCall Large Scale FOT

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LIST OF ABBREVIATIONS

ABBREVIATION	DESCRIPTION
ND	Nomadic Device
PSAP	Public Safety Answering Point
ICT	Information and Communication Technologies
SDIS	Service Départemental d'Incendie et de Secours
GPRS	General packet radio service
WSDL	Web Service Description Language
LFOT	Large Field Operational Test
PSA	PSA Peugeot Citroën
IVS	in-vehicle systems
SMS	Short Message Service
UML	Unified Modelling Language

REVISION CHART AND HISTORY LOG

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5.0	30 August 2012-08-30	Updated version
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EXECUTIVE SUMMARY

The LFOT conducted at French test site emphasized on eCall function by using in-vehicle Nomadic Devices (NDs) in order to test its benefits, usability and impact on users' behavior as well as their expectations. With the collaboration of public or private associated partners, 233 NDs (DANEW GS 410 and Tablet) were distributed to drivers from "Alsace and Franche-Comté Regions" in order to conduct the field operational test for the eCall function. In France, the responsible of eCall processing (number 112) is the Service Départemental d'Incendie et de Secours (SDIS), it takes in charge of call reception, processing and dispatching towards other required intervention. It is important to note that the SDIS 70 (Haute Soane, Franche-comte region) has been actively involved directly in TELEFOT for real LFOT testing. Salesmen (mobile commercial sales representatives), which are using intensively vehicles on roads, have been also participated to the eCall testing.

Initially, the LFOT setup and execution was divided into four stages. In the first stage, we decided to study, plan, design, schedule, and analyze user needs and expectations for the LFOT. In the second stage, we targeted to study current eCall systems such as communication channel, application development tools, and openness of the available NDs, and develop the eCall platforms that have been used for real experiments. The third stage concerns tests' environment with eCall and gathering the data. The final stage involved the evaluation and analysis of the data collected during the previous step.

The LFOT has emphasized the following points:

- Development effort of the application on two ND platform (Mobile CE and Android) as well as the server application for receiving data from NDs and visualize them on GoogleMap.

- Investigated the direct implementation of QUALCOMM in band modem requires customized smartphones.

- Conduct real experiments by involving the public service in charge of eCall 112 number to the tests that reports e-call corresponding to real accidents.

The outcome of the French test site is a data set that is used to answer the research questions and prove/disprove the hypothesis made during the initial stages. Research questions concern mainly usability such as change in users' acceptance and affordability over time, effect of the design of devices, users' age, gender, and experiences. In order to answer these research questions, we have used: 1) data generated from NDs (e.g., GPS position, event type and

description) and stored in French TeleFOT server, and 2), data provided by participants via the developed web based questionnaires that are related to user background and acceptance (before, during, and after the LFOT execution). For example, the usage of Call/Alert functions was mostly in accordance with participants' experience and age, e.g., elder people considered that eCall/Alerts are useful. Results also showed that there is significant increase in assessment of usefulness and satisfaction over time.

1. INTRODUCTION

TeleFOT is a Large Scale Collaborative Project under the Seventh Framework Programme, co-funded by the European Commission DG Information Society and Media within the strategic objective "ICT for Cooperative Systems.

Officially started on June 1st 2008, TeleFOT aims to test the impacts of driver support functions on the driving task with large fleets of test drivers in real-life driving conditions.

In particular, TeleFOT assesses via Field operational Tests the impacts of functions provided by aftermarket and nomadic devices, including future interactive traffic services that will become part of driving environment systems within the next five years.

Field Operational Tests developed in TeleFOT aim at a comprehensive assessment of the efficiency, quality, robustness and user friendliness of in-vehicle systems, such as ICT, for smarter, safer and cleaner driving.

This deliverable describes the work that has been done to develop and test eCall/alerts functions using NDs (nomadic devices). An eCall application was developed on two platforms (Mobile CE and Android) as well as the web questionnaires used by different users of the system (drivers, operator, and administrator) and web services to allow NDs to connect to the server and send required data.

Recently, several eCall in-vehicle systems (IVS) have been developed and use SMS messages that are not real time data (< 4s). These systems use so far embedded hardware components to allow wireless communications between vehicles and emergence agencies (i.e. V2I: Vehicle to Infrastructure communication), sending useful information such as airbag deployment as well as geographical coordinates from GPS module. Varieties of eCall systems from car makers, such as BMW, PSA, or from insurance companies exist already today and use SMS to communicate emergency calls [ALCATEL]. More precisely, the system embedded in the vehicle is composed of special purpose equipment: a GSM module with a SIM card, a GPS module and an interface with a button to issue a SOS call, in general to a special purpose platform managed by an insurance company (e.g., PSA system). Beside the ecall objective, the carmakers would like to gather information about the vehicle behavior when the accident happened for accidentology analysis.

Recall that such eCall systems are mainly automatic in-vehicle systems with the aim is to rapidly relaying important accident information, such as geographical location, time and

accident strength. As they are proprietary systems, their performances are not really accessible. Because most of the driving-assistance software tools are proprietary and not accessible to all road drivers, the European commission would like to create an eCall platform for drivers to make alerts with delay under the recommended threshold delay of 4s.

Unlike in-vehicle ecall systems implemented by carmakeres and insurance compagnies so far, that are based on short text messages (SMS) with the drawback of not being real time alert, the work has been done under TELEFTOT project concerned the development of an eCall platform based on GPRS/3G communications to allow drivers to establish an eCall (voice and data transfer) with the PSAP (Public-safety answering point) using their NDs [ECALL]. The study focused only on manually launched emergency calls as well as other alerts implemented on NDs. Therefore it is not actually the same service as Pan-European eCall, which will be implemented on a fixed in-vehicle device. More precisely, to report on an event on the road, driver has two options, (i) calls the PSAP and sends a GPRS packet at the same time or (ii) sends a GPRS packet reporting events. In the first case, the eCall application establishes a voice connection with an operator of PSAP, while sending at the same time a GPRS packet containing the geographical location of the event, a time stamp and other relevant information through the same channel that is being used to establish the voice call. Alternatively, the driver can also directly send text data to report an event. These events are stored into a server for further data analysis purpose. A server called “TeleFOT server” is established and used to store all collected data from different Nomadic Devices (NDs) embedded within vehicles. A client application is used by the PSAP operator to access particular events for emergency response. The same application is also used to analyze received data and to generate expected results.

The document is divided into two main parts. The first part gives an overview of the eCall system including, the system architecture, function specifications and issue we have faced, research questions, pilot testing and preliminary results, and survey tools used. Results obtained from real tests are described in the second part. Appendices are included to provide more details about devices used, developed Client/server application and related services and functions, web questionnaires, and the database.

2. FRENCH TEST SITE: SETUP AND PLANING

2.1. An overview of eCall

2.1.1. French test site Stakeholders

UTBM joined the TeleFOT consortium from September 2009 and was held responsible to develop and test the eCall. The eCall function is the only LFOT conducted at the French test site. UTBM is the major stakeholder who is responsible to undertake all the project activities regarding the test of eCall function, other involved stakeholders include: Philor (assisting in test tools deployment and NDs acquisition), Danew (NDs provider), and SDIS service who is responsible of 112 in France (SDIS 70, Franche-comte region).

The test set up and experiments have been conducted in three stages. In the first stage, the project feasibility, plan, design, analysis of user's needs and expectations, and schedule for the French LFOT have been investigated and studied. Furthermore, we performed users' recruitment and prepared users' questionnaires to gather useful information about users' background. A reasonable effort was dedicated to prepare the initial research questions, hypothesis, and performance indicators, however, these also was refined time to time during other phases of the project as new requirements were met. In the second phase, a state of the art review and analysis was performed to develop an understanding of the existing technologies that have been utilized for current eCall systems such as communication channel, application development tools, and openness of the available NDs. After the comprehensive study of available solutions, the specifications of the eCall application were described followed by the development of the eCall functionalities/services and test its conformity to users' needs and expectations as well as the development of other testing tools (e.g., TeleFOT Server and Client application). The third stage concerns tests' environment with eCall and gathering the data. After the development of test tools, we have conducted a pilot test including field testing, system evaluation, and refinement activities. After the successful pilot test, we have started real testing, during the first week of July 2011, and collected the real time data for eCall and alerts functions till the end of November 2011. The final stage included the evaluation and analysis of the data collected during experiments.

2.1.2. Map of the area

The eCall tests were mainly taking place in the Alsace & Franche-Comté region (see Figure 1).

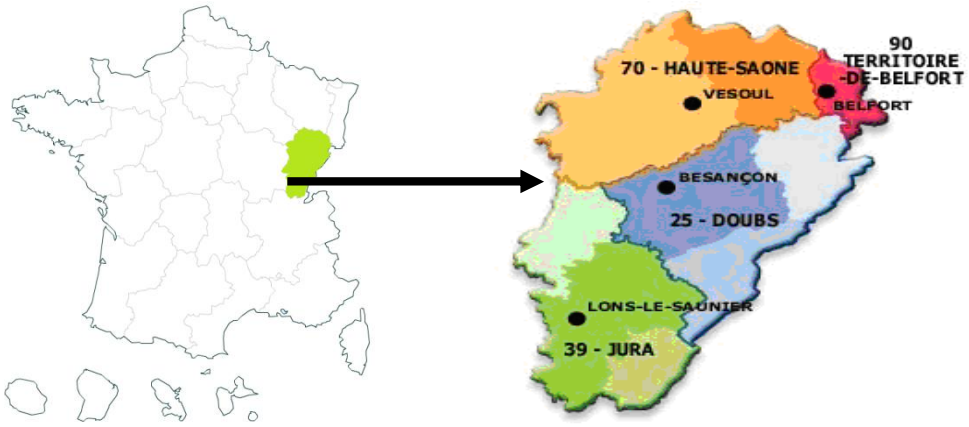
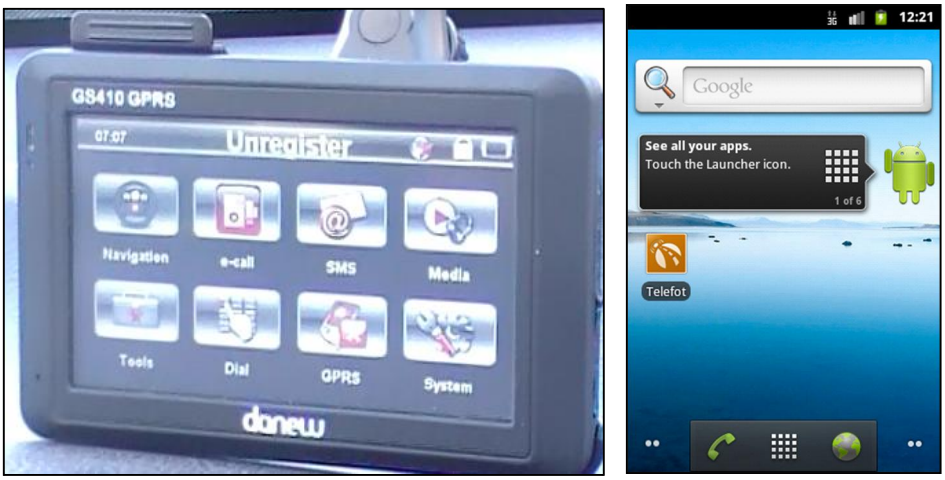


Figure 1: The region of Alsace & Franche-Comté where the French FOT was conducted.

2.1.3. Nomadic devices

We have selected *Danew GS 410 GPRS* and *Danew Tablets* (shown in Figure 2), which support navigation and GPRS connectivity. The main characteristics of these devices are described in Appendix I [DANEW].



(a) (b)

Figure 2: Danew GS 140 GPRS (a) and Tablet (b)

2.1.4. Participants

The LFOT involved drivers using their own vehicles from “Alsace-Franche-Comté” region equipped with devices provided by UTBM. 393 have registered and completed the background questionnaires and the eCall questionnaire before setting up the experiments. The number of participants planned (sampling desired) and those actually selected to participate to the real testing are shown in the following table. From 250 NDs purchased, 233 have been distributed to the sample of test users and the remaining NDs devoted to software development and Lab

testing. It should be noted that most test drivers are SDIS70 and mobile commercial sales representatives who use intensively vehicles on roads.

Table 1 : Number of participants planned/selected

		18 - 30 years	30 - 40 years	40 - 50 years	50 - 60 years	> 60 years	Total
Male	Planed	35	30	23	31	15	
	Selected	62	41	36	14	13	166
Femele	Planed	32	25	18	25	16	
	Selected	31	11	12	8	5	67
						Total	233

The following table show more information about selected users.

Table 2: Information about selected users

		Registered	Participants
Sexe	Man	311	166
	Woman	83	67
Department	Doubs (25)	51	24
	Bas-Rhin (67)	11	8
	Haute-Saône (70)	89	68
	Haute-Savoie (74)	4	5
	Haut-Rhin (68)	21	18
	Territoire de Belfort (90)	184	101
	Others	6	9
Age	> 60	17	18
	50-60	39	22
	40-50	64	48
	30-40	61	52
	18-30	184	93
Job	Business Person/Entrepreneur	28	24
	Director / Manager	27	20
	Teacher / Researcher	34	33
	Student / PhD student	106	28
	Engineer / Technician	31	22
	Salaried / Officer	35	22
	Without Occupation / Retired	12	8
	SDIS 70 (firefighter, in charge of 112 in France)	42	38
	Others	44	38

The participant drivers belonging to SDIS were motivated since they are concerned by the 112 eCall number processing in France on one hand and they are involved in the standardization of the eCall in Europe on the other hand. Most of the other participants are mobile commercial sales representatives that were involved via their companies' heads and managers. According to the established contract between us, they would be able to keep the NDs after the tests based on active participation and in counterpart of taking in charge their communication fees during 6 months (they need to get a data transmission line with a telecommunication operator). In summary, some of users like SDIS were motivated since they are involved in the standardization of the eCall in Europe. Some researchers would like to test the application in real contexts and see the results.

2.2. Functions specification and issues

An eCall application is developed to allow drivers to setup an eCall from in-vehicle nomadic devices (Danew GS 410 GPRS, and Tablet) to an emergency response center. Following are the two major functionalities of this application (see Figure 3 for example on GS 410 device). The first function is to setup an eCall with the PSAP by pressing the "SOS" button (shown in Figure 3). The embedded application first sends the position data (in textual format) using GPRS to the local TeleFOT server and then setup an eCall (voice call) with the PSAP. The position data gathered in the previous step will be directly accessible by the human operator receiving the eCall so that s/he can easily determine the geographical position of the event to be reported by a driver. The second function is to send alerts. In fact, the driver can report an abnormal event on the road by sending a textual message to the local TeleFOT server using GPRS.

For eCall data transfer, an in-band modem solution has been identified as the most suitable technology that fulfils all eCall requirements. With this solution the textual data is transmitted "in-band" over the voice channel (Figure 4). Unlike GPRS communication, the in-band modem guarantees that the data is received instantly upon receiving the phone call. Another advantage is that the data can be sent at the same time as the voice call over the same voice channel that is used to establish the voice link.

Figure 3: The eCall application installed on Danew GS 140 GPRS

Qualcomm1 developed an in-band modem software (standardized by 3GPP) available free of charge from the 3GPP website2. The Qualcomm in-band modem software is only compatible with devices running an ARM processor. Since Danew GS 410 GPRS is also using an ARM processor, we had expected there would be no compatibility issue in order to embed the Qualcomm in-band modem software within Danew device. The Qualcomm in-band modem reference implementation is provided in [QUALCOMM-1].

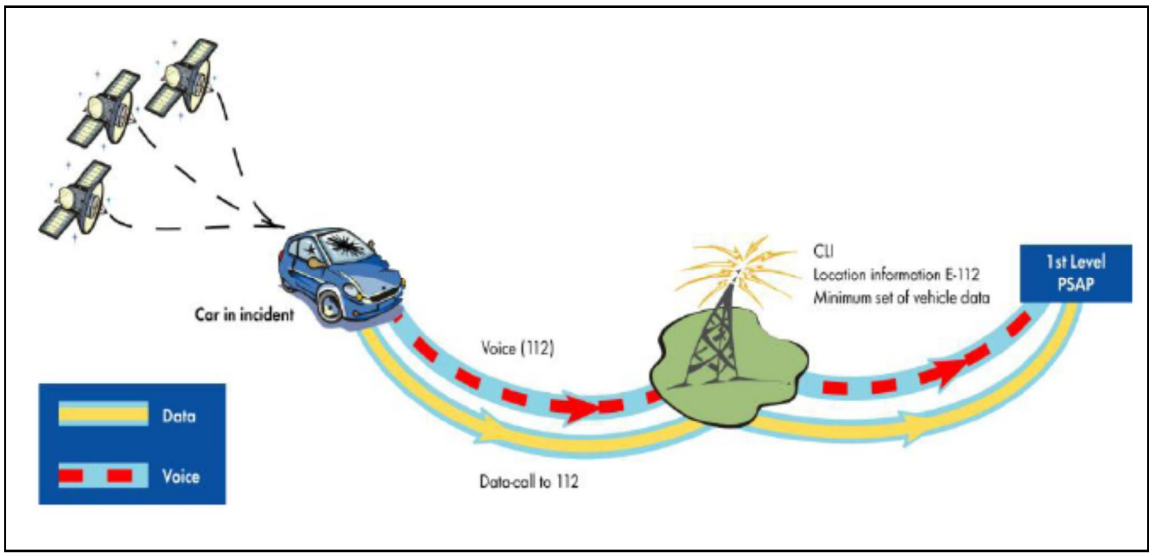


Figure 4: Qualcomm eCall system overview[3]

We have investigated the implementation of the QUALCOMM in-band modem on Danew GS410 we are using for the experiments in agreement with Danew Group. Our effort in developing and integrating the Qualcomm in-band modem [Qualcomm-2] on NDs lead to the following findings:

[1] QUALCOMM, Incorporated. eCall Whitepaper Version 1.5, March 2009.
[2] http://www.3gpp.org/eCall
[3] eSafety Forum, "Recommendations of the DG eCall for the introduction of the pan-European eCall ", April 2006, Version 2.0

- The implementation of the Qualcomm modem requires the access to the lower-layer software running on the communication chipset (the speech codec PCM interface) which is not possible with a normal software application and not possible on smartphones in their standard versions. This can be done (as Qualcomm did) with customized phones with modification of the lower-layer software running on the communication chipset.

- We have contacted Qualcomm to know if Qualcomm could supply modems free of charge for the experiment purpose as a line of code to be implemented into nomadic devises. In their own tests, Qualcomm has used special test phones that allow a modification of the lower-layer software running on the chipset, and they cannot share these tests outside of Qualcomm.

- The code provided by Qualcomm runs on ARM processor in-vehicle systems (IVS) or PSAP systems, and cannot run on aftermarket nomadic devices in their standard versions. A successful implementation requires the Smartphones to be customized, i.e., hardware/software customized, and among the tens chipsets available in the market from Qualcomm, only one or two of them support the eCall function for fleet management or for in-vehicle embedded applications.

With the assistance of Danew Group, we have tried to implement the in-band modem on Danew GS 410, with processor Qualcomm ARM 9 and GSM/GPRS module to send real time data and voice call simultaneously. However, since Qualcomm chipset was initially made to target IVS or PSAP systems, to mass-produce customized NDs with the Qualcomm chipset, we should first have it custom-made to support eCall function, that is “to send real time data and voice call at the same time” on NDs. However, after trying to implement the QUALCOMM in band-modem code on Smartphones (based on Windows CE system), we discovered that the ND hardware should be customized too. However, this objective would require more resources unexpected initially since the Qualcomm in band-modem was supposed to be implemented immediately on standard NDs without customization). The additional resources are at least 6 to 8 PM effort or as estimated with the partner Danew, approximately 5000 NDs purchase to allow Danew group covering the effort.

2.3. Research questions

The research questions were selected from those described in D2.2.1., Appendix III, Table III.v:

- RQ1. To what extent have the functions and devices been used (before, during, after journeys)?
- RQ2. Are the functions/devices being used more or less over time?
- RQ3. Is travel behavior affected?
- RQ4. Is driving behavior affected?
- RQ5. Does problem awareness/problem perception change?
- RQ6. Is user acceptance influenced by perceived usefulness of device/function?
- RQ7. Is user acceptance influenced by perceived ease-of-use?
- RQ8. Is user acceptance influenced by perceived trust in device/function?
- RQ9. Does the design of the device affect user's acceptance of function/device?
- RQ10. Does the design of the user interface affect user's acceptance of function/device?
- RQ11. Is there a change in users' acceptance over time?
- RQ12. Is there a change in perceived affordability over time?

The final choices were based on a set of well-defined criteria described in D4.7.1, section 2 and concerns only user acceptance.

- RQ2. Are the functions/devices being used more or less over time?
- RQ9. Does the design of the device affect user's acceptance of function/device?
- RQ11.Is there a change in users' acceptance over time?
- RQ12. Is there a change in perceived affordability over time?
- RQ13. Example, Drivers age, experience, and gender may have influence on using eCall function

In order to answer these research questions, we have used: 1) data generated from NDs (e.g., GPS position, time) and stored in French TeleFOT, and 2), data provided by participants via web based questionnaires that related to user background and acceptance (before, during, and after the FOT execution) (see Annex II for more details). According to the background questionnaires, approximately 244750 kilometers are driven by participants each year. We based our analysis on questionnaires filled by participants (180 before, 40 during, 40 after LFOT execution) and data received from NDs.

2.4. Pilot Testing

As shown in Figure 5, the overall operation of the eCall system can be described as follows. To report an event on the road, driver has two options, (i) Call to the PSAP and (ii) send a GPRS packet to report on an event. In the first case, eCall application (running on the ND) will establish the voice link with operator at PSAP, while at the same time; it sends a data packet containing the geographical location of the event, time stamp and other relevant information through the same channel as voice. Alternatively, the driver can also directly send text data to report an event by pushing the corresponding button. In any case, these events are stored in a web server database for future data analysis purpose.

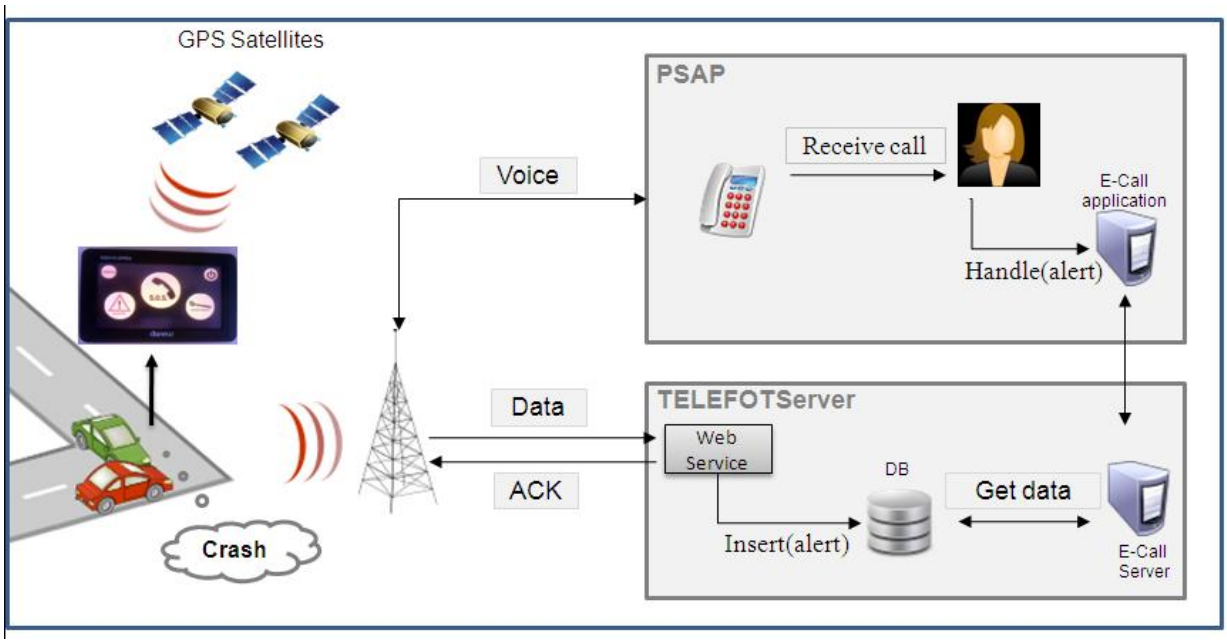


Figure 5: The eCall platform architecture

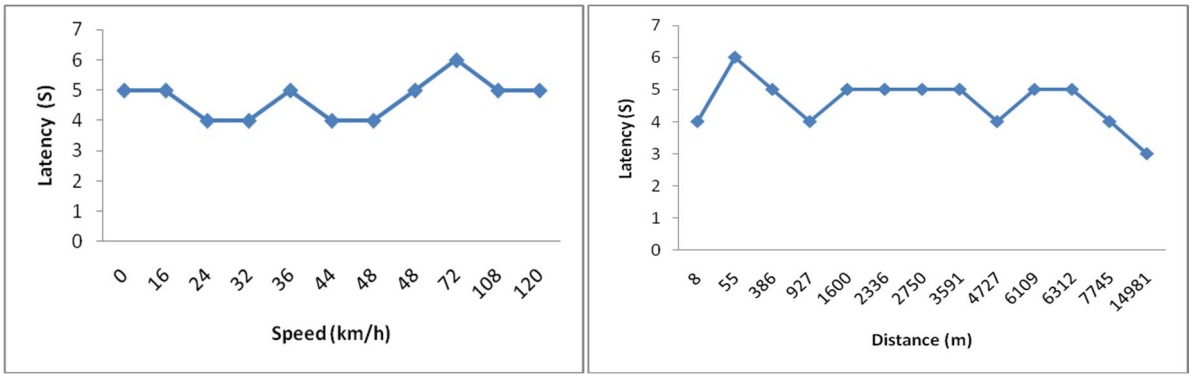
The pilot test consists of two phases: testing the technical functionalities in order to ensure that the functions are stable and provide the expected output and modifying the functions after comprehensive testing report. The pilot test was conducted between 11th and 30th of June 2011 with 15 subjects driving in Belfort/Montbéliard city both in urban and highway environments.

We used the web based questionnaires to collect users' background information prior to start piloting and users' up-take data after the pilot test is finished. We performed then limited data analysis to anticipate new information and to further refine our research questions and hypothesis for the real test.

Results, essentially the latency, are reported by evaluating the three techniques we have developed mainly when using GS 410. The first technique consists in sending alerts without making a call. The second technique, called synchronous parallel eCall, consists in sending, at the same time (simultaneously maybe better), the alert and the call (multi-threading). Finally, the third technique, called asynchronous sequential eCall, consists in sending first alerts followed by the voice call.

During the experiments, the vehicles speed and the locations are also collected. We have measured driving patterns by collecting the vehicle's speed and position from GPS Data to get the time delay and the distance from TeleFOT server (located at UTBM-Belfort).

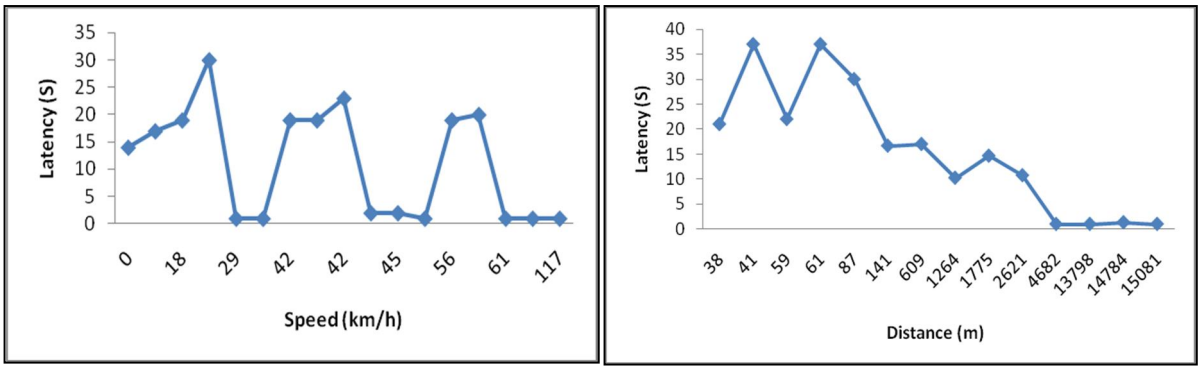
To compute latency, we have processed as follows; from the Danew devices, events are sent to the server by specifying, the alert type, the current position, the timestamp, the device id. These data are received by the server and stored in the database. The server replies to each event by sending an ACK message (a signal to acknowledge the receipt of the event) to the vehicle. After receiving the ACK message, the latency is computed, which measures the amount of time delay the system spent in processing the message, i.e. the time delay when the vehicle sends an alert until it receives the ACK message.



(a) (b)

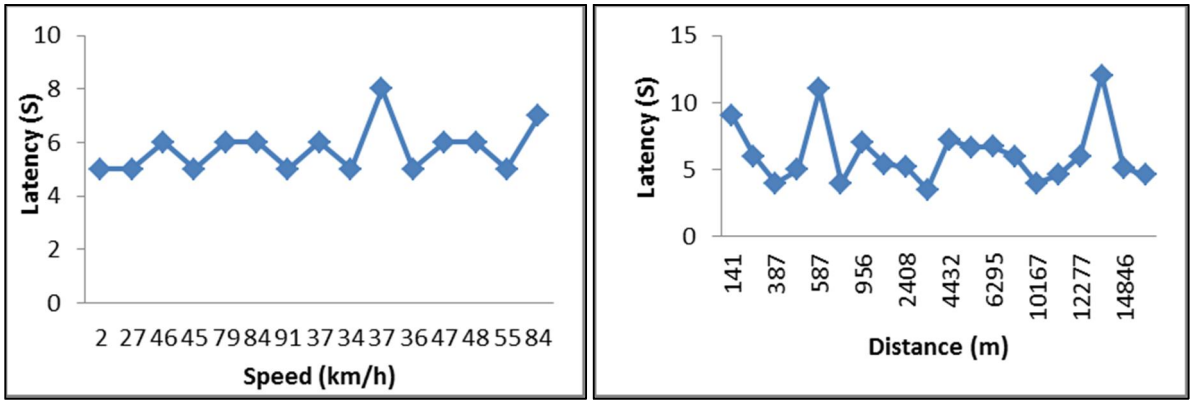
Figure 6: Latency versus (a) Speed and (b) Distance when sending only alerts

Figure 6(a) and Figure 6(b) illustrate the vehicle latency variation according to the speed and distance in the case of simple alerts without calling. For the two curves, regardless the distance and the speed, the latency is around 4.69 s (in average). Figure 7 (a) and Figure 7(b) show respectively the variation of the vehicle latency according to the speed and distance in the case of synchronous parallel eCall. In these figures, we remark that the latency is increased comparing to the first case (Figure 6) because of the connection mode (sending and alert and making a call simultaneously) from the vehicle to the PSAP. For this case, the average latency is approximately 13.46s.



(a) (b)

Figure 7: Latency versus (a) Speed and (b) Distance when using parallel eCall technique



(a) (b)

Figure 8: Latency versus (a) Speed and (b) Distance when using sequential eCall

Figure 8 (a) and Figure 8(b) show the vehicle latency variation according to the speed and distance when using asynchronous sequential eCall technique. Unlike in Figure 6, for this connection mode between vehicle and PSAP, the latency increases slightly and it is around 6 s in average for the Figure 8(a), and around 7 s (in average) for the Figure 8(b) whatever the speed or distance.

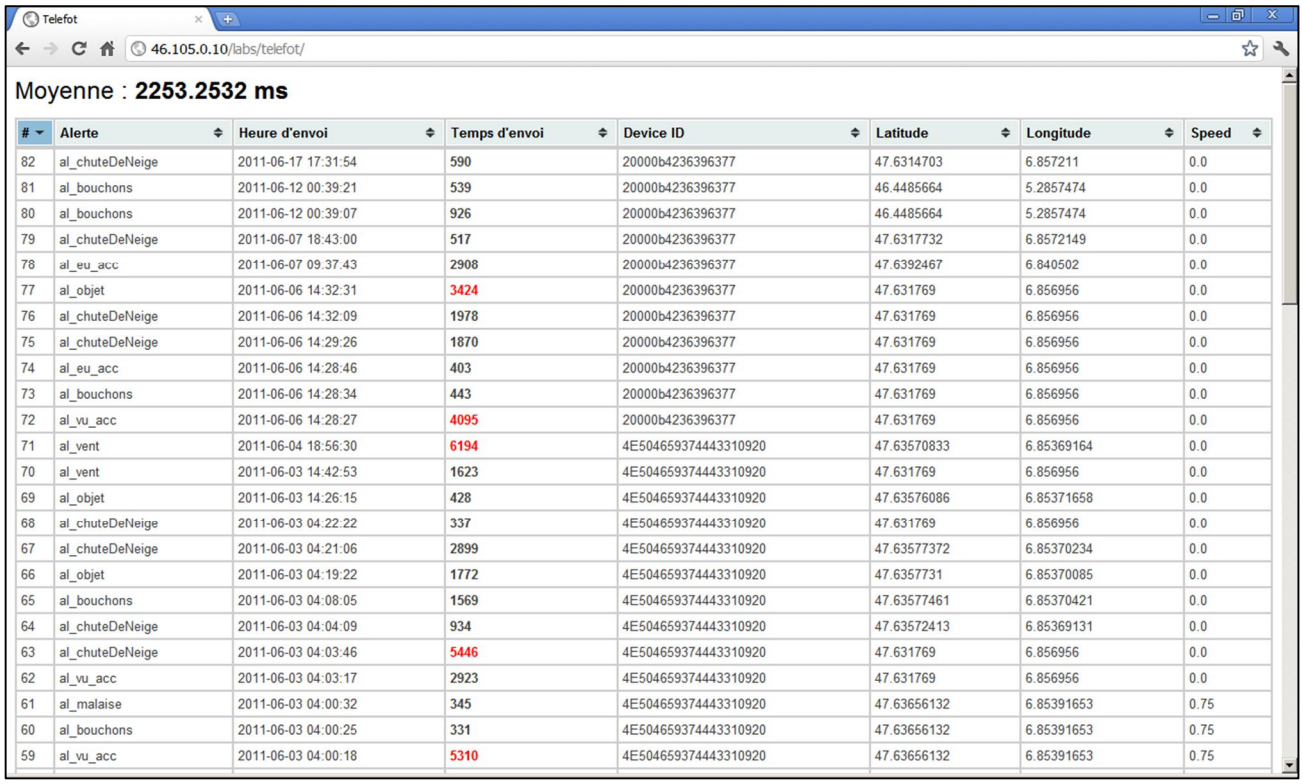
For these three communication modes, we conducted experiments on the highway and urban road of 15 kms in the same conditions. As we can see from these results, the delay, to send out information from the in-vehicle ND to the server and to receive an ACK message, is neither sensitive to the vehicle speed, nor to the distance between the vehicle and the server location. By the way, Figure 6(b), Figure 7(b), and Figure 8(b) show that when the distance from the server increases the latency decreases. This might depend on the cellular network (i.e. GPRS network) conditions and locations (i.e. distance between the vehicle and the relay station, network overload).

Table 3: Average delay and location accuracy for 3 communication modes

Communication mode	Average latency	Location accuracy
Simple alerts	4.69 s	47 m

Synchronous parallel eCall	13.46 s	71 m
Asynchronous sequential eCall	6 s	65 m

The table above summarizes the latency for the three communication modes used in our experiments. The latency is the time needed by the application to send data to the server when using the Tablets. Each time an eCall or an alert is made, data are sent to the server. Then, the web service will send back a confirmation to the application. The following screenshot (Figure 9) shows an average sending time of 2.253 seconds for 82 tests.



#	Alerte	Heure d'envoi	Temps d'envoi	Device ID	Latitude	Longitude	Speed
82	al_chuteDeNeige	2011-06-17 17:31:54	590	20000b4236396377	47.6314703	6.857211	0.0
81	al_bouchons	2011-06-12 00:39:21	539	20000b4236396377	46.4485664	5.2857474	0.0
80	al_bouchons	2011-06-12 00:39:07	926	20000b4236396377	46.4485664	5.2857474	0.0
79	al_chuteDeNeige	2011-06-07 18:43:00	517	20000b4236396377	47.6317732	6.8572149	0.0
78	al_eu_acc	2011-06-07 09:37:43	2908	20000b4236396377	47.6392467	6.840502	0.0
77	al_objet	2011-06-06 14:32:31	3424	20000b4236396377	47.631769	6.856956	0.0
76	al_chuteDeNeige	2011-06-06 14:32:09	1978	20000b4236396377	47.631769	6.856956	0.0
75	al_chuteDeNeige	2011-06-06 14:29:26	1870	20000b4236396377	47.631769	6.856956	0.0
74	al_eu_acc	2011-06-06 14:28:46	403	20000b4236396377	47.631769	6.856956	0.0
73	al_bouchons	2011-06-06 14:28:34	443	20000b4236396377	47.631769	6.856956	0.0
72	al_vu_acc	2011-06-06 14:28:27	4095	20000b4236396377	47.631769	6.856956	0.0
71	al_vent	2011-06-04 18:56:30	6194	4E504659374443310920	47.63570833	6.85369164	0.0
70	al_vent	2011-06-03 14:42:53	1623	4E504659374443310920	47.631769	6.856956	0.0
69	al_objet	2011-06-03 14:26:15	428	4E504659374443310920	47.63576086	6.85371658	0.0
68	al_chuteDeNeige	2011-06-03 04:22:22	337	4E504659374443310920	47.631769	6.856956	0.0
67	al_chuteDeNeige	2011-06-03 04:21:06	2899	4E504659374443310920	47.63577372	6.85370234	0.0
66	al_objet	2011-06-03 04:19:22	1772	4E504659374443310920	47.6357731	6.85370085	0.0
65	al_bouchons	2011-06-03 04:08:05	1569	4E504659374443310920	47.63577461	6.85370421	0.0
64	al_chuteDeNeige	2011-06-03 04:04:09	934	4E504659374443310920	47.63572413	6.85369131	0.0
63	al_chuteDeNeige	2011-06-03 04:03:46	5446	4E504659374443310920	47.631769	6.856956	0.0
62	al_vu_acc	2011-06-03 04:03:17	2923	4E504659374443310920	47.631769	6.856956	0.0
61	al_malaise	2011-06-03 04:00:32	345	4E504659374443310920	47.63656132	6.85391653	0.75
60	al_bouchons	2011-06-03 04:00:25	331	4E504659374443310920	47.63656132	6.85391653	0.75
59	al_vu_acc	2011-06-03 04:00:18	5310	4E504659374443310920	47.63656132	6.85391653	0.75

Figure 9: information about latency when using the Tablet device

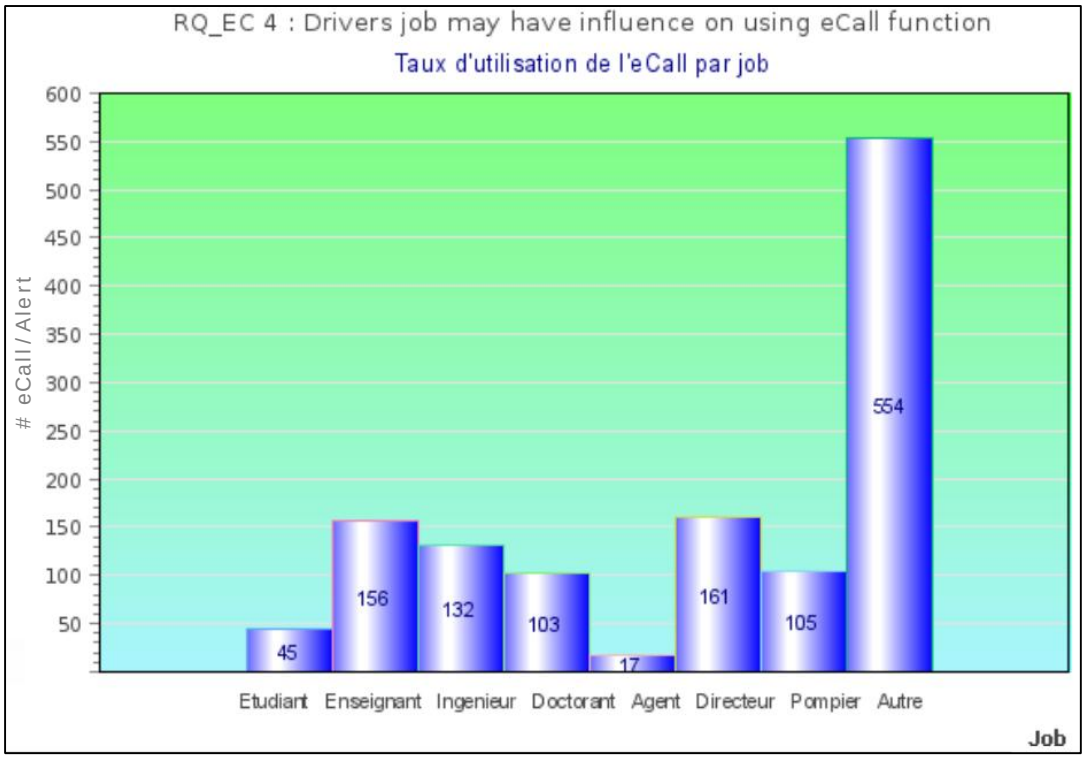
The following table describes the pilot testing set up and results.

Table 4: Pilot testing set up and results

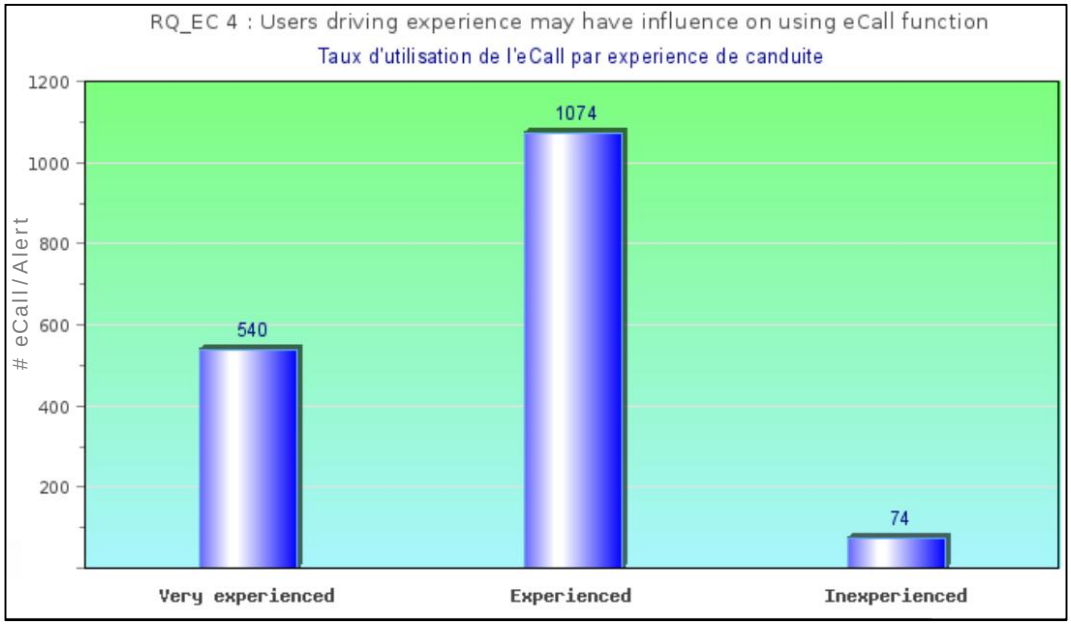
FOT ID	LFOT, French FOT
Pilot duration (dates)	11 June 2011 – 30 June 2011
Number of participants	15 participants driving in Belfort/Montbéliard city both in urban and highway environments.
Function description (short)	eCall function. The application running on the Danew devises (GS410) for users to simultaneously send data to the UBM server and report on accidents by calling the operator. Data such as user's identity, location, speed, time, are stored on the database and events locations are displayed in real-time on the map.
Description of	Drivers were given Danew devises during pilot test and feedback was

pilot execution	collected via individual interviews
Piloting of questionnaires	All data are automatically stored and analyzed to check that all RQs can be answered. The latency, i.e., the time delay when the data sent to the server until ACK message is received was evaluated using two techniques, synchronous parallel eCall and sequential eCall.
Feedback, issues and solutions	It was noticed that in both techniques the latency is neither sensitive to the vehicle speed, nor to the distance between the vehicle and the server location Because in synchronous parallel eCall sending and alert and making a call simultaneously, the average latency was approximately 13.46s, while in sequential eCall the average latency is 6s. Therefore, the sequential eCall technique is used for long run tests [ITS-2011]. Other minor problems related to the application in both sides, ND and server, such as the precision of GPS coordinates and vehicles speed have been solved. Other improvements of the map have been done in order to visualize automatically all the received alerts. Another issue was reported, it was related to the ID of devices because all GPS have the same serial number, and thus we did not know which person reports the alert. To solve this problem we had improved both the embedded application and the server application to generate and support IDs for all devices. For tablets, a mapping application was developed to record devices and to assign each one to its user.
Pilot analysis to test if research questions could be answered	The sampling frequency of the data was checked and all research questions could be answered

As described above, the pilot test consisted of two phases: testing the technical functionalities as described above with the main objective is to ensure that the functions are stable and provide the expected output and modifying the function after comprehensive testing report. Furthermore, Web based questionnaires to collect users' background information prior to start piloting and users' up-take data after the pilot test is finished. After finishing this pilot test, we performed limited data analysis to anticipate new information and to further refine our research questions and hypothesis (described above) for the real test. Below are some preliminary results automatically extracted from the database (experiments during the pilot test) and concerns only the research question RQ4 "Drivers age, marital status, driving experience, and gender, education level, may have influence on using eCall function" (Figure 10). This process was performed to show that all analysis and evaluation requests to the database deliver correct results. Actual results are presented when describing real experiments.



(a)



(b)

Figure 10: Utilization rate of eCall per driver's job (a) and experiences (b)

After the successful piloting experiment, we started the real test starting from the first week of July 2011 that remains until the end of November 2012. The NDs distribution process has been started during the stakeholder forum, which was held on the 6th of July in Lure, Malbouhans, during the opening ceremony of the platform PVF-ITS (Figure 11). The scenario of the test is depicted in Figure 12.

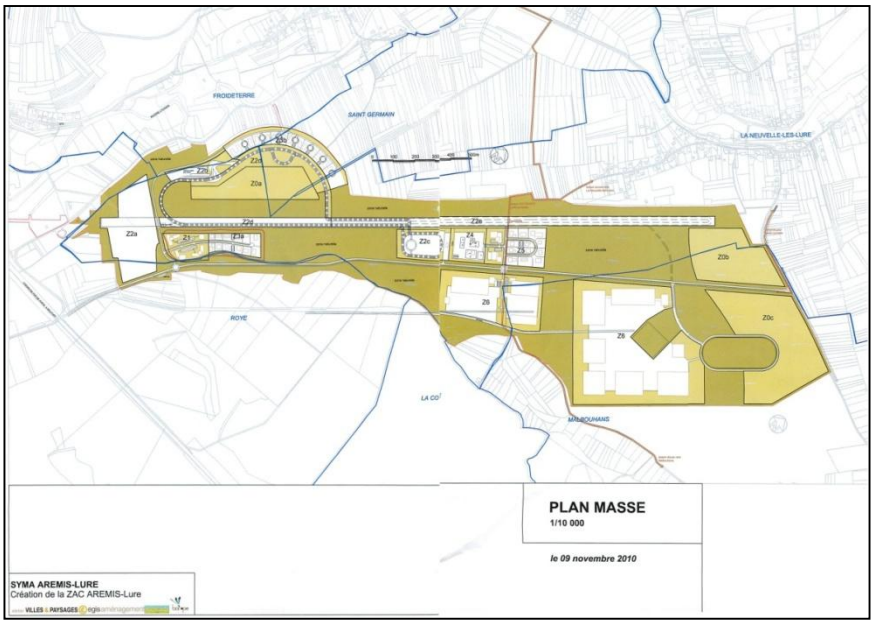


Figure 11: The plan of the area allocated to build the PVF-ITS platform

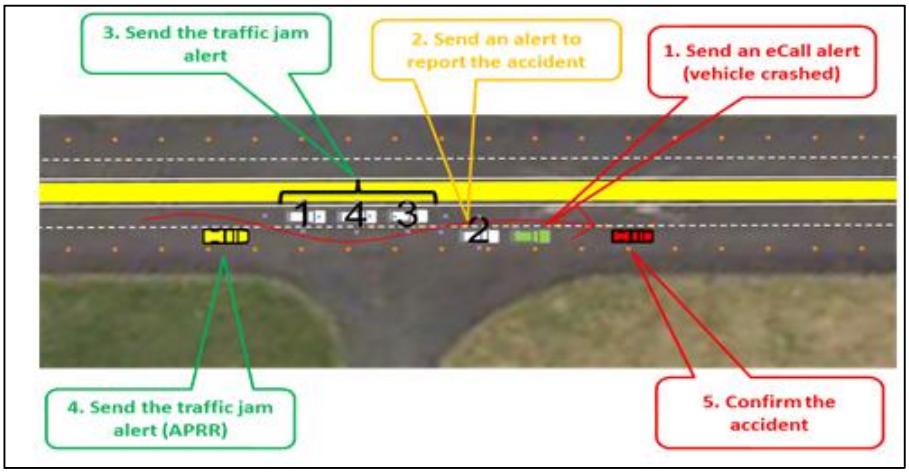


Figure 12: Test scenario during stakeholder forum

Figure 12 illustrates the test scenario during stakeholder forum. With the participation of SDIS 70, we have used 6 vehicles as follows. One vehicle (green color) sent an eCall and other vehicles passing by the accident location confirmed the accident. As soon as a traffic jam starts to form, drivers send alerts by pushing the corresponding button on their NDs. This scenario allows participants to be informed of the usefulness of these functions. Furthermore, during this day we have distributed NDs to participants; each has been assigned to a DANEW device with installed eCall application.

3. RESULTS

In order to perform statistics, we have used different questionnaires, background, before starting test, during the test, and after completing the test as indicated in Figure 13. Data also stored on the database such as number of eCall activation, alerts submitted were used to evaluate and assess on some research questions. More details are given in Appendix II and D3.5.1.

Figure 13: Before (Avant), during (Pendant), and after (Apres) questionnaires

Almost all basic statistics have been done by sending requests to the database. For example, as shown in Figure 14, several requests could be performed to get results such as rates of eCall/Alerts utilization in function of users information such city where they live, their driving experience, their style of driving (menu eCall vs. users). Other results could be also provided from questionnaires such as eCall influence, eCall reaction (menu questionnaire). In the menu “Research questions”, we can get all these data by requesting the database.

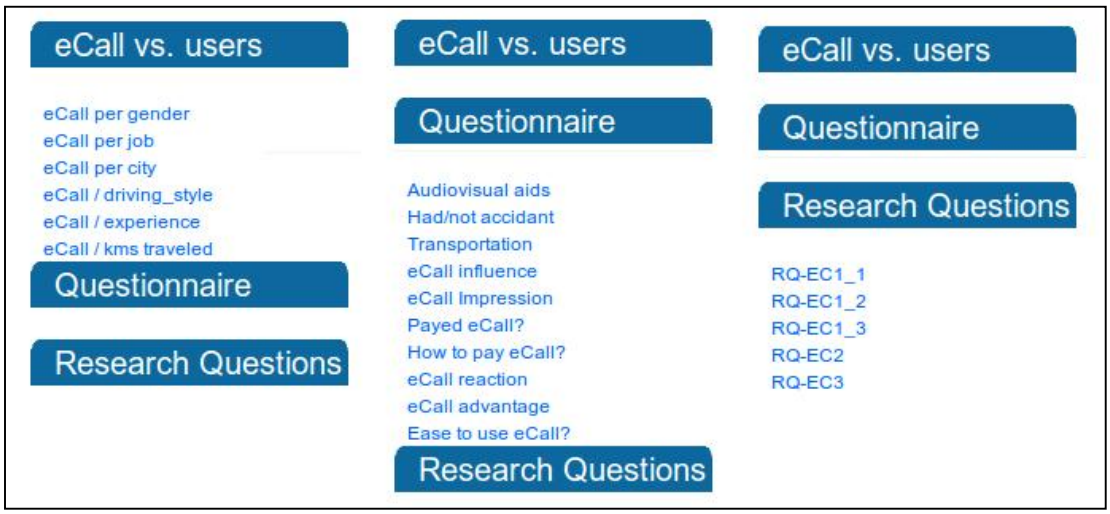


Figure 14: Menu for data processing and extraction from the database

3.1. Statistics

3.1.1. RQ13: Is Drivers age, experience, and gender may have influence on using eCall function?

Figure 15 shows the numbers of eCall and alerts issued. We can see that the number of Alerts issued is high compared to eCall triggering function. In fact, drivers have had chance to encounter during their journeys the following situations: fog, object on the road, radar, than accidents.

The overall assessments of the participants of the usage of eCall/Alert functions they used were significantly in accordance to the situations encountered during their journeys. It is most probable to encounter objects on the road, fog, traffic jams, radar... than accidents. According also to interviews with some participants it would be good to report on road situations and condition, but it is good to share these information with other surrounding vehicles to prevent drivers before getting into dangerous situations.

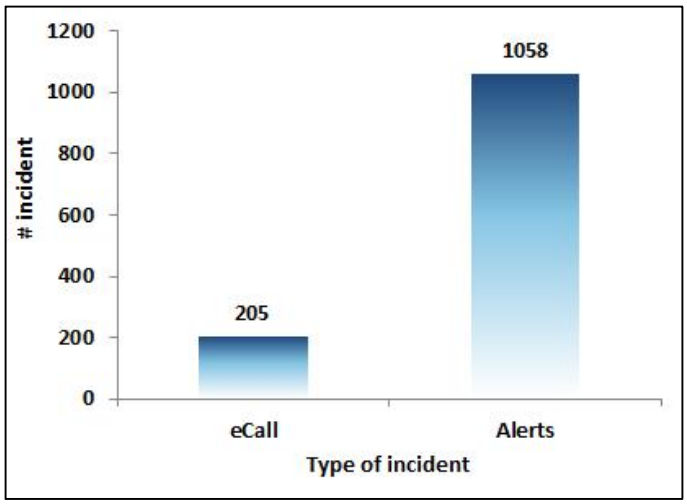


Figure 15: Number of eCall/Alerts issued by participants

Figure 16 shows the number of alerts issued by participants. We can see that women issued less alerts, by almost 10%, i.e., they represent 29% of the population, but they have issued only 20% of total alerts.

The overall assessments of the participants of the usage of Call/Alert functions they used were slightly depend on participants' gender.

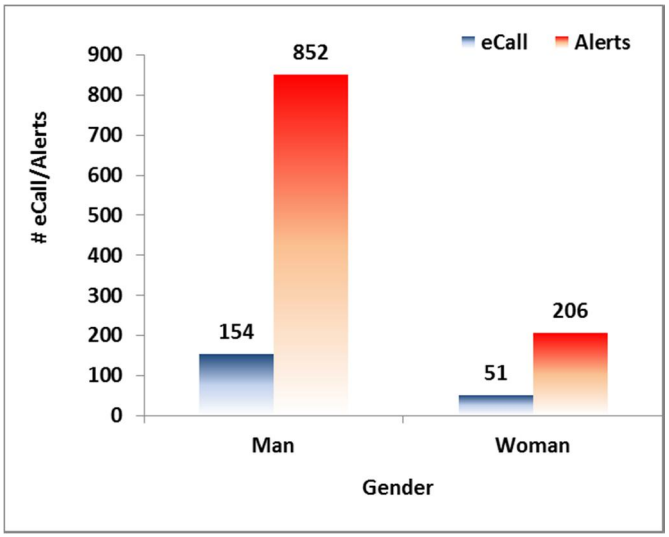
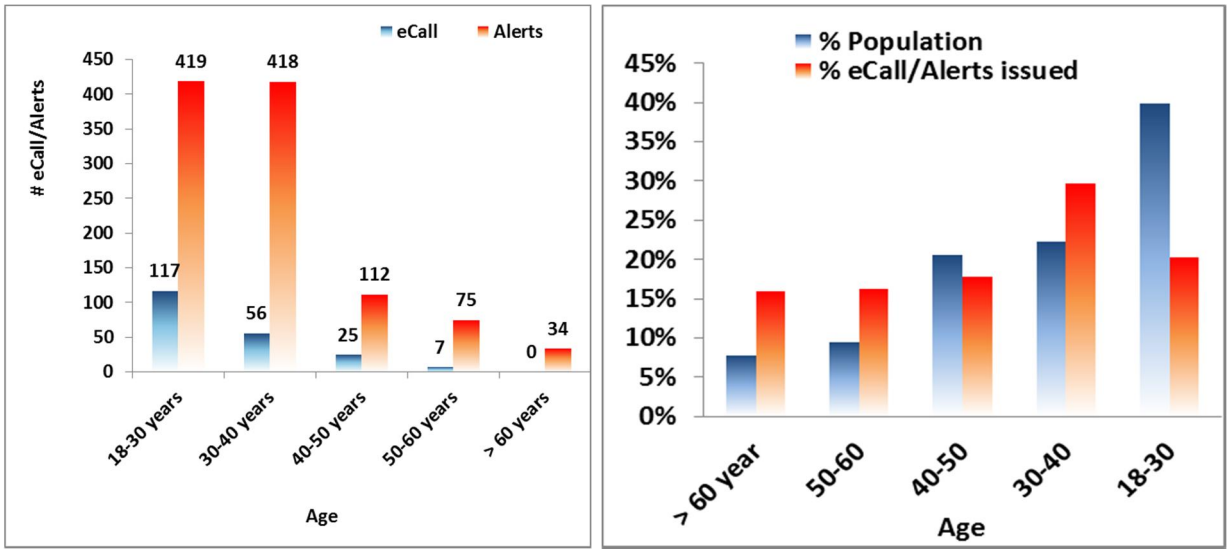


Figure 16: Gender versus issued alerts

Figure 17 (a) shows the utilization rate of the eCall versus participants' age. We can see that while young participants (18-30 years old) represent 40% of the populations (Figure 17(b)) they have issued only 20% of eCall/alerts. Participants with age between 40 and 50 years represent 21% of the total population but they issued 18% of eCall/alerts. This is because most of these participants are students or teachers and are not heavily using their vehicles during the day. Participants that are 50 years old or more represent 17% of the population but they have issued almost 32% of eCall/Alerts because most of them are heavily using their vehicles. Participants with age between 30 and 40 years represent 22% of the population but they have issued almost 30% of eCall/Alerts because most of them are from SDIS or travelling salesman (mobile commercial sales representatives) heavily using their vehicles during the day.

The overall assessments of the participants of the usage of eCall/Alert functions they used were significally in accordance with participants' ages. Elder people show the usefulness of eCall/Alerts. Those participants heavily using their vehicles for their journeys are more exposed to use the eCall or send alerts.



(a) (b)

Figure 17: (a) Age versus alerts issued, (b) % of eCall/alerts issued vs. % of the population

Figure 18 shows the number of eCall/Alerts issued by participants stratified according to driving experience.

The overall assessments of the participants of the usage of Call/Alert functions they used were significally depends on participants' experiences. This could be explained by the fact that it is difficult for inexperience drivers to use in-vehicle devices and embedded applications.

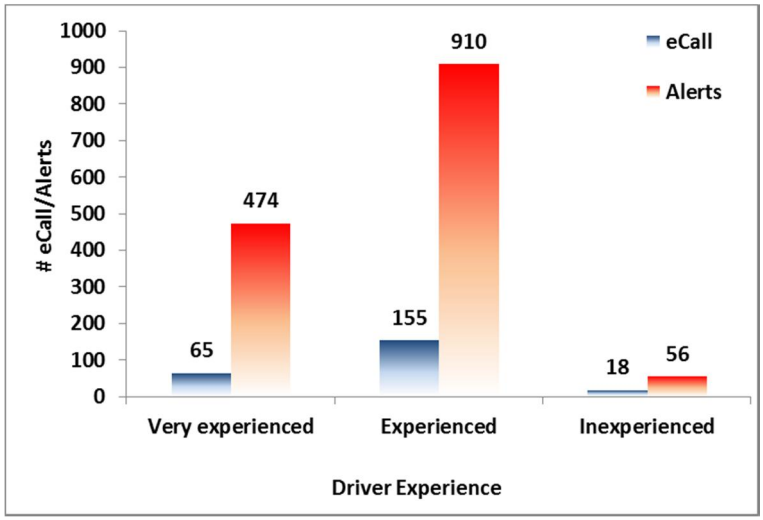


Figure 18: Driving experience

3.1.2. RQ12. Is there a change in willingness to pay over time?

The research question used to assess on the participants willingness to pay for the eCall function is: "based on your present impression of the eCall service would you consider paying to get access to it". We can see form the results presented in Figure 19 that the percentage of

participants like to have eCall/Alerts function not be paid increases from 38% before starting the test to 76% at the end of testing period.

Most participants based on their usage of the eCall/Alert functions show their no willingness to pay for having access to it. These functions should be made available for free.

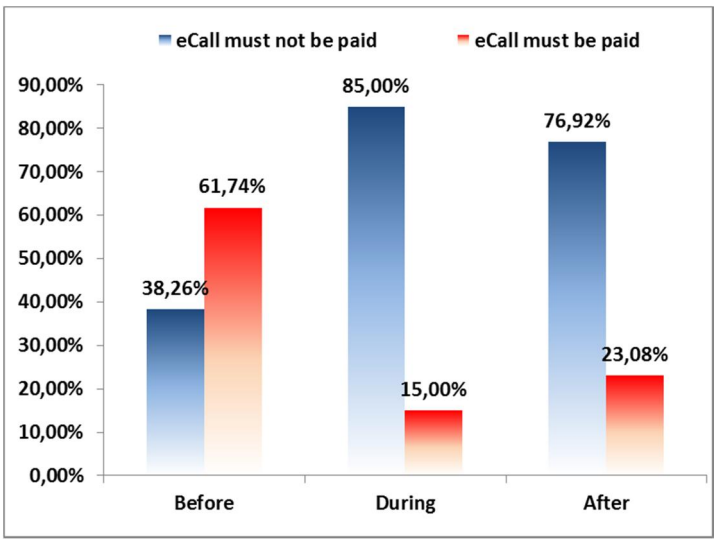


Figure 19: Willingness to pay

3.1.3. RQ11: Is there a change in users' acceptance over time?

We have used the following questions to answer this research question : 1) What is your present reaction to the eCall, 2) How do you judge the potential benefit of having access to this eCall, 3) Based on your current impression of the eCall service, how would you describe it?

Figure 20 show the advantages of the eCall before, during and after testing period. The percentage of population stated a great advantage was high before starting the test and decreases by almost 50% during and after testing periods. The percentage of population showing simple advantages is high before and during testing, but decrease slightly after the testing period. However, around 5% of the population shows no or little benefits, but increases to reach 20% after testing period.

The overall assessments of the participants of the advantages of eCall/Alert functions they used were significantly in accordance with their usage over time. We can see that participants were significantly used the functions in the beginning of the test but decrease over time since they did not see any advantages of accessing to it. The percentage of participants saying that eCall/alerts functions have no or little advantages increases from 3% before the test to reach almost 30% after the test period.

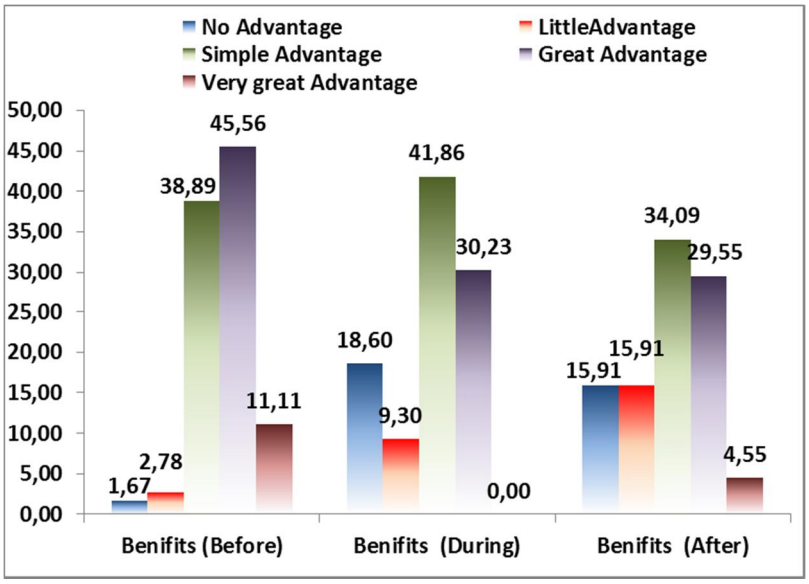


Figure 20: eCall advantages Before, During, and After testing period

Figure 21 depicts the results obtained from participants' impression before, during, and after the testing period. Metrics used are useful, pleasant, and raising alertness. For example, for usefulness, before starting the tests, around 59% of the participants indicate the usefulness of eCall/alerts, 33% have neutral opinion, and 8% show a negative opinion about the usefulness of having access to the eCall. During the tests, 68% have a neutral opinion, 23% show its usefulness, and around 9% of participants show the non-utility of having access to the eCall. After testing period, the opinion of the participants still the same like before starting the tests with slight increases of those with negative opinion.

The overall assessments of the participants of the impression of the eCall/alerts they used were not significantly correlated to their usage over time. For usefulness there is no pattern to be extracted, but we can see a decrease in the % of participants with positive opinion after the test period and the % of participants with negative opinion slightly increases. The percentage of participants filling those eCall/Alerts functions are good decreases during the tests but increase again after the testing period, however the % of participant with negative opinion slightly increases.

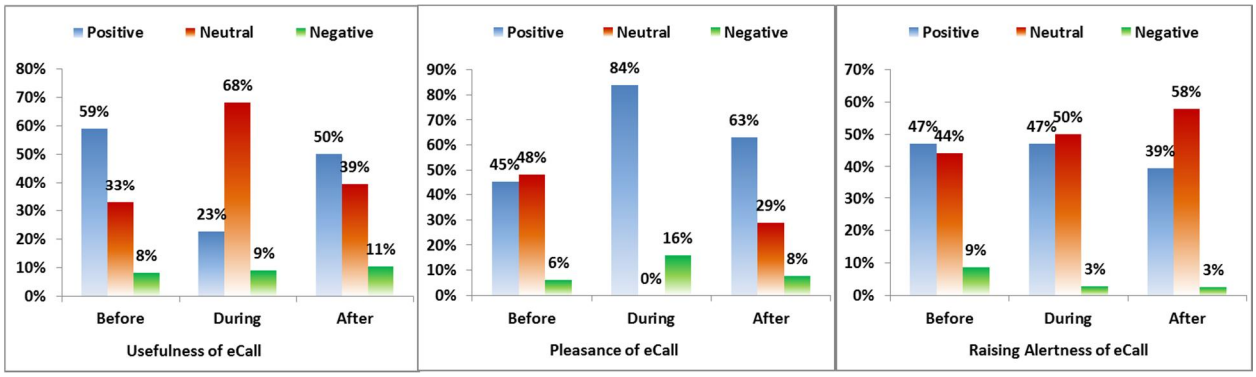


Figure 21: Impression of the eCall service

3.1.4. RQ9: Does the (physical) design of the device affect user's acceptance of function/device?

To answer this question, we have analyzed the evolution of using the two devices. We noticed, as depicted in Figure 22, that the utilization of GS410 increases during the first two months after launching the test and decreases gradually. This might be explained by the complexity of using this device as well as its small screen. However, the utilization of Tablet increases during the testing period because of it is easy to use and its features, e.g. large screen.

The overall assessments of the participants of the physical design of the devices they used were significantly in accordance with their usage over time.

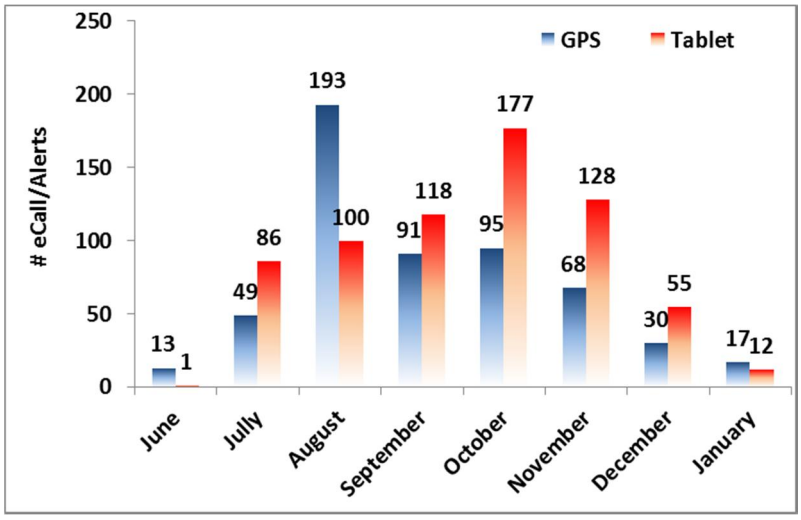


Figure 22: The utilization of devices over time

3.1.5. RQ11: Are the functions/devices being used more or less over time?

To answer this question we reported answers to the following question: is that the functions are used more or less over time? Figure 23 shows the evolution over time of the utilization of the eCall/alert functions. The utilization of these functions increases in the beginning of the

test and decreases during last month of the test. We report also data from December/January since some participants' continue to use it after testing period.

The overall assessments of the participants of their usage of the functions they used were significantly correlated to their usefulness over time. There is significant increase in assessment of usefulness and satisfaction over time.

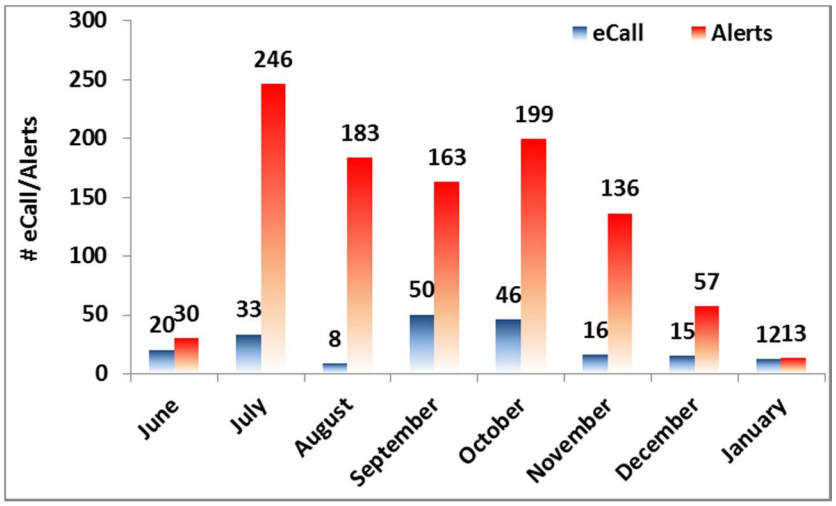


Figure 23: eCall/alerts activation over time

After analyzing and gathering results from data stored, we noticed that some conclusions could be derived and only the impact of users information and the evolution of their opinions on the use of the eCall/alerts. Therefore, we have pursued the study by performing data analysis, based on the population criteria, as described in the following section.

3.2. Data analysis

There are several data analysis methods that could be used as shown in the following table.

Table 5: Data analysis methods comparison

	Advantages	Drawbacks
PCA Principal Component Analysis	PCA is simple to implement, the only mathematical tools used are the computation of values / eigenvectors of a matrix, and base changes. PCA allows, thanks to the graphics it provides, to understand much of the results of a simple glance. PCA is a powerful tool; it offers a summary and a complete view of the relationship between quantitative	PCA applies to specific cases and it is used to generate a particular type of result. Because it is a method to summarize data, it does tend to generated loss of information, even if in some representative cases it sometimes hides features.

	variables in a study population. PCA is very flexible; it applies a set of content data and any size. This versatility is reflected especially by the application of the PCA in various fields.	
FCA Factorial Correspondent Analysis	FCA can find the best summary possible in a short space of reduced dimensions. FCA allows simultaneous representation of rows and columns in the desired space.	Where data volume is important, the main planes tend to be not clear. Several individuals are represented as several points on the plan. The projection on a subspace of lower dimension can appear close to individuals who are not if we take into account all dimensions
MCA Multiple Correspondent Analysis	MCA highlights individual's types with similar profiles with respect to selected attributes. MCA is used to display a set of dimensions without distorting what is known elsewhere.	

To analyze eCall surveys we choose to use the FCA, because we had a lot of variables and thus too many dimensions to study. The PCA method was not fitted to perform this analysis; in fact it would only summarize one variable at once. However, the FCA method allows analyzing more than one variable, and then allows perfectly summarizing the initial scatter diagram and helping for a better interpretation of the correlation on the graph. For this analysis, we have performed the following crossing of tables:

- Users background/eCall-Before
- Users background/eCall-During
- Users background/eCall-After

The background questionnaires and the eCall questionnaire before, during, and after conducting the experiments are considered. The first one gave us information about participants such as age, department of origin, profession or their driving style and experience. The three other questionnaires are more focused on the eCall application itself. Therefore, the contingency table, shown below, could be interesting due to repetition of same questions in the three questionnaires. The focus will be on the intersection Who/before use, Who/During use, and Who/After use for both eCall and alerts.

Table 6: How to cross the questionnaires

	Before use	During use	After use
Who			

To facilitate data reading and their interpretation, we used only important information from background questionnaires such as driving style, driver experience, age, gender, and profession. From questionnaires before, during and after we have selected questions that could answer some of the research questions, such as eCall advantages, usefulness, satisfaction, willingness to pay, and effectiveness.

The results were calculated using the software XLSTAT [http://www.xlstat.com/fr/] which is a plugging for Excel provides a module AFC.

3.2.1. Users-background/eCall-Before

The eigenvalues with the percentage of inertia are shown in the table below:

Table 7: Percentage of inertia of user-background/eCall-Before

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13	F14
Eigenvalue	0.017	0.016	0.010	0.004	0.003	0.002	0.002	0.001	0.001	0.000	0.000	0.000	0.000	0.000
Inertia (%)	30.379	28.752	18.373	6.770	5.631	4.262	2.841	1.051	0.931	0.644	0.233	0.103	0.028	0.003
% Cumul	30.379	59.131	77.504	84.274	89.905	94.167	97.008	98.059	98.990	99.634	99.866	99.969	99.997	100.000

Several criteria could be used to select the number of axes while maintaining the maximum of information:

- C1: the first criterion is to keep the first axes that keep 80% of the inertia. To keep 80% of the information, it is necessary here to work on the first 4 axes, F1, F2, F3, and F4.
- C2: The second criterion is to select only the axes with inertia greater than average inertia of the axes. There are 14 axes which are necessary to represent all necessary information. The average inertia is therefore: 1/14, or about 7.14% of the inertia. We can notice that the first 3 axes are higher than average inertia, and then the fourth axis goes to 6.77%. The first 3 axes are recommended for this test according to this criterion.
- C3: The last criterion is the criterion of the “coude”. This requires analyzing graphically the contributions of the axes, and stop when the inertia of the axis becomes low while remaining close to the previous axis. We noticed that from the third axis the inertia is low and decreases slightly. Three axes, F1, F2, and F3, are required for analysis.

Finally we will perform our analysis on the first three axes because they contain 77% of information, which close to 80%. For different graphics, if a point is near to the center (x-and y less than 0.5), it means that in this plan, the question was chosen uniformly. Therefore, we will also study graphs of plans 1-3 and 2-3.

Before starting the tests, as shown in Figure 24, Figure 25, Figure 26, men have shown a negative opinion regarding eCall (useful, satisfying, efficient, raising alertness). However, most women have shown neutral or positive opinion for all these metrics. Participants above 40 years old show a positive benefit of having access to the eCall. However those 18-40 years old have shown a neutral and sometime negative opinion about eCall. Participants 18-40 years old, women, and those participants with balanced driving, as well as those journeys are less than 20000 km/year has shown their willingness to pay of having access to eCall. Those who wish to pay for the eCall service, indicate to pay 10 to 50 euros/year. Among those who do not wish to pay for the eCall service, are the salaries/officers, students/teachers, persons older than 40 years, and those who are not experienced and/or with offensive driving style.

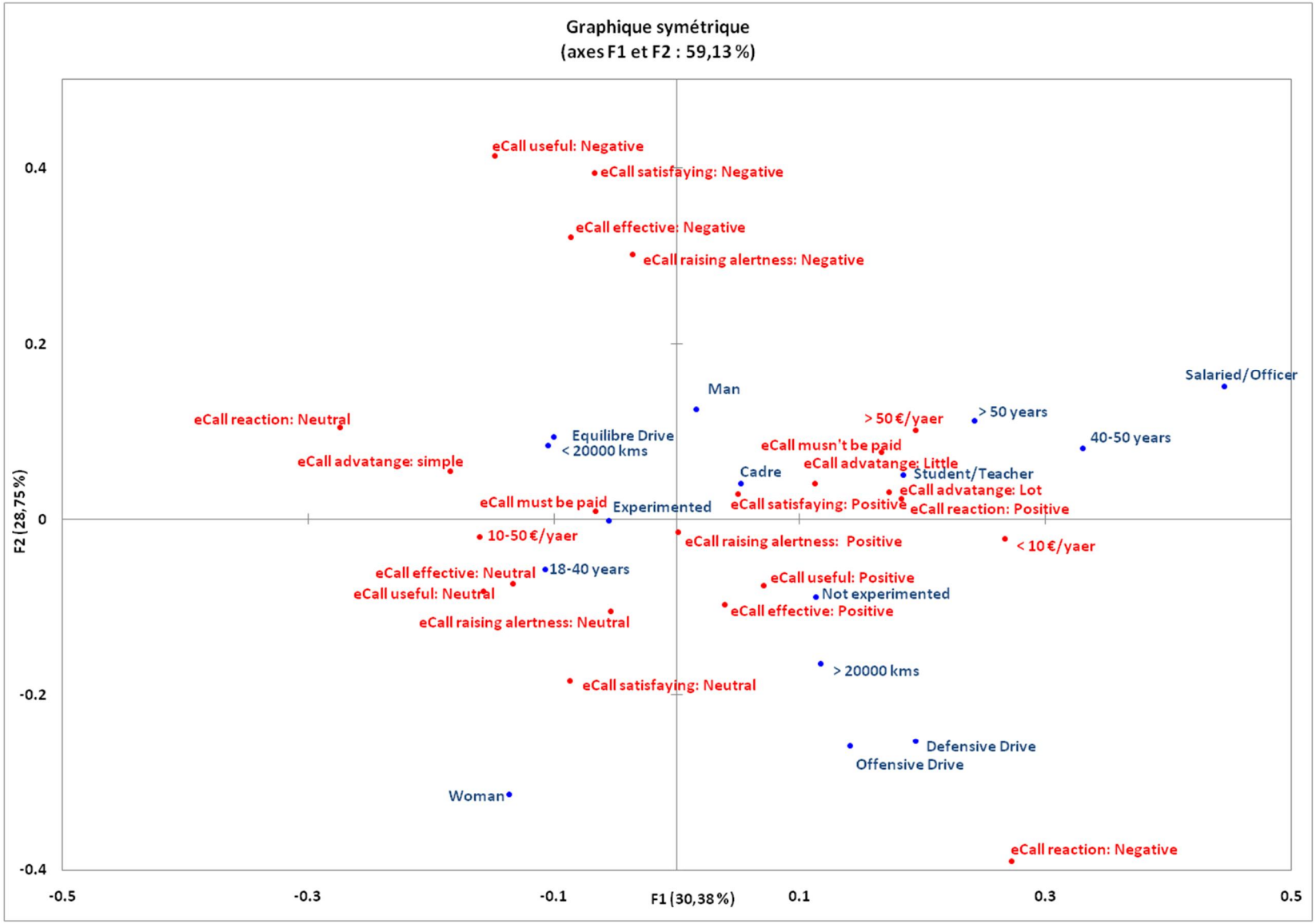


Figure 24: Before F1-F2

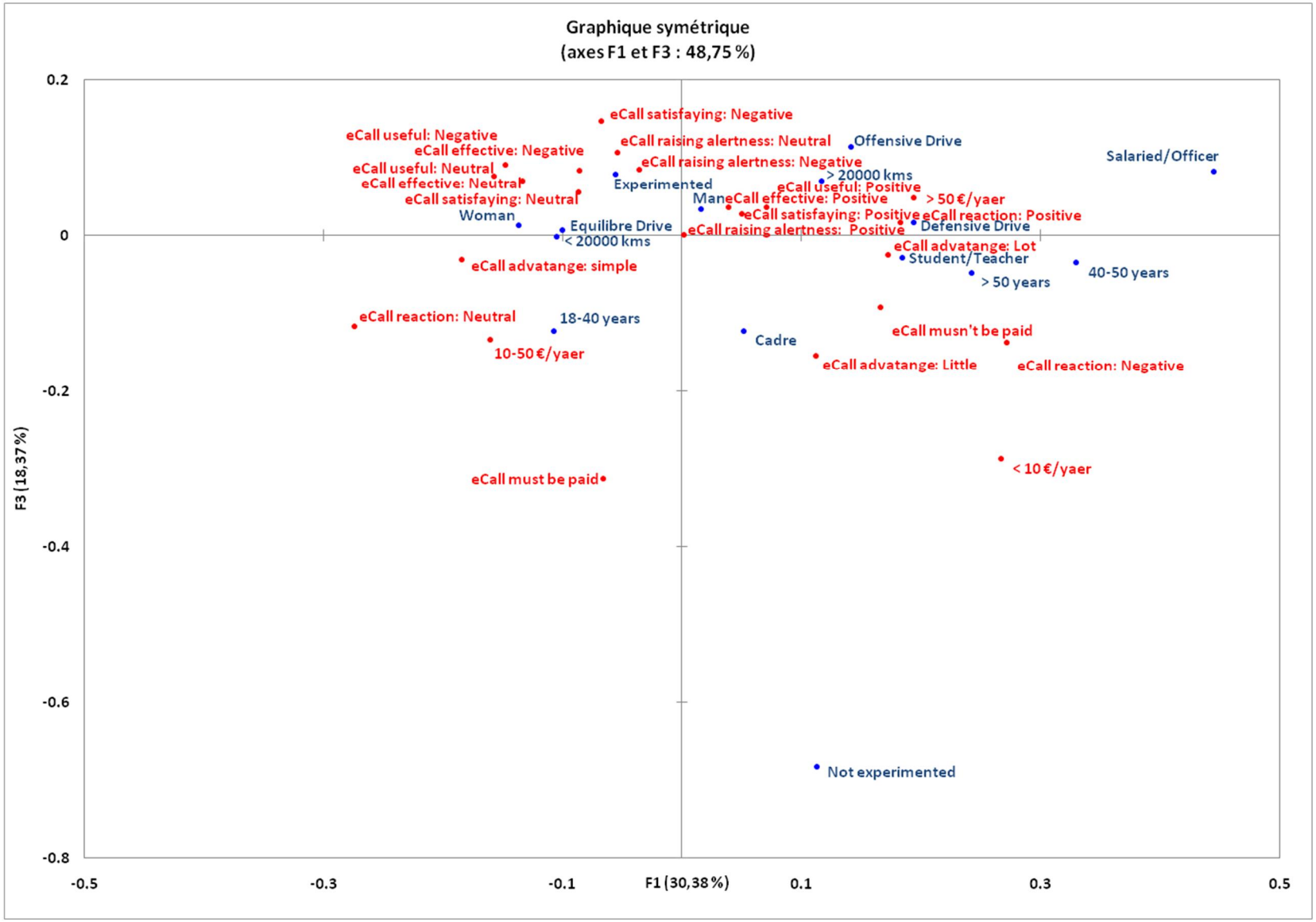


Figure 25: Before F1-F3

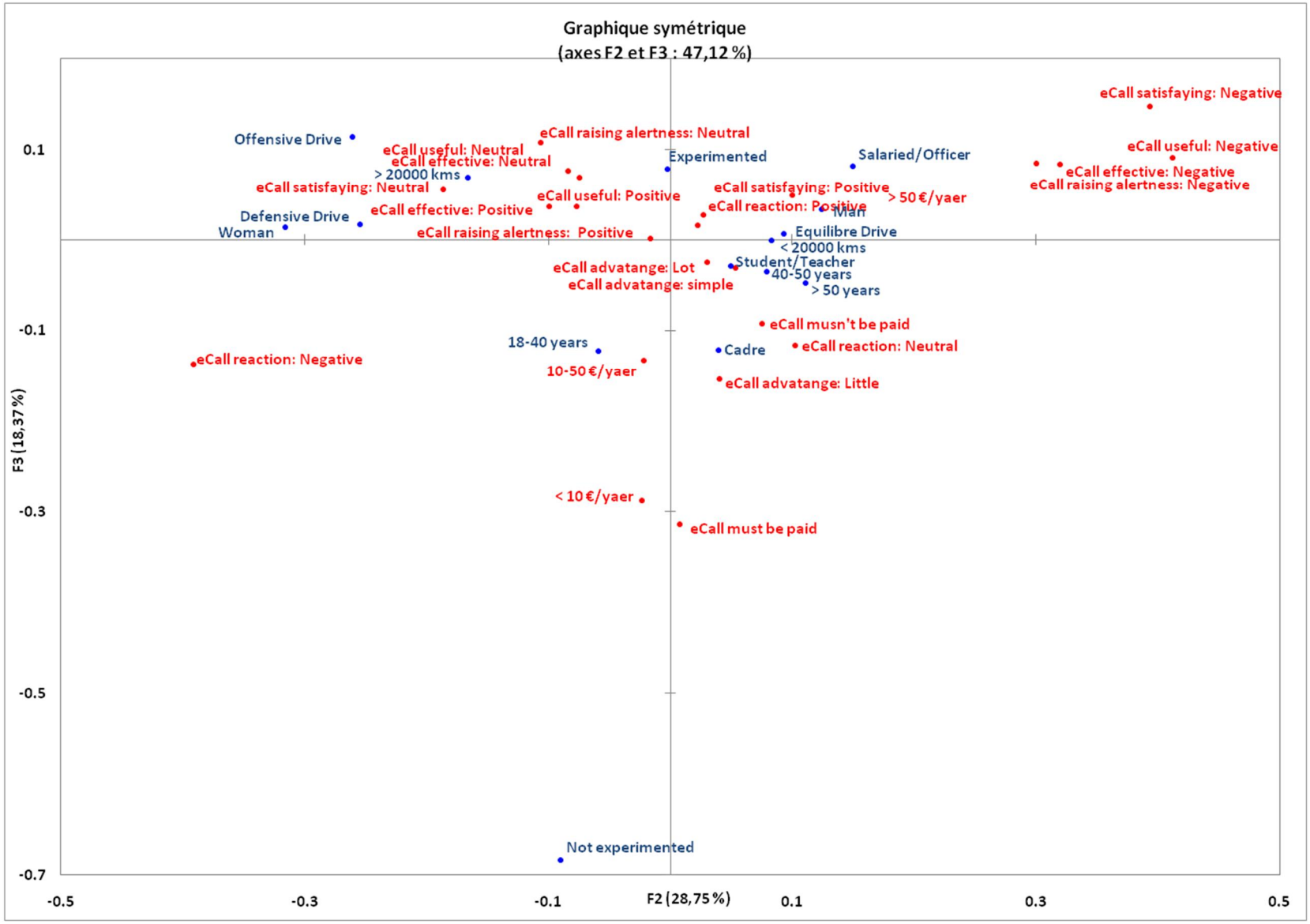


Figure 26: Before F2-F3

3.2.2. Users-background/eCall-During

The eigenvalues with the percentage of inertia are shown in the table below:

Table 8: Percentage of inertia of users-background/eCall-During

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13	F14
Eigenvalue	0.096	0.073	0.024	0.019	0.007	0.006	0.004	0.003	0.002	0.001	0.001	0.000	0.000	0.000
Inertia (%)	40.805	31.030	10.122	7.892	2.916	2.377	1.510	1.191	0.949	0.582	0.447	0.128	0.040	0.011
% Cumul	40.805	71.835	81.957	89.849	92.765	95.142	96.652	97.843	98.791	99.374	99.821	99.949	99.989	100.000

We have also used criteria C1, C2, and C3 to select the most important axis as follow:

- C1: to keep 80% of the information, it is necessary here to work on the first 3 axes, F1, F2, and F3.
- C2: we can notice that the first 4 axes are higher than average inertia 7.14%, and then the fifth axis goes to 2.916%. The first 4 axes are then selected according to this criterion.
- C3: we noticed that from the fifth axis the inertia is low and decreases slightly, and then F1, F2, F3, and F4 could be used for analysis.

Finally we will perform our analysis on the first three axes because they contain around 82% of information.

During the tests (Figure 27, Figure 28, Figure 29), men have shown their negative opinion regarding the eCall usage but women tends to be more positive. Participants 40 years old and above have a slight tendency to neutral opinion compared to young participants, those between 18 and 40 years, their opinion varies between negative and positive. Participants show either their willingness to pay or not to pay for having access to this function. During the tests we cannot see any clear patterns and participants have a board opinion.

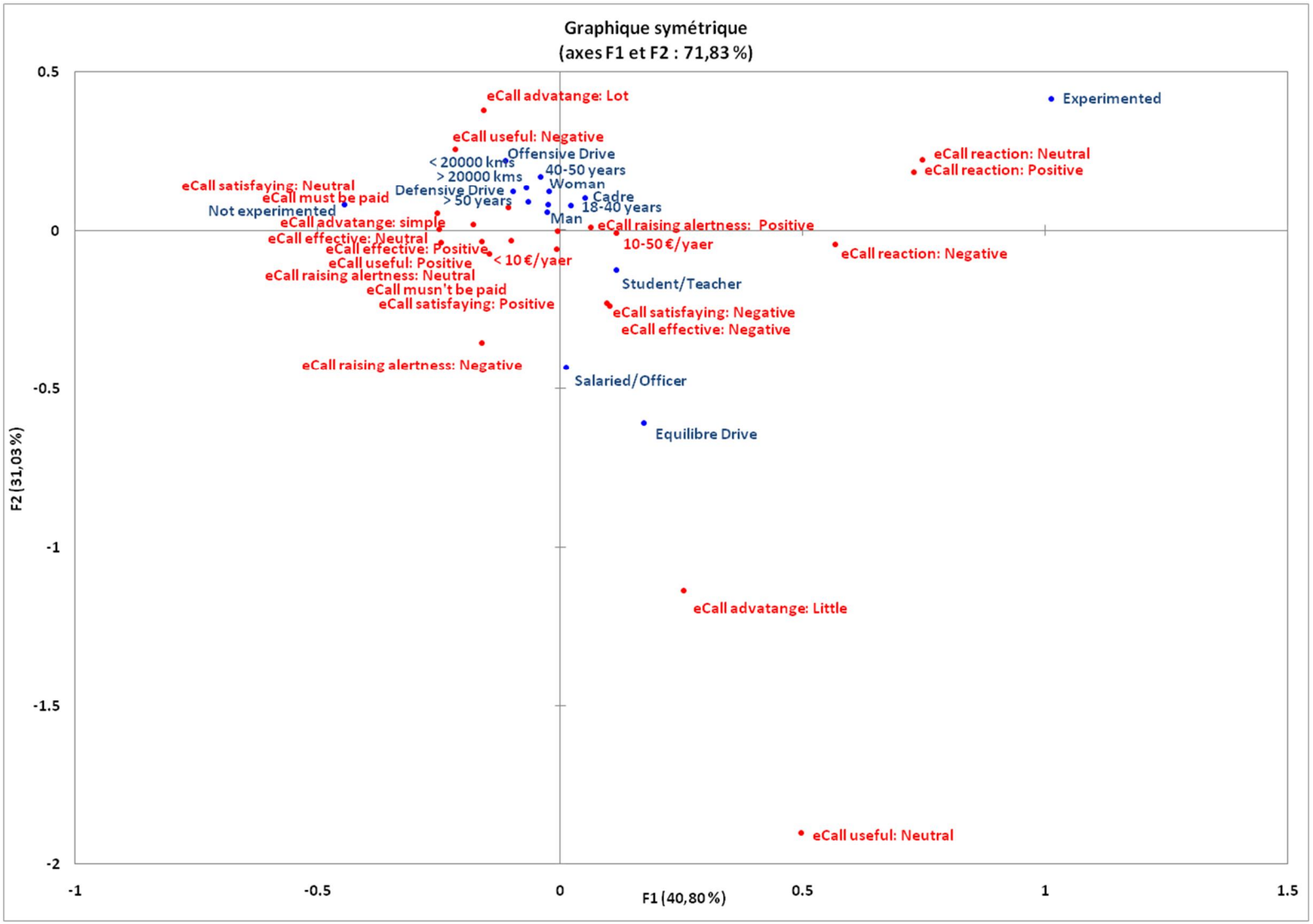


Figure 27: During F1-F2

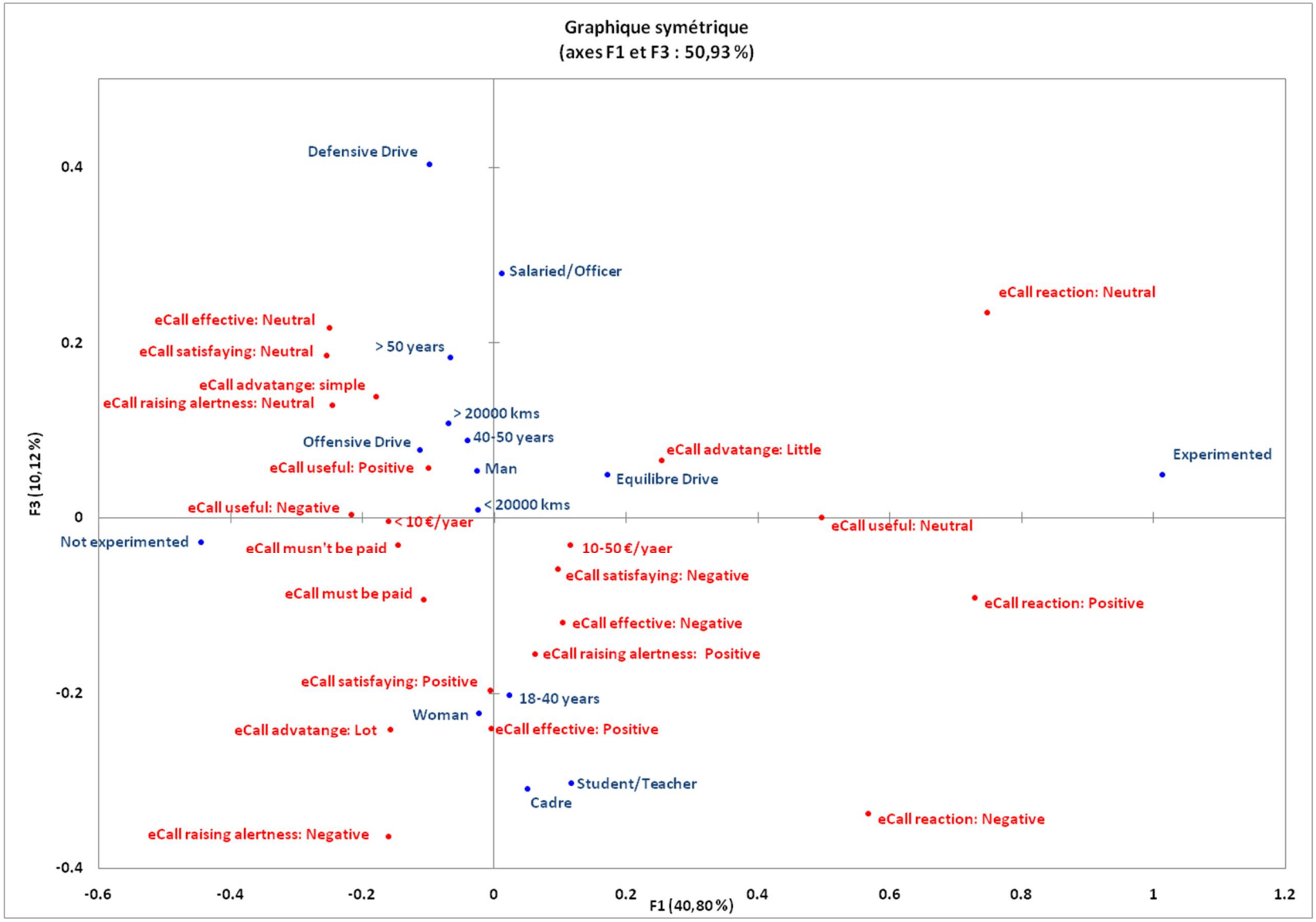


Figure 28: During F1-F3

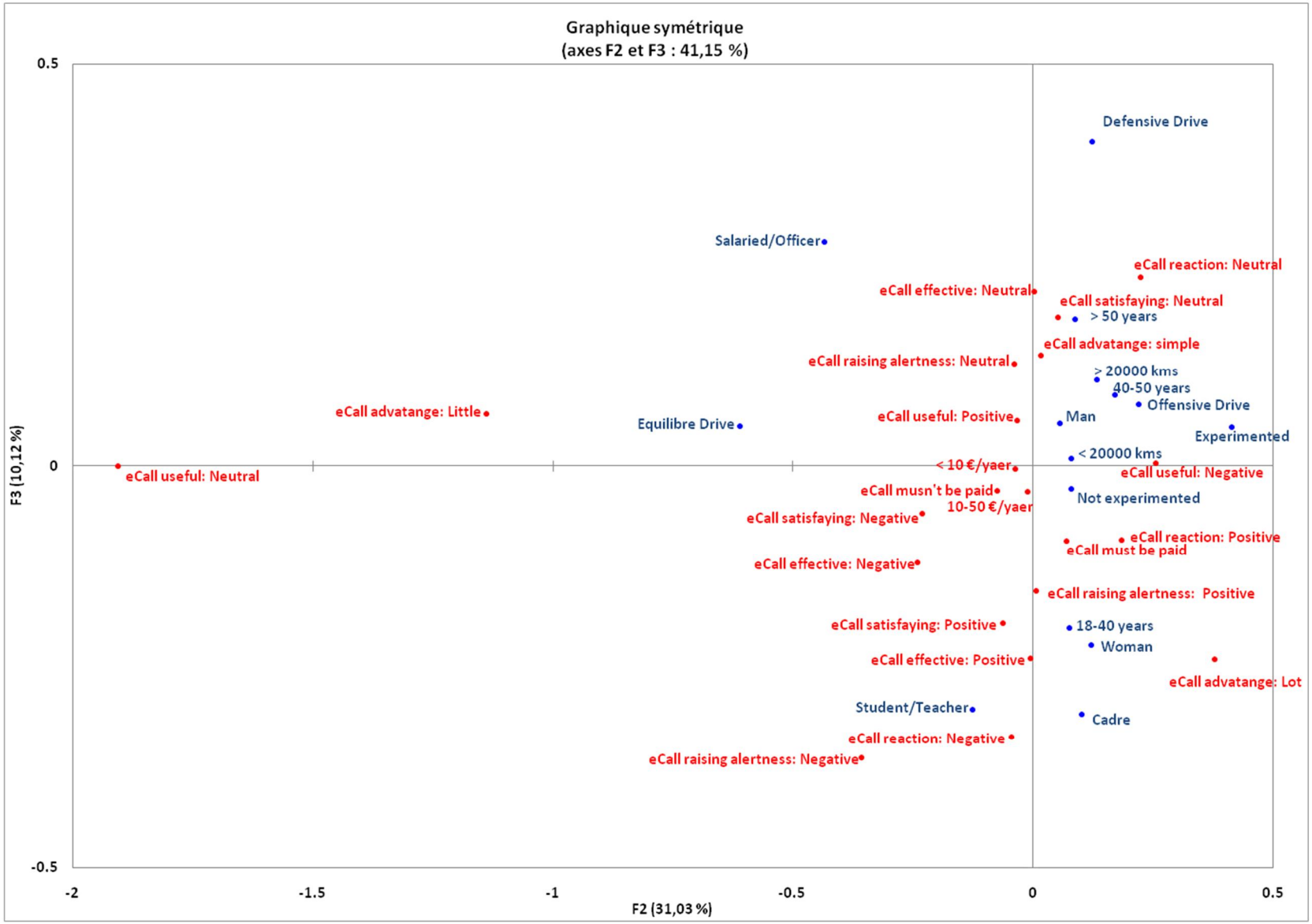


Figure 29: During F2-F3

3.2.3. Users-background/eCall-After

The eigenvalues with the percentage of inertia are shown in the table below:

Table 9: Percentage of inertia of users-background/eCall-After

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13
Eigenvalue	0.063	0.025	0.018	0.015	0.012	0.007	0.005	0.004	0.002	0.001	0.000	0.000	0.000
Inertia (%)	41.626	16.383	12.004	9.773	7.739	4.398	3.069	2.637	1.165	0.726	0.291	0.137	0.054
% Cumul	41.626	58.009	70.013	79.786	87.525	91.923	94.992	97.629	98.793	99.519	99.809	99.946	100.000

We have also used criteria C1, C2, and C3 to select the most important axis as follow:

- C1: to keep 80% of the information, it is necessary to work on the first 4 axes, F1, F2, F3, and F4.
- C2: we can notice that the first 5 axes are higher than average inertia 7.69%, and then the sixth axis goes to 4.398%. The first 5 axes are then selected according to this criterion.
- C3: we noticed that from the sixth axis the inertia is low and decreases slightly, and then F1, F2, F3, F4, and F5 could be used for analysis.

However, we will perform our analysis on the first three axes for easy analysis of the results.

After testing period (as shown in Figure 30, Figure 31, Figure 32), men show no opinion related to eCall usage, while women have shown their positive feedback. Before and during the tests, women were neutral, but they enjoyed the eCall service. Participants 40-50 years old have a negative reaction to the eCall in opposite to what they answered before and during the tests, while those between 18 and 40 years and those more than 50 years prefer to say nothing about their reaction to the eCall. For paying to have access to the eCall function, there was a slight change of opinion, participants over age 50 and those between 18 and 40 years are willing to pay more than 50 euros/year. Women, salaries/officer, participants with offensive driving and their journeys are more than 20000 km/year are not willing to pay. Regarding non-experienced participants, those are 40 to 50 years old, those who drive less than 20000 km/year, students/teachers, and those with a balanced driving style, are divided between paying and not paying for having access to the eCall function.

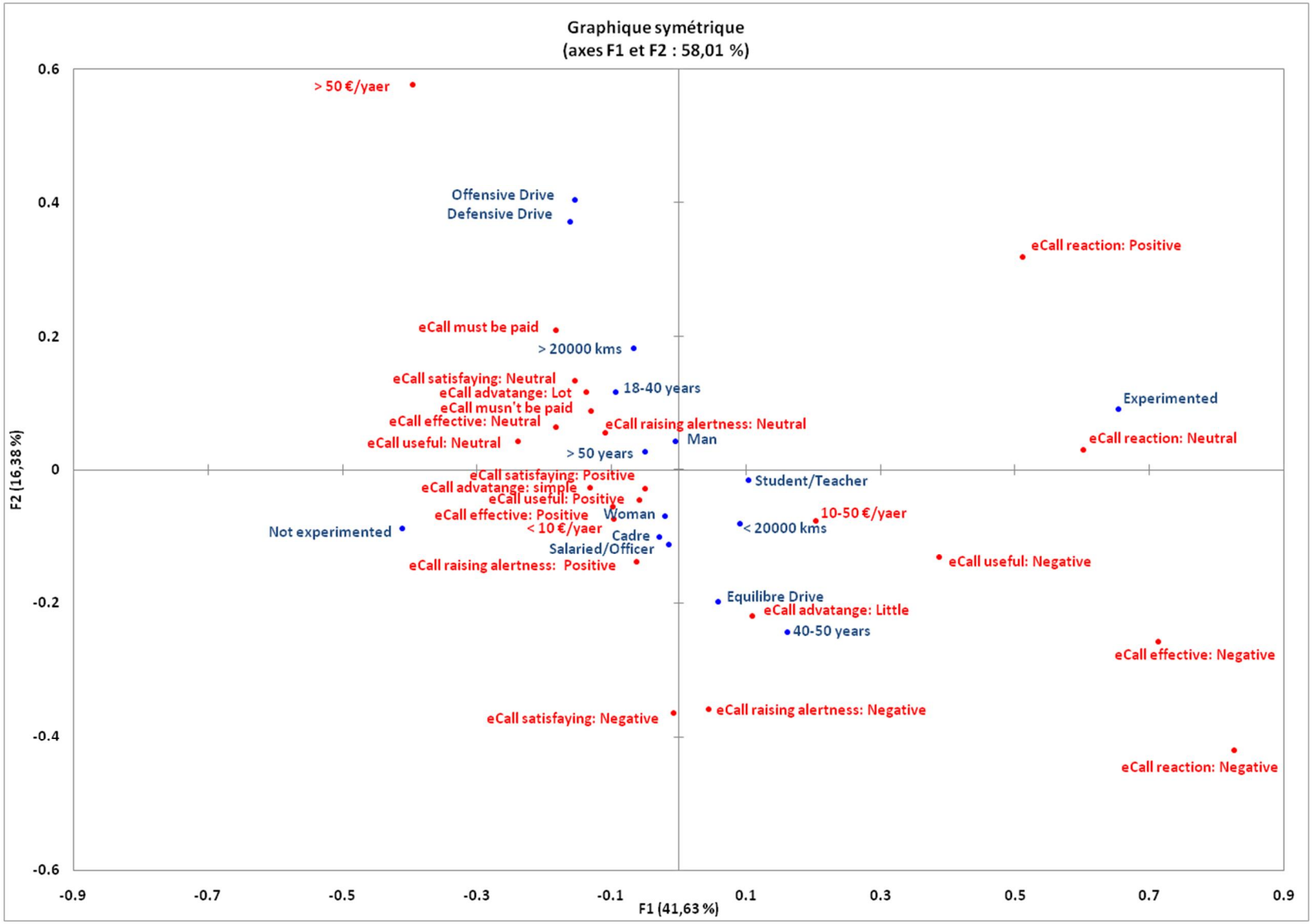


Figure 30: After F1-F2

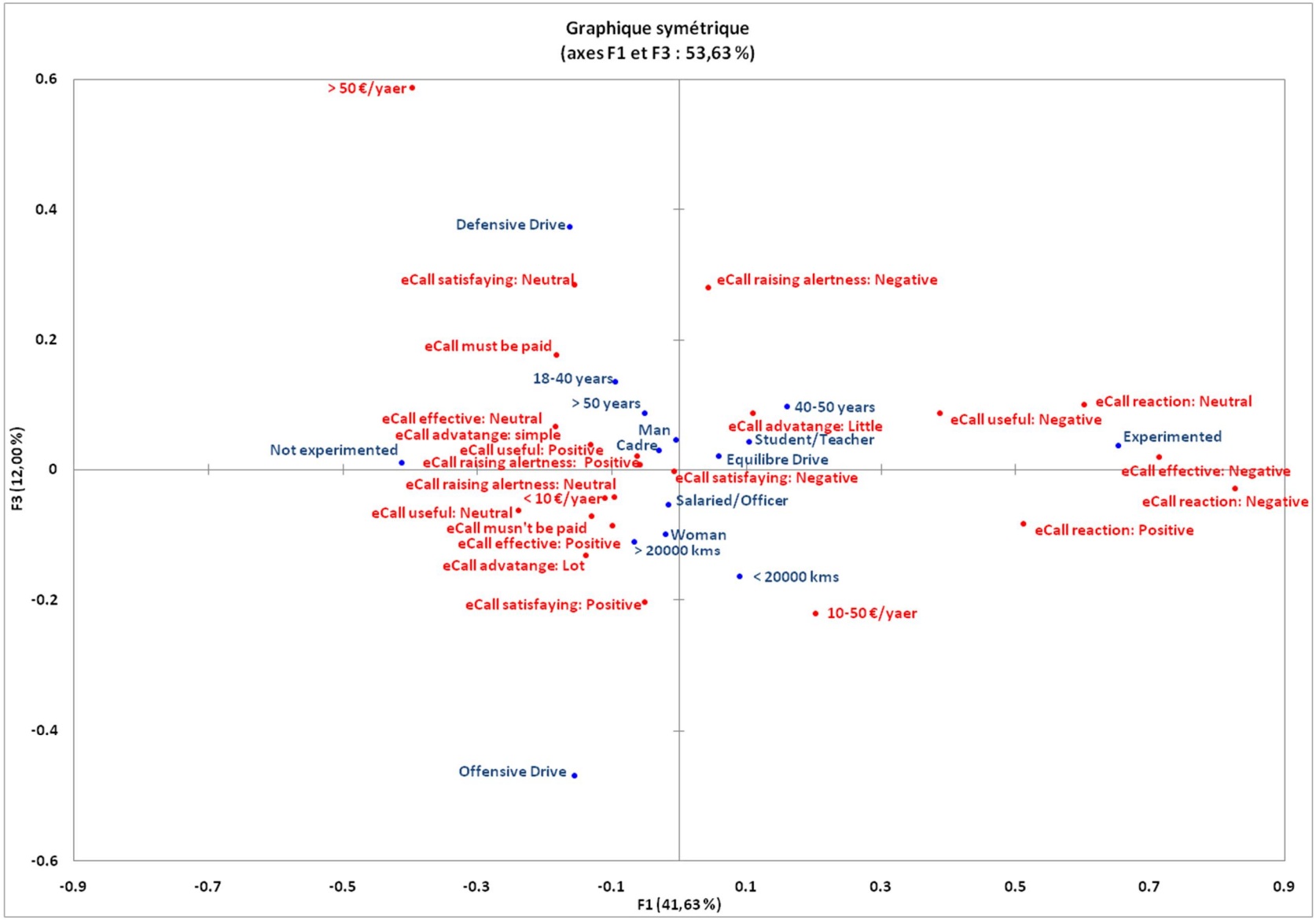


Figure 31: After F1-F3

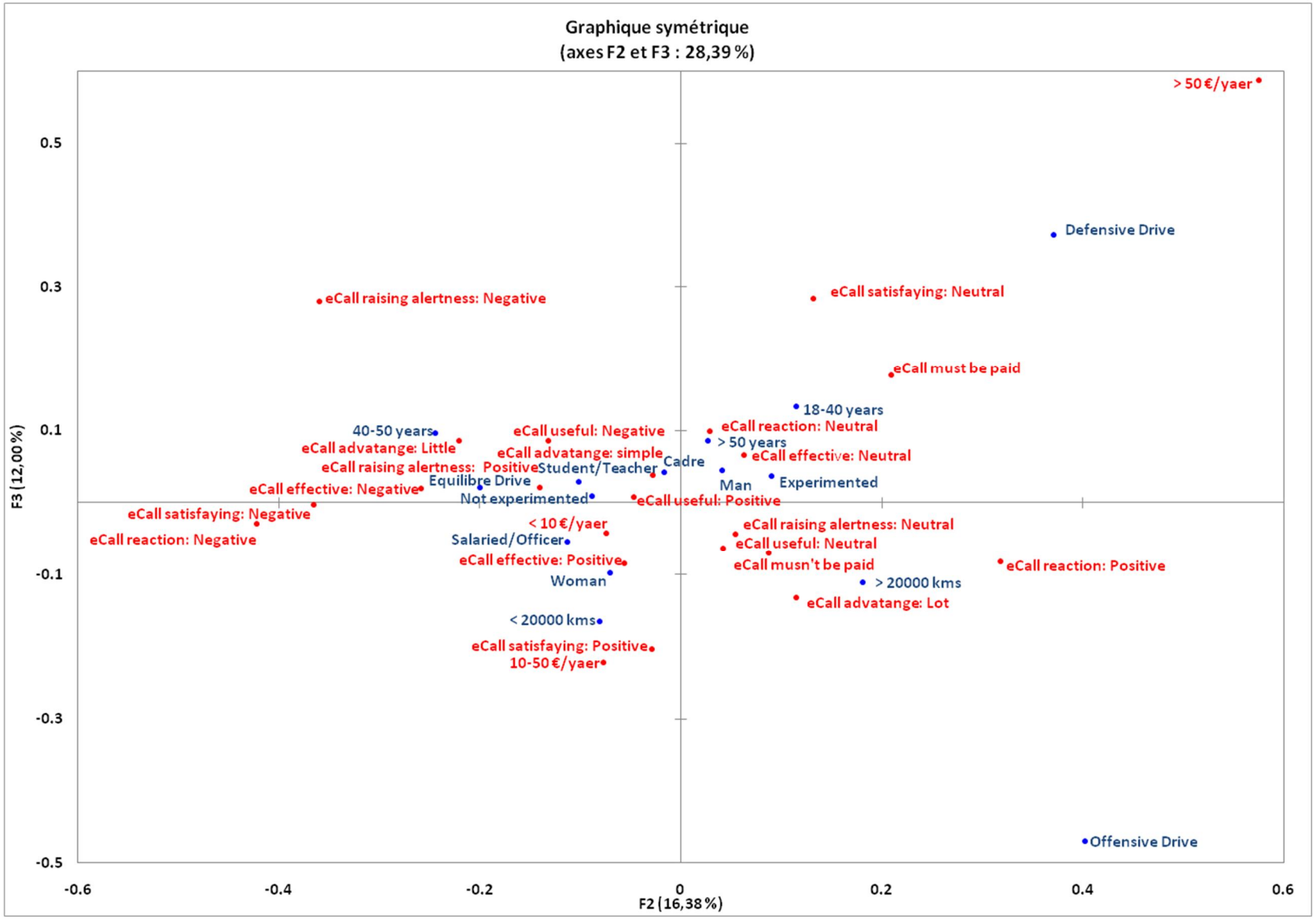


Figure 32: After F2-F3

3.3. Summary of the results

This section summarizes the statistic results for research question we have considered:

RQ13: Is Drivers age, experience, and gender may have influence on using eCall function

- The overall assessments of the participants of the usage of eCall/Alert functions they used were significantly in accordance to the situations encountered during their journeys. It is most probable to encounter objects on the road, fog, traffic jams, radar… than accidents. According also to interviews with some participants it would be good to report on road situations and condition, but it is good to share these information with other surrounding vehicles to prevent drivers before getting to dangerous situations.
- The overall assessments of the participants of the usage of Call/Alert functions they used were slightly depend on participants' gender.
- The overall assessments of the participants of the usage of Call/Alert functions they used were mostly in accordance with participants' ages. For example Elder people considered that eCall/Alerts are useful.
- The overall assessments of the participants of the usage of Call/Alert functions they used were mostly related to participant's experiences. This could be explained by the fact that it is difficult for inexperienced drivers to use in-vehicle devices and embedded applications. This should be taken into consideration when launching new FOT.

RQ12: Is there a change in willingness to pay over time?

- Most participants based on their usage of the eCall/Alert functions show their no willingness to pay for having access to it. This is because most of them believe that this function must be integrated in new vehicles. Some alerts, such as speed alert camera and traffic jams, if further developed and made available on NDs and could inform users about potential dangers, participants are willing to pay for having access to them.

RQ11: Is there a change in users' acceptance over time?

- The overall assessments of the participants of their reaction to eCall/Alert functions they used were significantly correlated to their advantages. We can see that the opinion of participants having a very positive reaction change during and after testing period, i.e., from almost 30% to 15% after the test period. This is more in accordance with its advantages, i.e., the percentage of participants saying that eCall/alerts functions have no or little advantages increases from 3% before the test to reach almost 30% after the test period. However, almost 60% of participants showed either neutral or positive reaction to the eCall/alerts functions.
- The overall assessments of the participants of the advantages of eCall/Alert functions they used were significantly depend on their usage over time. We can see that participants were significantly used the functions in the beginning of the test but decrease over time since they did not see any advantages of accessing to it. The percentage of participants saying that eCall/alerts functions have no or little advantages increases from 3% before the test to reach almost 30% after the test period.
- The overall assessments of the participants of the impression of the eCall/alerts they used were not significantly correlated to their usage over time. For usefulness there is no pattern to be extracted, but we can see a decrease in the % of participants with positive opinion after the test period and the % of participants with negative opinion slightly increases. The percentage of participants filling those eCall/Alerts functions are good decreases during the tests but increase again after the testing period, however the % of participant with negative opinion slightly increases.

RQ9: Does the (physical) design of the device affect user's acceptance of function/device?

- The overall assessments of the usage of eCall/alerts by participants were related to the physical design of the devices they have had during experiments. For example, unlike GS410, the utilization of Tablet increases during the testing period because of it is easy to use and its features as well, e.g. large screen.

RQ11: Are the functions/devices being used more or less over time?

- The overall assessments of the participants of their usage of the functions they used were significantly in accordance to their usefulness over time. There is significant increase in assessment of usefulness and satisfaction over time.

Several conclusions could be derived from analysis of data. For example, Firefighter (from SDIS), engineers/technicians, and researchers/students are the socio professional categories who used the most ECall at 23%, 16% and 20%. However, as firefighter center in France is the one which has to deal with emergency calls, their eCall were made in real conditions during real accidents. They are the one who really used e-Call and answered truthfully all the surveys. Therefore due to their professional or personal relations with emergency situations they could be the first target for a possible launch or a second attempt for developing, testing, and standardization of the eCall. In general, testers plan to pay a possible utilization of eCall, but this price has to be affordable for all. As the survey analysis shows it, French testers mostly do not want to pay more than 50€ for this application program. Tablets were much more used than GS410 for 83%. Yet GS410 and Tablets were handled out at same proportions, this is because of the Tablet is easy to use. Still, for some not experienced drivers, Tablets and GS410 utilization are still too complicated when they do not have a co-driver. They argue that launching a warning or an eCall is difficult or nearly impossible while driving.

4. CONCLUSIONS

This deliverable describes the work we have done during TELEFOT project to develop and test eCall function. We have first studied and analyzed needs and expectations and surveyed existing technologies and software tools. We developed the eCall application on two platforms as well as the web questionnaires used by different users (drivers, operator, and administrator) and web services to allow NDs to connect to the server and send required data.

With the collaboration of public or private associated partners (SDIS), 250 drivers and vehicles from “Alsace and Franche-Comté Regions” each equipped with a ND (DANEW) were used to conduct the field operational test for the eCall/alerts functions. The objective was to test its benefits, usability and impact on users’ behavior.

The outcome of the French test site is a dataset that was used to answer the research questions. Several conclusions have been made, but basically two problems emerged after survey analysis due to high question variety diversity. For launching other FOTs, surveys would have to be shorter with only important questions. Background questions should be reduced to only those actually needed (e.g., gender, experience) to be correlated with other questions that are related to experiments (before, during, after). All questions used to access the function to be tested should be same in all questionnaires (before, during, after) with 2 to 3 choices. Testers did not truthfully answer all surveys and some did not answer all the surveys, thus data quantity and quality are reduced on the long run. Based on our experiences, data need to be gathered automatically from devices installed (e.g., NDs, from CAN bus, Camera) on the vehicle keeping the questionnaires to fill by users to the minimum, e.g., the willingness to pay for the function. We also noticed that the utilization of a device depends on its friendly interface and its design (e.g., small/large screen).

REFERENCES

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[QUALCOMM-2] The Qualcomm in-band modem reference implementation: http://www.3gpp.org/ftp/Specs/archive/26_series/26.268/26268-900.zip

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[ITS-2011] W. Ait-Cheik-Bihi, A. Chariete, M. Bakhouya, A. Nait-Sidi-Moh, J. Gaber, M. Wack, An In-vehicle eCall Platform for Efficient Road Safety, In: 8th ITS Europeen congress, 2011.

[ALCATEL] Real-World Emergency Call Handling Services: Saving Lives and Reducing Costs http://www.alcatel-lucentbusinessportal.com/private/active_docs/SPG5677090201_Emergency_20swp.pdf (last consulted: April 25, 2011).

APPENDIX I: DEVICES CHARACTERISTICS

Main Characteristics of the Tablets

- GPRS connectivity for WEB services (internet) and FTP
- Processors: SiRF Atlas III dual-core, 372 MHz, DSP 248MHz.
- 64MB RAM and a 1GB flash memory
- GPS: SiRF Star III, antenne intégrée
- GPRS: GSM tri-bande/GPRS 900/1800/1900 MHz
- Sim card (data) and micro SD card slot
- Large 4,3" LCD touch screen
- Battery: li-polymer 1500mAh rechargeable, autonomy 3,5h
- mini-USB, audio jack 3,5mm
- Navigation software: Destinator
- OS Windows CE. Net 5.0 Core version
- Dimensions GPS: 125mm x 80.3mm x19mm
- Weighs about 180 grams [2]

Main characteristics of GS410 device

- OS Android2.2
- SCREEN 7-inch multi-touch capacitance 800 * 480 resolution
- CPU High performance, high-pass Qualcomm MSM7227,600MHz (can be overclocked800GHz)
- RAM 512MB DDR2
- HDD 512MB, TF card, expandable
- WEBCAM Before1.3M px Behind 2.00M px
- Phone 3G/2G cell phone calls
- Internet access Built-in WIFI + built-in WCDMA 3G Wireless Internet
- Bluetooth headsets, file transfer
- Navigation Built-in GPS navigation
- Sensor G-Sensor, Battery 4200mAH
- Case Material ABS Molded Case
- Color White/black, Size 118.6 X 197.8 X 11.8mm, Net weight 400grams
- Box size 255mm×200mm×48mm
- Video format (support) Mpeg-4, H.263, H.264, Windows media, etc.
- Audio format support MP3, AAC, AAC+, AMR-WB/+, EAAC+, etc.
- Picture format support BMP, JPG, PNG, GIF, etc.
- Buttons Power button X 1HOME button X 1Menu button X 1Volume + button X 1Volume - button X 1Return button X 1Reset button X 1
- Interface USB port X 1SIM card slot X 1TF card slot X 1Headset jack X 1DC in port X 1

APPENDIX II: DESIGN AND DEVELOPMENT

In order to develop the required software/hardware tools to undertake the LFOT, we developed first an eCall application that is installable on Danew devices to make an eCall and send a short textual message using GPRS based connectivity. Secondly, we developed a server and client applications and services to store the real time data gathered during the test, and to view and analyze the data collected. The eCall application was developed on Windows mobile CE and Android platforms.

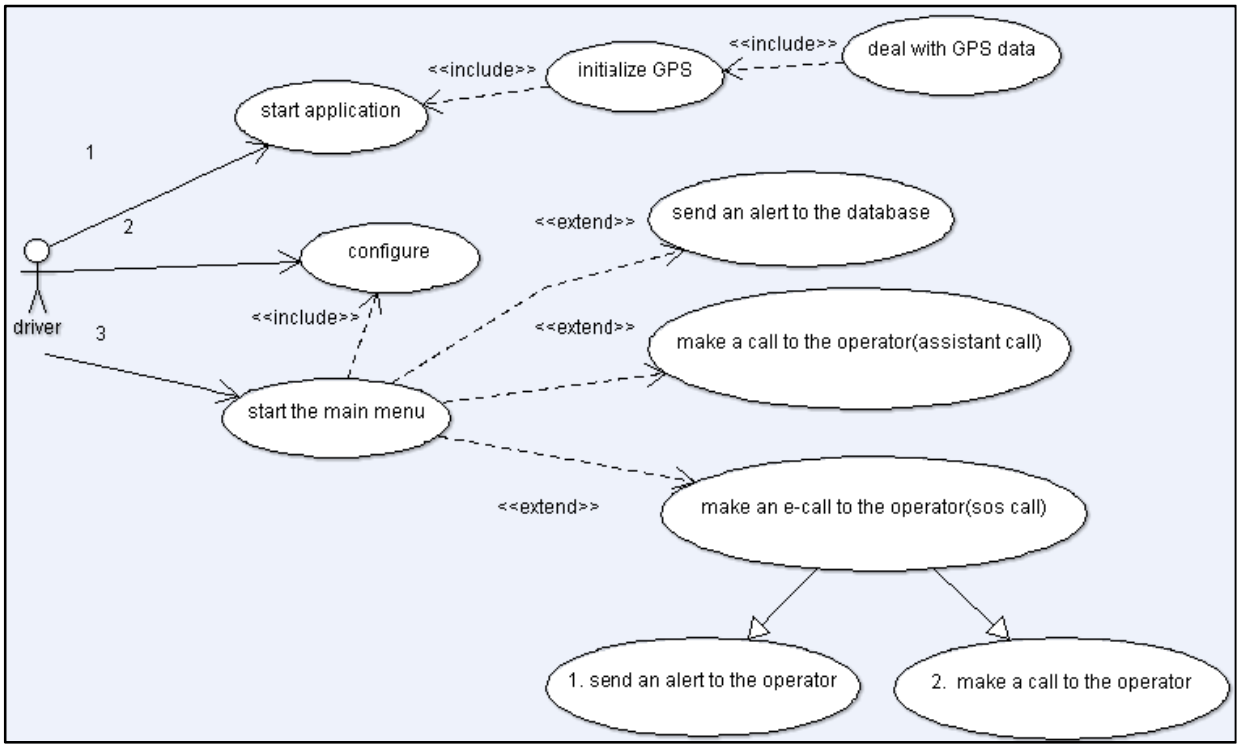

Figure 33: eCall System: use case diagram

Figure 33 presents the UML (Unified Modelling Language) use case scenario of the eCall system and Figure 34 presents the UML sequence diagram.

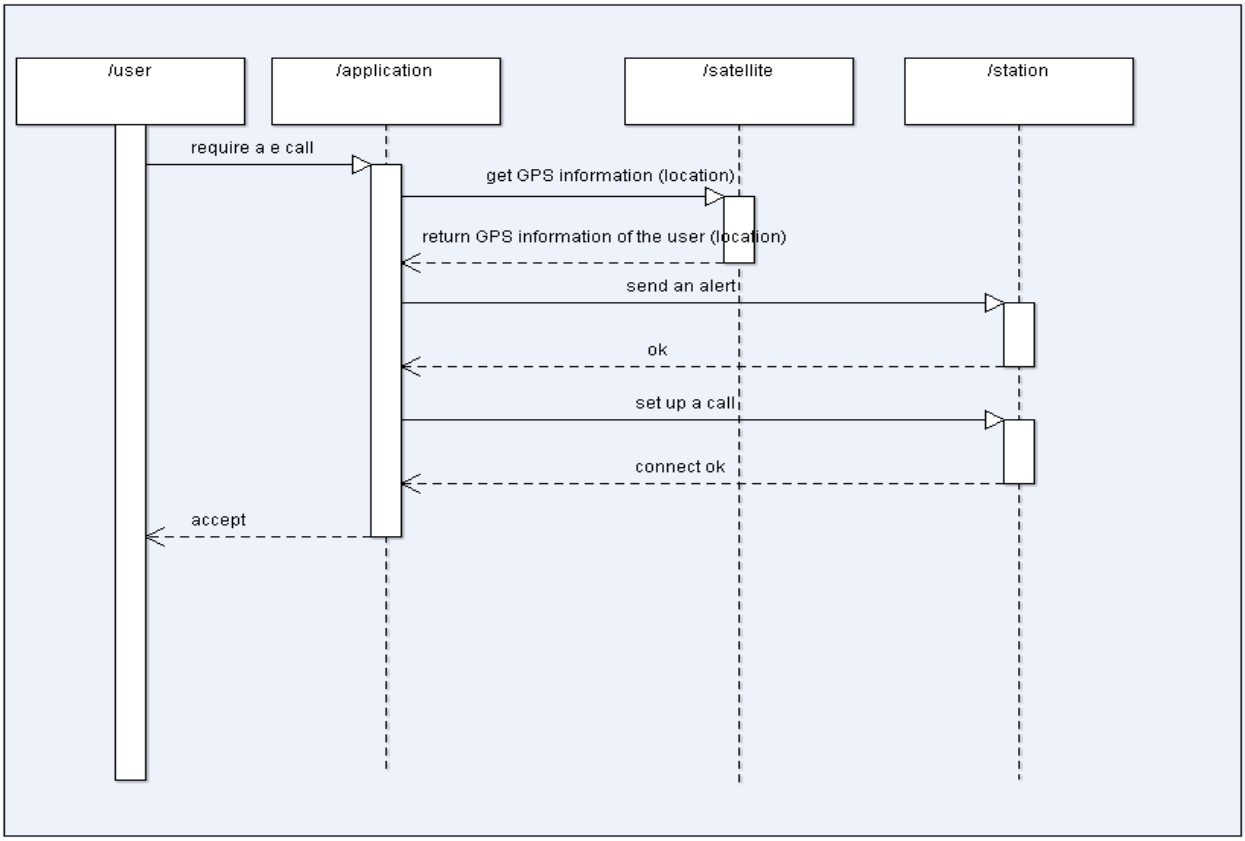

Figure 34: eCall System: sequence diagram

The rest of this section describes the client-side applications (on Danew and Tablet devices) and server-side services.

eCall application for Windows mobile

An application was developed on Danew device to establish a voice link with PSAP as well as data link to send textual data. The development tools used are as follows:

- Microsoft Visual Studio 2008: C#.Net as IDE
- Microsoft Windows CE 5 SDK: underlying operating system
- ActiveSync and Windows Mobile Device Center (based on the operating system)
- Danew GS410 GPRS: The target ND with navigation and GPRS connection
- Sim card: used within Danew device

The application is a C# .Net project developed within Visual Studio 2008. Following external libraries/dll files have also been used.

- MySQL Connector /Net version 5.2.7 for permitting a connection with the database.
- GPRSConn.dll: to establish a GPRS connection.
- YFHelpTK.dll: to establish voice link

The project panel is shown in Figure 35.

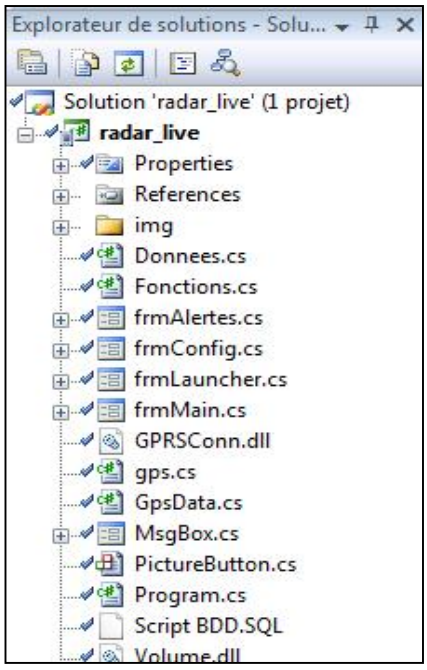

Figure 35: eCall Application project panel

The file 'img' contains all the images of the application. They are loaded once the creation of the formulas, which permit the creation of personalized themes. All the files of type 'frm' are the screens of the application. The class 'Donnees' contains the data of configuration of the application. These are loaded from an XML file. The static class 'Fonctions' provides all the principal actions of the application such as, making a call, launching an alert, retrieving the unique number of the terminal. The class 'gps' corresponds to the thread scanning the GPS and retrieving the information. The class 'GpsData' permits to transform the characteristic string offered by the GPS in the exploitable data.

The first visible screen at the start of the application is a simple button-image which can be moved with the help of the title bar. We can also find a 'close button' that allows stopping the application. Through this launcher form, user can access all the functionalities of the eCall application (Figure 36).

Figure 36: eCall Application launcher

The configuration screen of the application (see Figure 37) permits the user to enter the necessary information of different operations of the application. The user should thus provide:

- His telephone number
- The urgent number (e.g., 112 or the telephone number of the operator)
- The number of automobile assistant

Once entering into one of the domains of text, the virtual keyboard shows automatically. Once the user enters from the text to a text domain, this one is automatically and immediately duplexed in a domain of verification. This functionality permits the user to see what he or she typed once the clavier masks the zone of text. The button of registry verifies that all the

necessary data have been well offered for the records in an instance of the class ‘Donnees’. On the contrary, a warning message is displayed.

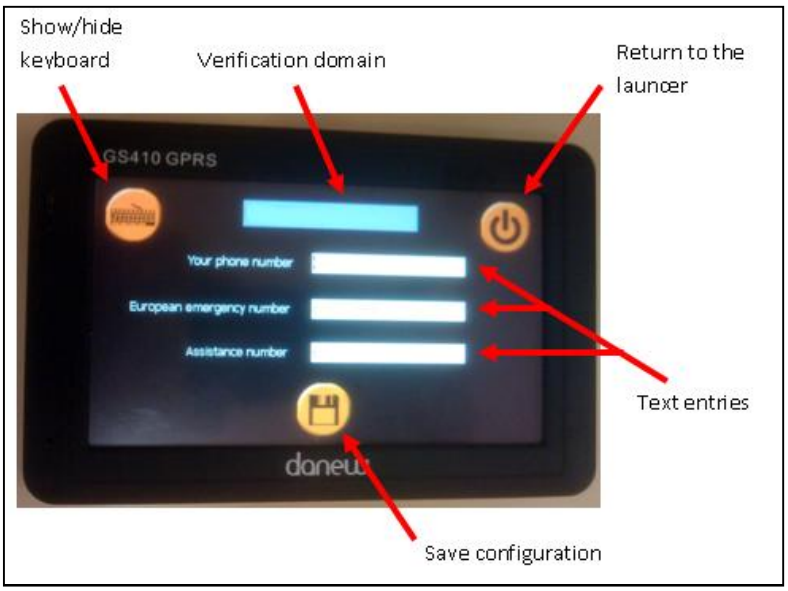

Figure 37: Configuration form

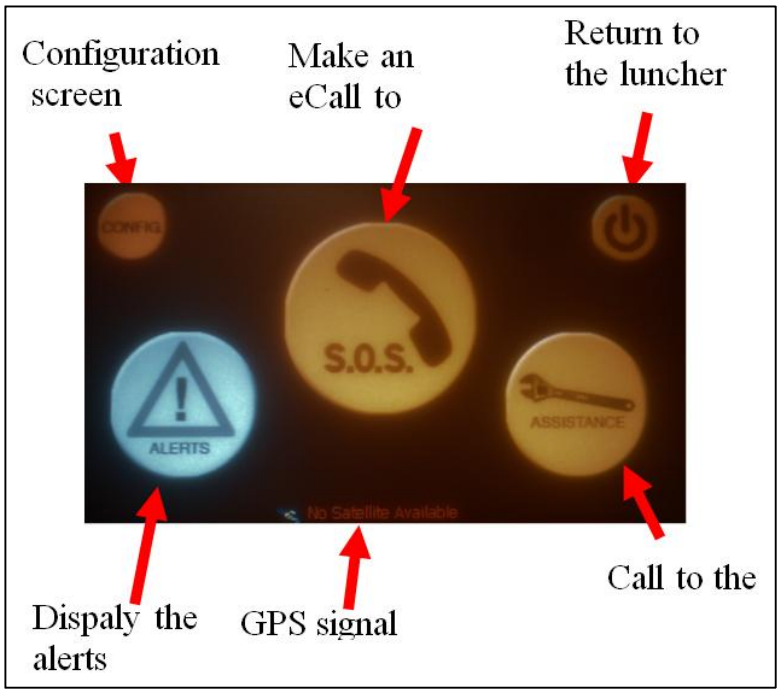

Figure 38: eCall main menu

Figure 39: eCall alerts system

Figure 38 demonstrates the menu of eCall application while Figure 39 shows the different options to send an alert to the PSAP. The following codes are used for different events.

Code of the alerts:

- AC → I have an accident
- TF → Traffic jam
- RA → Speed camera
- UA → I see an accident
- FO → Fog

After the development, each module of the eCall application was tested and verified according to the requirements. The following table presents a brief report of testing.

Table 10: Report of eCall testing

Functionalities	Expected Results	Gained Results
Loading of the configuration file	The XML file data is successfully saved with the help of class 'Donnees' and is visible in the configuration screen.	OK
Loading application launcher form	Clicking on the required button displays the TeleFOT application launcher form	OK
Passage of an eCall	If confirmation, call of configured number, if not, return to the principal screen	OK
Passage of an call of assistant	If confirmation, call of configured number, if not, return to the principal screen	OK

Available satellites	Title « Available satellites » written in green and button « Alerts » clickable	OK
Launch of an alert	The database should contain the launched alert. It should verify the following points: • Correct alert code • Correct terminal ID • Latitude longitude and directions filled • Hour and Date of launch of the correct alert • Statute = « Waiting » • Login operator = Null	OK

The results were quite satisfactory and the technical functionalities has been varified. However, during the initial test phase, we have identified that the Call setup time is resonably very high. We have tried to identify the problem because the process of sending alerts (connecting, then sending), took up to 30 seconds. The problem was the .NET SQL Connector.

Each call to the connector would throw a MissingManifestResource exception. So, we decided to drop the SQL Connector and use a Web service[4]. We decided to use PHP for our web service, since it is s very common, and easy to install.

A WSDL (Web Service Description Language) descriptor has to be exposed on the network. It is used as interface between the database and the software embedded on the ND and contains the address to the server, and description of the function and its parameters return values, etc. Since .NET handles Web services out-of-the-box, we just had to include the WSDL location as a resource of the project, and then call it like any other method. On the server side, the database can completely change (switch to an Oracle, PostGRE, or even XML-based database), and still be compatible with client software, as long as the WSDL descriptor remains the same. The web service acts as an interface (as in the object programming paradigm) over the database. The WSDL file contains description for only one method:

int StoreAlert(string *alert*Type, string deviceId,

string coordinates, string heading,

string sentTime, float speed)

This means that the client software calls the web service as normal functions, with the alert type, the device id, the coordinates, the time and the speed as parameters, and receives a code indicating the success or the errors encountered. The error codes are:

- 0 : Alert is sent
- 1 : Could not connect to GPRS
- 2 : Invalid GPS Data
- 3 : Database transaction error
- 4 : Wrong database
- 5 : Could not connect to database
- 6 : Invalid query

[4] A web service is defined by W3C [http://www.w3.org/TR/ws-arch/] as a software system to support interoperable machine-to-machine interaction over a network.

- 7 : Unknown Error
- 8 : Your device is not registered

We noticed that most of the time spent on sending an alert is when connecting to the server. The alert itself is sent in a very short time, but connection can take several seconds. The solution was to maintain the GPRS connection always active. This was achieved by using a thread to periodically check on the GPRS connection status, and reconnect when necessary. In order to do so, we use the functions written in the GPRSConn.dll file. This DLL contains 3 methods:

- bool GPRS_Connect()
- bool GPRS_Disconnect()
- bool GPRS_GetConnectStatus(bool* status)

Since it is impossible to send an alert while calling (typical situation in an eCall, where we must send the coordinates while calling). Therefore, three techniques were developed. The first technique consists in sending alerts without making a call. The second technique, called synchronous parallel eCall, consists in sending, at the same time, the alert and the call (multi-threading). Finally, the third technique, called asynchronous sequential eCall, consists in sending first alerts followed by the call [ITS-2011].

In order to measure the latency of these techniques, we have conducted experiments in Belfort/Montbéliard city both in urban and highway environments. The purpose of these experiments was to measure and evaluate the communication time between the vehicle and the server (see section 2.4).

eCall application for Android

We have also developed the eCall application on Tablet using Android. It is a software stack for mobile devices that includes an operating system, middleware and key applications. The Android SDK provides the tools and API (Application Programming Interface) necessary for developing applications on the Android platform using the Java programming language. Android includes a set of core libraries that provide most of the functionalities available in the core libraries of the Java programming language

In order to use the eCall application, the used devices have to be registered on the TeleFOT server. This step requires creating a personal account and fill-in a multiple forms (e.g., background questionnaire). This step is essential to use the eCall application. The application developed on Android uses also the web service described above and located on the TeleFOT server. The URL of the web service is: http://TeleFOT-set.utbm.fr/userDeviceMatching.php

```
- Name: matchDevicetoUser
  Binding: TeleFOTBinding
  Endpoint: http://TeleFOT-set.utbm.fr/userDeviceMatching.php
  SoapAction: http://TeleFOT-
  set.utbm.fr/userDeviceMatching.php/matchDevicetoUser
  Style: rpc
  Input:
    use: encoded
    namespace:
    encodingStyle: http://schemas.xmlsoap.org/soap/encoding/
```

```
    message: matchDevicetoUserRequest
    parts:
      userId: xsd:integer
      model: xsd:string
      serialNumber: xsd:string
      brand: xsd:string
      phoneNumber: xsd:string
  Output:
    use: encoded
    namespace:
    encodingStyle: http://schemas.xmlsoap.org/soap/encoding/
    message: matchDevicetoUserResponse
    parts:
      return: xsd:int
  Namespace:
  Transport: http://schemas.xmlsoap.org/soap/http
```

Figure 40: Procedure for matching NDs to the users

After the registration phase, the user can install the application on the device and fill-in the form (Figure 41) using the User id associated to account created in the previous steps (The User id can be found on MySQL database of the TeleFOT web site).

Figure 41 : Mapping form

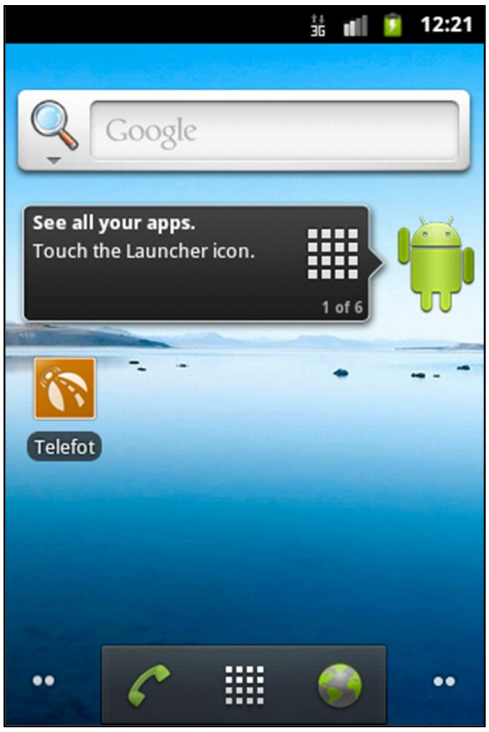

Figure 42: eCall application Icon

The screenshot depicted in Figure 42 shows the eCall application on Home screen view of an android device with a TeleFOT icon.

Alike the eCall application on Danew GS 410 device, the application interface is composed of three tabs; each one represents functionality different:

- eCall: enables the user to make an emergency call sending data to the server (device id, GPS coordinates, …)
- Alerts: enable to send weather and traffic information about the current location
- Incidents: enables to send alert about dangerous events

All these functions use a PHP web service (Figure 43), which is located on the TeleFOT server. The URL of the web service is: http://TeleFOT-set.utbm.fr/services.phpfunction

```
Name: StoreAlert
Binding: TelefotBinding
Endpoint: http://telefot-set.utbm.fr/services.php
SoapAction: http://telefot-set.utbm.fr/services.php/StoreAlert
Style: rpc
Input:
  use: encoded
  namespace:
  encodingStyle: http://schemas.xmlsoap.org/soap/encoding/
  message: StoreAlertRequest
  parts:
    alertType: xsd:string
    serialNumber: xsd:string
    coordinates: xsd:string
    heading: xsd:string
    sentTime: xsd:string
    speed: xsd:float
Output:
  use: encoded
  namespace:
  encodingStyle: http://schemas.xmlsoap.org/soap/encoding/
  message: StoreAlertResponse
  parts:
    return: xsd:int
Namespace:
Transport: http://schemas.xmlsoap.org/soap/http
```

Figure 43: The web service structure

For example, the function eCall allows the user to make an emergency call by sending in parallel extra-information about the user such as her location, her device id... To make the emergency call, the user has to tap on the big orange button, eCall (Figure 44).

Figure 44 : eCall home screen on smartphone

Once the user clicks the eCall button, the system asks the user to confirm her action before launching the application (Figure 45). Then the information is sent to the server, and simultaneously a voice call to an emergency number is started in order to establish communication with an emergency operator (Figure 46).

Figure 45 : eCall emergency call confirmation message

Figure 46 : Emergency number call

Similar to the eCall function, the Alert function enables the user to send multiple types of alerts such as Traffic congestion, Snowfall, Strong wind, Fog, see an accident or object on the road (Figure 47).

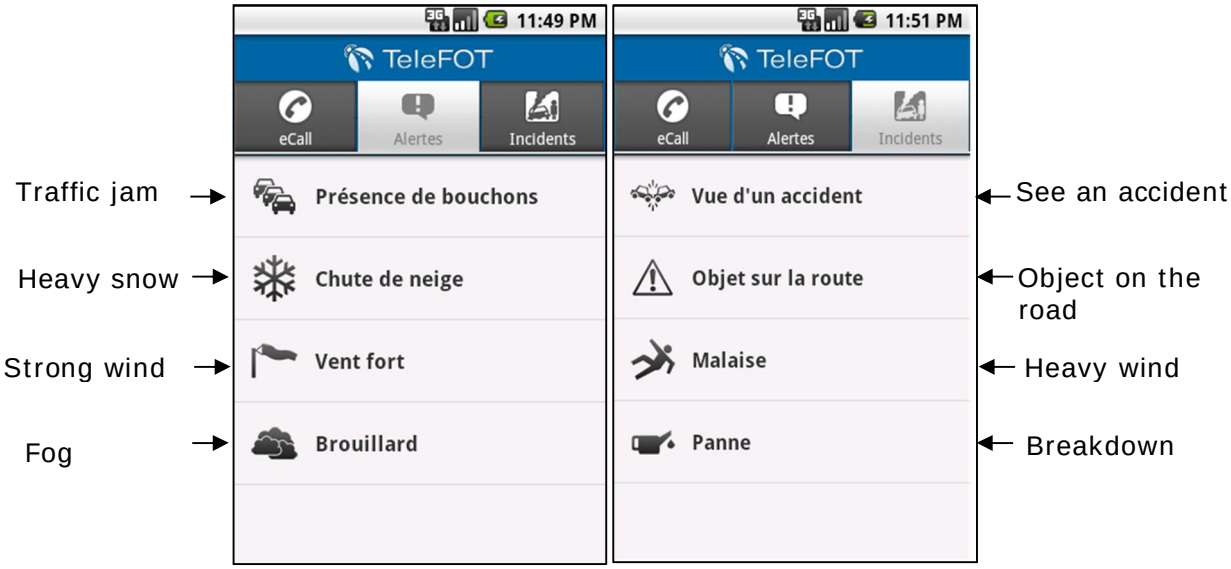

Figure 47 : Alerts views

Server application

In order to store all the information received from different vehicles, we realized the need of TeleFOT Server and Client applications. All the data collected from different NDs installed within vehicles are stored using TeleFOT server. The client application will be used by the PSAP operator to access particular events for emergency response. The same application will also be used to analyze the data and to generate expected results.

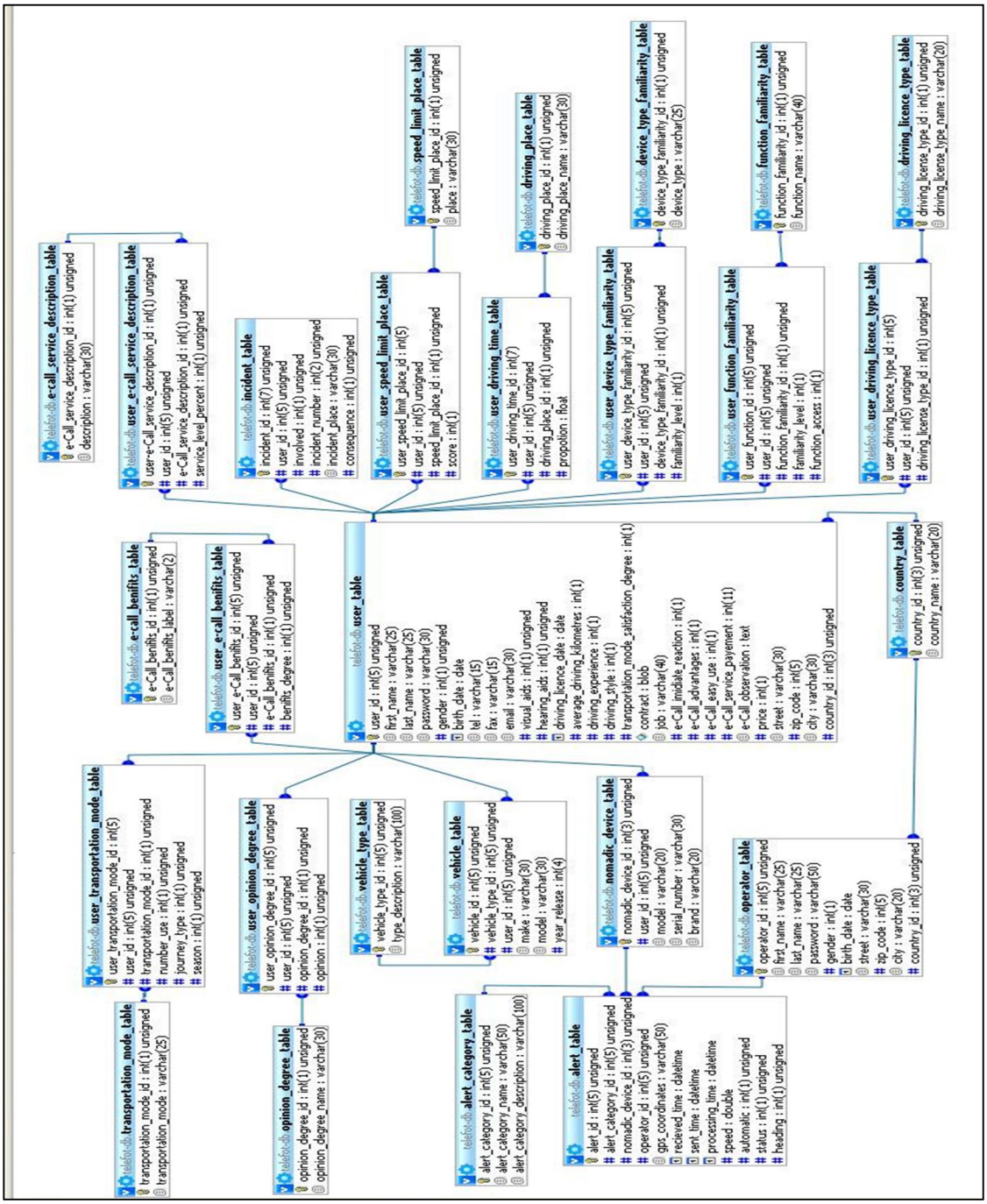

Figure 48: Logical Data Model of the Client/Server Application TeleFOT

Figure 48 shows the different classes used within Client/Server application. Tables are described in Appendix III.

The principle actors of the eCall system are:

- Driver: send alerts to the server using smart phone.

- Operator: responsible for handling alerts sent by drivers.
- Administrator: manage driver accounts and perform other tasks, e.g., statistics.

The different features that can be performed by actors are summarized as follows:

- Administrator for managing user accounts, such as list, filter, search, of add new users, and for visualizing statistics (e.g., Figures)
- Operator for processing and managing alerts sent by drivers
- Driver for sending alerts. When the driver noticed a problem on the road, she can issue an alert by sending a message to the server. She can also push the eCall button.

To authenticate, the operator must enter her login and password, the system checks whether the login and password are correct, if so, the operator accesses the application, otherwise the system prompts operator and then she can try again (see the sequence diagram depicted in Figure 49).

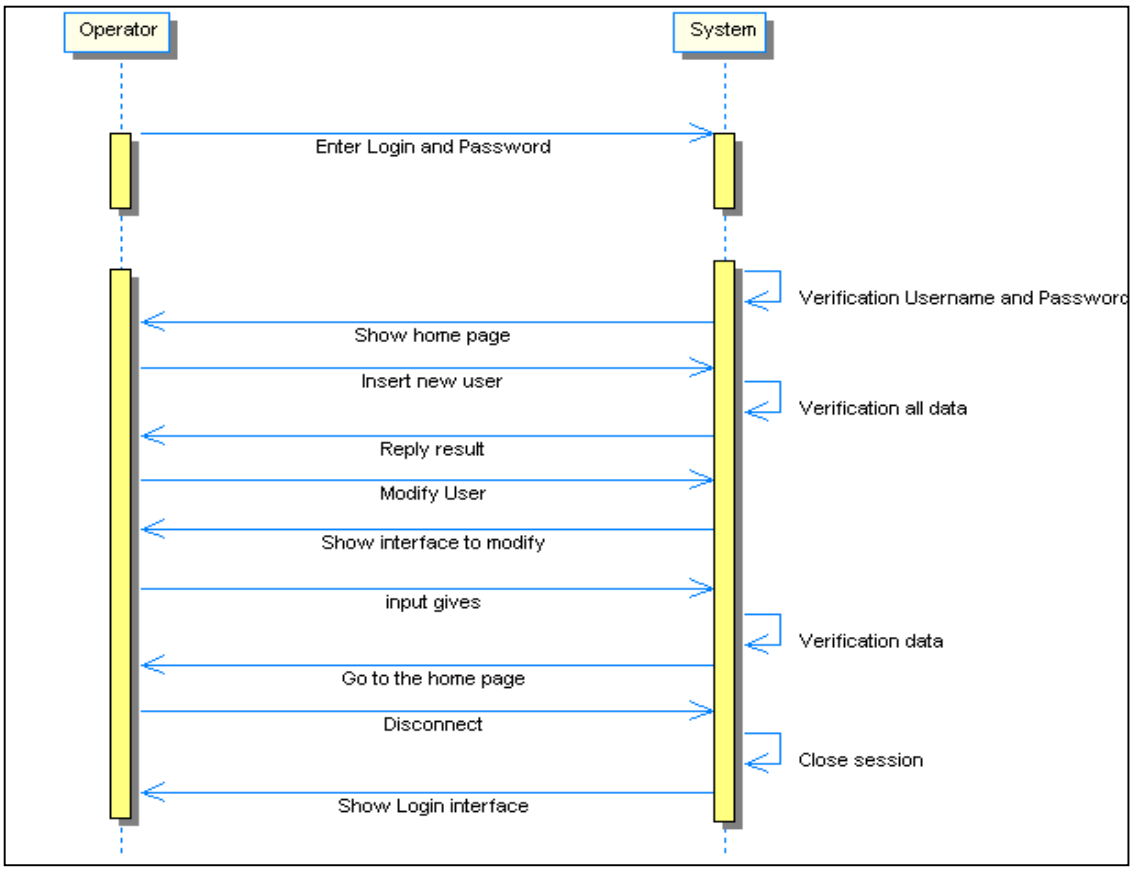

Figure 49: Sequence diagram/Login Operator

When a driver sends an alert following an event occurs on the road, the system temporarily records it, then the Operator deletes or process this event. If the operator performs an operation on the alert, the system automatically changes its status (see Figure 50).

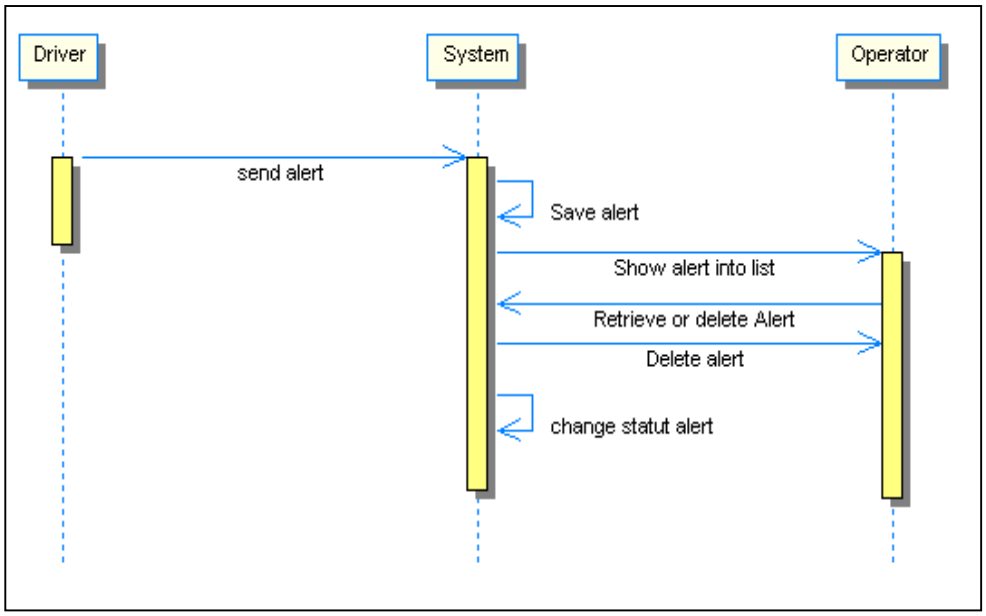

Figure 50: Sequence diagram / alert processing

To have access to the database, the user (mainly for administrator and operator) first provides her password and login username as depicted in Figure 51. If the login and Password are not correct, the message “Incorrect Login and Password” will be shows on the same interface.

Figure 51: General login interface for all users

After logging using the interface shown in Figure 52, the operator, for example, could perform her tasks such process alerts. For example, as shown in Figure 53, the operator could modify her information.

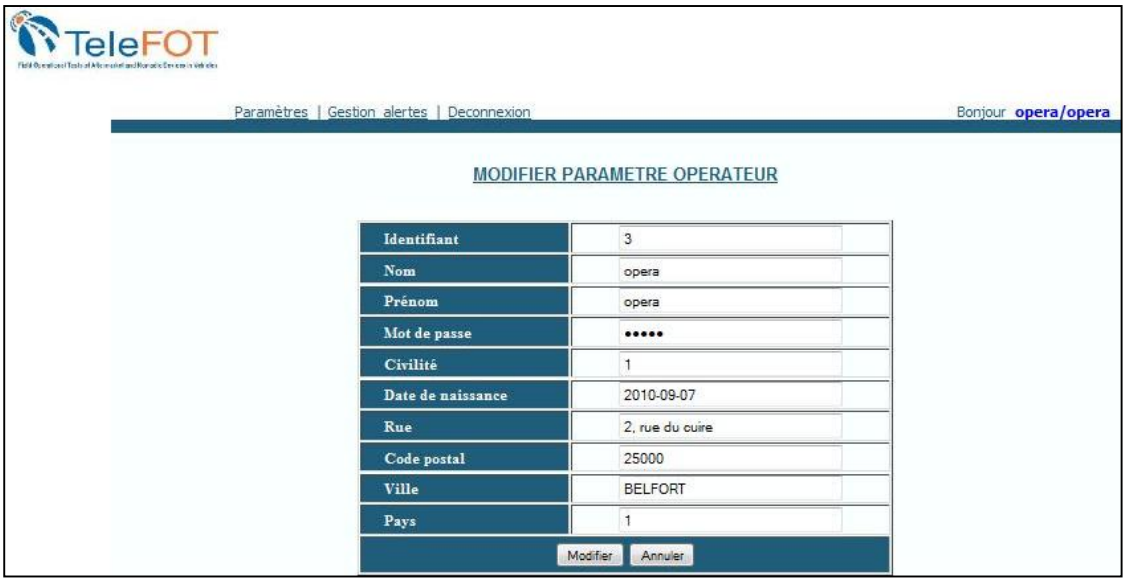

Figure 52: Login interface

Once some information is changed, a confirmation message is shown to allow the operator to validate the changes, as shown in Figure 53. The operator could also manage alerts by clicking on “Manage Alerts" from the menu. The interface consists of two parts (see Figure 54):

- A Google Map interface on which are placed all coordinates corresponding to the alerts whose status is "0" (all alerts not processed yet).
- An interface in which all the information about the alert itself, e.g. The person who issued the alert, the alert type, alert level, the address of the place where the alert has been issued, telephone number etc...

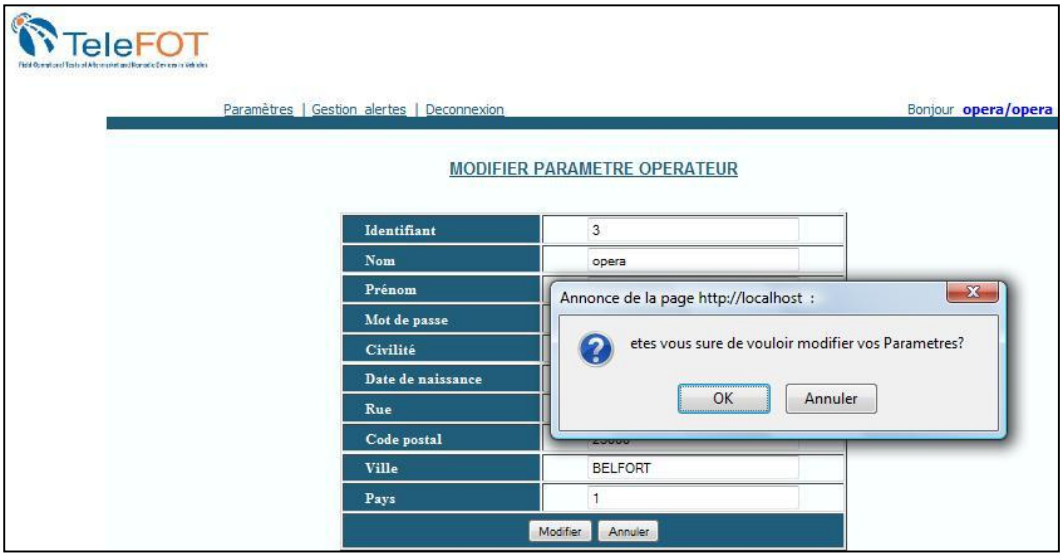

Figure 53: Login interface

Filtrer par niveau d'alerte Toutes

Adresse	Coordonnées GPS	Nom & Prénom	Téléphone	Type Alerte	Heure réception	Traiter
	47.73193058 6.7680895	Pablo Simier	0650891799	Accident avere	31-01-2012 à 14:43:31	
	47.73143501 6.76684402	Pablo Simier	0650891799	Chute de neige	31-01-2012 à 08:26:23	
	49.34407159 6.17927634	Jacqueline BENOIT	0663808013	Vent fort	30-12-2011 à 15:20:08	
	49.34407159 6.17927634	Jacqueline BENOIT	0663808013	Vent fort	30-12-2011 à 15:20:08	
	49.34407159 6.17927634	Jacqueline BENOIT	0663808013	Vent fort	30-12-2011 à 15:20:08	
	49.34153684 6.18150521	Jacqueline BENOIT	0663808013	Bouchons	30-12-2011 à 15:19:50	
	49.34153684 6.18150521	Jacqueline BENOIT	0663808013	Bouchons	30-12-2011 à 15:19:50	
	49.34153684 6.18150521	Jacqueline BENOIT	0663808013	Bouchons	30-12-2011 à 15:19:50	
	60.15458802 24.73203704	Mohamed Bakhouya	0642697310	Accident avere	30-03-2012 à 19:23:39	
	60.15458802 24.73203704	Mohamed Bakhouya-bis	0642697310	Accident avere	30-03-2012 à 19:23:39	
	60.15458802 24.73203704	Mohamed Bakhouya-bis	0642697310	Brouillard	30-03-2012 à 19:23:30	

Figure 54: Map view of alerts

On the table, information about alerts whose status is "0", i.e., not processed yet are shown. There three types of alerts represented by different colors as shown in the legend of the figure:

- Red: high level alerts (e.g., a person having an accident).
- Orange: medium level alerts (e.g., a person who saw an accident).
- Green: low-level alerts (e.g., when there is fog).

The operator can filter alerts by level as shown in Figure 55.

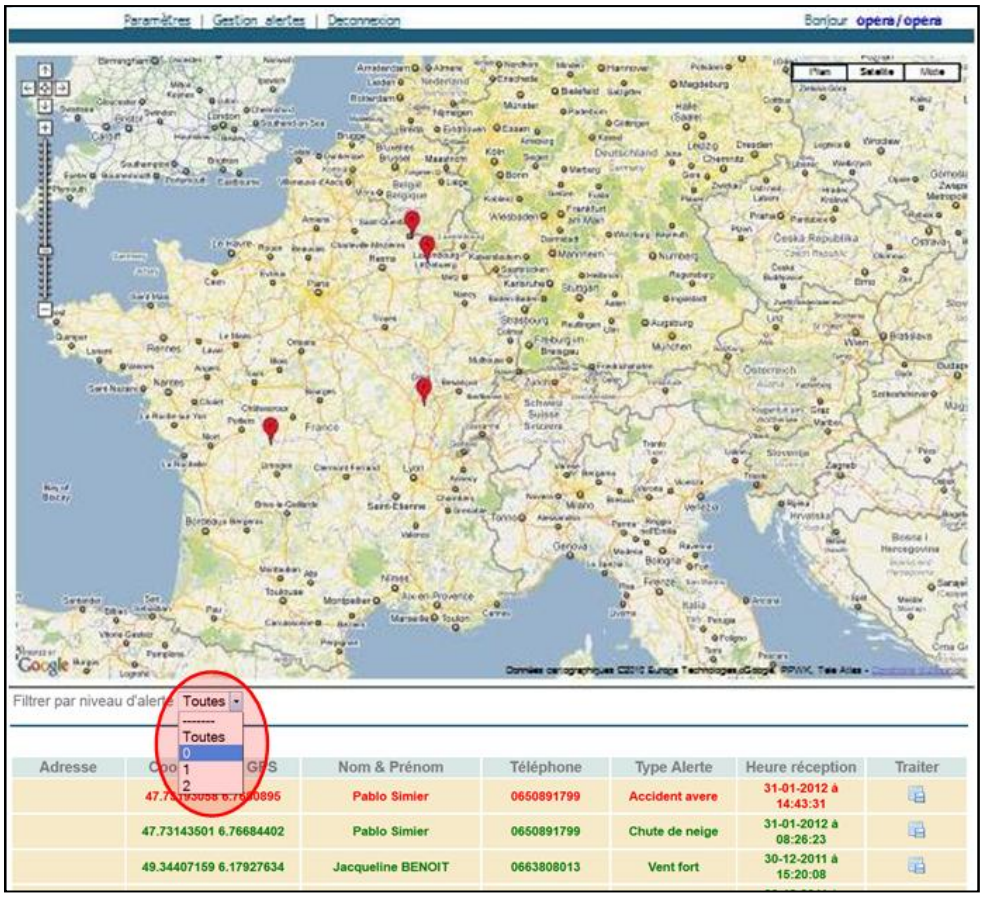

Figure 55: Filtering alerts by level

The operator can also check alerts information by clicking on as show on Google Map interface (see Figure 54). More information can be shown by clicking of the user name as described in Figure 56. The operator can process the alert by selecting and then add more information if necessary that will be registered on the database (see Figure 57).

Figure 56: Display user information

Figure 57: Add description of the alert

Several interfaces are provided to the administrator to perform her tasks: e.g. listing users (see Figure 58 for example for filtering alerts, or search alerts).

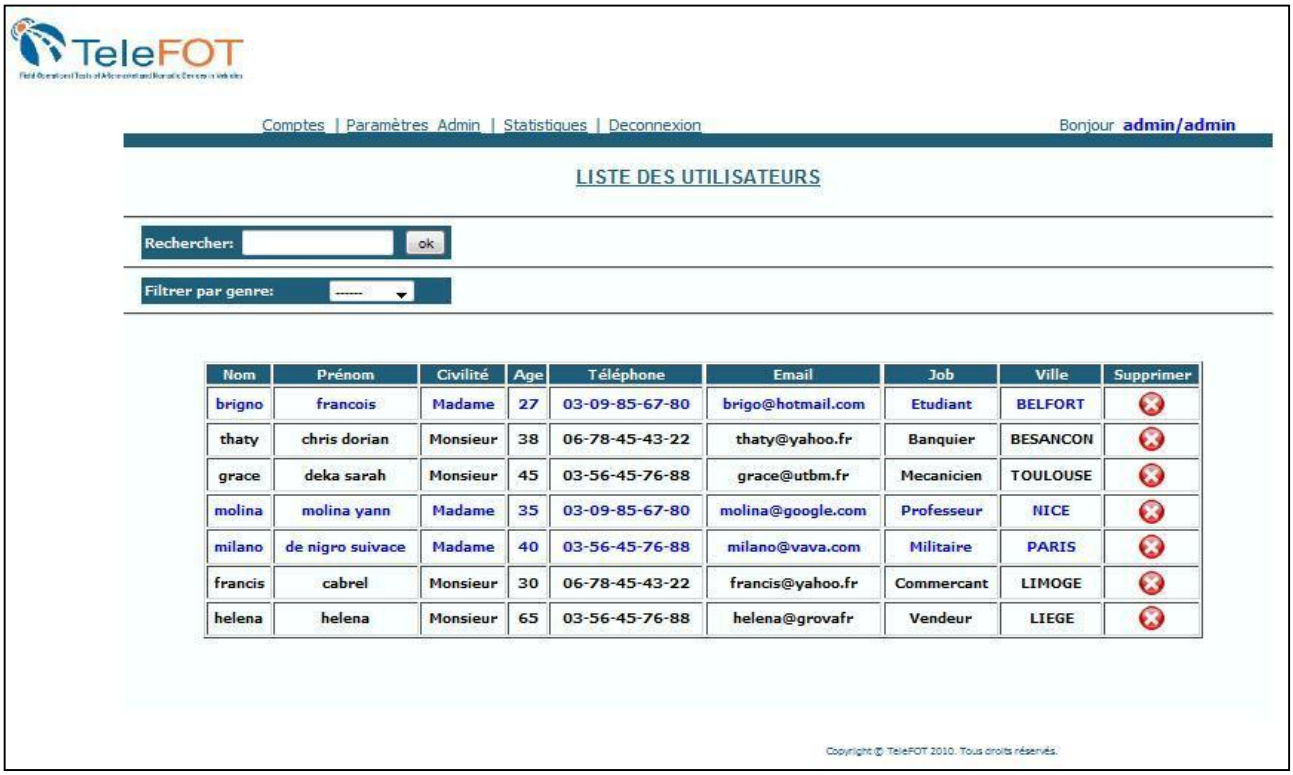

Figure 58: Filtering alerts by level

APPENDIX III: DATABASE DESCRIPTION

Table 11: Alert category table

Field name	Type	Value	Description
alert_category_id	Integer		
alert_category_name	String		Alert category name
alert_category_description	String		Alert category description
alertLevel	Integer	• 0 → Alert RTI • 1 → Incident • 2 → eCall	

Table 12: Alert table

Champ	Type	Value	Description
alert_id	Integer		
alert_category_id			Foreign key
nomadic_device_id	Integer		
user_id	Integer		The operator id
gps_coordinates	String		Latitude, longitude
recieved_time	datetime		
sent_time	datetime		
processing_time	datetime		
Speed	double		GPS speed
Automatic	Integer	0 or 1	1 for RTI Alerts and Incident and 0 for eCall
Statut	Integer	0 or 1	By default 0, once alert is handled, the value becomes 1.
Heading	Varchar		Direction e.g NE, SE.
Description	Varchar		Description of the alert

Table 13: Device type familiarity table

Champ	Type	Description
device_type_familiarity_id	Integer	
device_type	String	• Navigation device • Smartphone • PDA

Table 14: Driving license type table

Champ	Type	Description
driving_license_type_id	Integer	
driving_license_type_name	String	• motorcycle • light truck/lorry • heavy truck/lorry • bus • Nothing

Table 15: Driving place table

Champ	Type	Description
driving_place_id	Integer	
driving_place_name	String	• city traffic • rural road • highways/motorways • other roads

Table 16: Function familiarity table

Champ	Type	Description
device_type_familiarity_id	Integer	
device_type	String	• Navigation device • Smartphone • PDA

Table 17: Incident table

Champ	Type	Value	Description
incident_id	Integer		
user_id	Integer		
involved	Integer	• 1 → yes, where I had blame • 2 → yes, where I had no blame	
incident_number	Integer		
incident_place	String	• City • Rural road • …	
Consequence	Integer	• 1 → Minor damages to the vehicle(s) involved • 2 → Major damages to the vehicle(s) involved • 3 → Personal injuries • 4 → Personal injuries (major/death)	

Table 18: Nomadic device table

Champ	Type	Description
nomadic_device_id	Integer	
user_id	Integer	
Model	String	
serial_number	String	
Brand	String	

Table 19: Opinion degree table

Champ	Type	Value	Description
opinion_degree_id	Integer		
opinion_degree_name	String	• Opinion 1 • Opinion 2 • …	In the same order as the background questionnaire

Table 20: Speed limit place table

Champ	Type	Description
speed_limit_place_id	Integer	
Place	String	• residential roads • highways/motorways • overtaking other vehicles

Table 21: Transportation mode table

Champ	Type	Description
transportation_mode_id	Integer	
transportation_mode	String	• car • motorcycle/moped • bicycle • bus/tram/underground • train • walk

Table 22: User-Device type familiarity

Champ	Type	Value	Description
user_device_type_familiarity_id	Integer		
user_id	Integer		
device_type_familiarity_id	Integer		Foreign key → device type familiarity table
familiarity_level	Integer	• Not at all → 0 • I know what it is but never used it → 1 • Some use experience → 2 • Considerable use experience→ 3	As defined in the questionnaire

Table 23: User-Driving license type

Champ	Type	Description
user_driving_license_type_id	Integer	
user_id	Integer	
driving_license_type_id	Integer	Foreign key → driving license type table

Table 24: User-Driving time

Champ	Type	Description
user_driving_time_id	Integer	
user_id	Integer	
driving_place_id	Integer	Foreign key → driving place table
Propotion	Float	Driving time percent

Table 25: User-Function familiarity

Champ	Type	Value	Description
user_function_id	Integer		

user_id	Integer		
function_familiarity_id	Integer		Foreign key → function familiarity table
familiarity_level	Integer	• 1 → Never heard of it • 2 → I know what it is but never used it • 3 → Some use experience • 4 → Considerable use experience • 5 → Current use	
function_access	Integer	0 or 1	

Table 26: User-Opinion degree

Champ	Type	Value	Description
user_opinion_degree_id	Integer		
user_id	Integer		
opinion_degree_id	Integer		Foreign key → opinion degree table
Opinion	Integer	• 1 → strongly disagree • 2 → disagree • 3 → neither disagree, nor agree • 4 → agree • 5 → strongly agree	

Table 27: User-Speed limit place

Champ	Type	Value	Description
user_speed_limit_place_id	Integer		
user_id	Integer		
speed_limit_place_id	Integer		Foreign key → speed limit place table
Score	Integer	• 1 → never • 2 → rarely • 3 → sometimes • 4 → often • 5 → very often	

Table 28: User-Transportation mode

Champ	Type	Value	Description
user_transportation_mode_id	Integer		
user_id	Integer		
transportation_mode_id	Integer		Foreign key → transportation mode table
number_use	Integer	• 6 → never • 5 → 1 day/month or less • 4 → 2-3 days/month	

		• 3 → 1-2 days/week • 2 → 3-5 days/week • 1 → every day of the week
journey_type	Integer	• 6 → Not used • 5 → Holiday journeys • 4 → Journeys to/from leisure activities (hobby, sports, etc.) • 3 → Shopping journeys • 2 → Business related journeys (e.g. to/from business meetings, clients etc.) • 1 → Journeys to/from work or school
Season	Integer	• 1 → winter • 2 → summer

Table 29: Vehicle table

Champ	Type	Description
vehicle_id	Integer	
user_id	Integer	Owner of the vehicle
vehicle_type_id	Integer	Foreign key → vehicle type table
make	String	e.g. renault
model	String	e.g. Megane
year_release	Date	
utilisation	String	Other use of the vehicle

Table 30: Vehicle type table

Champ	Type	Description
vehicle_type_id	Integer	
type_description	String	• Personal • Professional charges comprises • Professional

Table 31: eCall benefits

Champ	Type	Value	Description
eCall_benefits_id	Integer		
eCall_benefits_label	String	Question 1 Question 2	In the same order than the questionnaire

Table 32: eCall service description

Champ	Type	Value
eCall_service_description_id	Integer	
Description	String	• Useful • Pleasant • Good • Satisfactory

• Efficient • Sympathetic • Assistance • Desirable • Increase alertness

Table 33: User-eCall benefits

Champ	Type	Value	Description
user_eCall_benefits_id	Integer		
user_id	Integer		
eCall_benefits_id	Integer		Foreign key → eCall benefits table
benefits_degree	Integer	1 → dramatically reduce 2 → decrease slightly 3 → no change 4 → increase slightly 5 → dramatically increase	

Table 34: User-eCall service description

Champ	Type	Value	Description
user-eCall_service_description_id	Integer		
user_id	Integer		
eCall_service_description_id	Integer		Foreign key → eCall service description table
service_level_percent	Integer	1 → 100% 2 → 75% 3 → 50% 4 → 25% 5 → 0%	

Table 35: User_table

Champ	Type	Value	Description
user_id	Integer		
first_name	String		
last_name	String		
Password	String		
Gender	Integer	0 for man 1 for woman	
birth_date	Integer		
Tel	String		
Fax	String		
Email	String		
Contract	String		The contract signed by the user will be scanned and stored in the database.
Job	String		

Street	String	
zip_code	Integer	
City	String	
country_id	Integer	
visual_aids	Integer	1 → yes, glasses 2 → yes, contact lenses 3 → no
hearing_aids	Integer	1 → yes 0 → no
driving_licence_date	Date	
average_driving_kilometres	Integer	1 → less than 10000 km/year 2 → 10001 to 20000 km/ year 3 → 20001 to 30000 km/ year 4 → 30001 to 50000 km/ year 5 → 50001 km/ year or more
driving_experience	Integer	1 → Very experienced driver 2 → Experienced driver 3 → Neither inexperienced, nor experienced 4 → Inexperienced driver 5 → Very inexperienced driver
driving_style	Integer	1 → Very defensive 2 → Defensive 3 → Balanced 4 → Offensive 5 → Very offensive
transportation_mode_satisfaction_degree	Integer	1 → Very dissatisfied 2 → Dissatisfied 3 → Neither dissatisfied, nor satisfied 4 → Satisfied 5 → Very satisfied
eCall_imidiate_reaction	Integer	1 → Very negative 2 → negative

		3 → indifferent 4 → positive 5 → very positive
eCall_advantages	Integer	1 → no advantage 2 → little advantage 3 → simple advantage 4 → big advantage 5 → very big advantage
eCall_easy_use	Integer	1 → very easy 2 → easy 3 → difficult 4 → very difficult 5 → i don't know
eCall_service_payement	Integer	1 → certainly not 2 → probably not 3 → may be cannot decide 4 → yes probably 5 → yes certainly
eCall_observation	String	
Price	Integer	1 → less than 1 euro 2 → 1 - 10 euros 3 → 11 - 50 euros 4 → 51 – 100 euros 5 → 101 - 150 euros 6 → more than 150 euros

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APPENDIX VI: ECALL QUESTIONNAIRES

Background questionnaire, finale version 2010-09-06

PARTICIPANT CODE

Country code (DE, GR, FI, FR, IT, ES, SE, UK)	FOT code (FOTXX)	Participant number (T/P/C000)

You gender ☐ man ☐ woman

You were born what year? _____

PRESENT CAR(S)

What is the make(s) of the car(s) that you normally drive?

Car #1			Car #2		
Make (e.g. Renault)	Model (e.g. Megane)	Year (e.g. 2009)	Make (e.g. Renault)	Model (e.g. Megane)	Year (e.g. 2009)

Car #1 is
☐ Privately owned
☐ Company owned without complementary fuel and service
☐ Company owned with complementary fuel and service
☐ Other:
_____

Car #2 is
☐ Privately owned
☐ Company owned without complementary fuel and service
☐ Company owned with complementary fuel and service
☐ Other:
_____

VISUAL AND/OR HEARING AIDS

Do you use any visual aid when driving? (choose all that apply)
☐ yes, glass
☐ yes, contact lenses
☐ no

Do you use any hearing aid when driving? (Please choose only one of the following)
☐ yes
☐ no

DRIVING EXPERIENCE

What year did you get your car driver's license? _____

Do you have a driver's license also for other types of vehicles? (Please choose all that apply)	☐ yes, motorcycle ☐ yes, light truck/lorry ☐ yes, heavy truck/lorry ☐ yes, bus ☐ no
In total, how many kilometers do you personally drive on average per year? (Include private as well as work related driving).	Please choose only one of the following: ☐ less than 10 000 kilometers/year ☐ 10 001-20 000 kilometers/year ☐ 20 001-30 000 kilometers/year ☐ 30 001-50 000 kilometers/year ☐ 50 001 kilometers/year or more
Estimate the proportion of time you drive in city traffic, on rural roads and on highways/motorways. (Take into account private as well as work related driving. The numbers should add up to 100)	city traffic _____ % rural roads _____ % highways/motorways _____ % other roads _____ % 100% of total driving time

How would you describe yourself in terms of driving experience? Please choose only one of the following:

☐ Very inexperienced driver	☐ Inexperienced driver	☐ Neither inexperienced, nor experienced	☐ Experienced driver	☐ Very experienced driver

YOUR DRIVING STYLE

How would you describe your driving style in general? as choose only one of the following:

☐ Very defensive	☐ Defensive	☐ Balanced	☐ Offensive	☐ Very offensive

How often do you …? Please choose the appropriate response for each ite,_

	Never	Rarely	Some-times	Often	Very often
Exceed the speed limit (by more than 10%) on residential roads	☐	☐	☐	☐	☐
Exceed the speed limit (by more than 10%) on highways/motorways	☐	☐	☐	☐	☐
Exceed the speed limit (by more than 10%) when overtaking other vehicles	☐	☐	☐	☐	☐

INCIDENTS AND ACCIDENTS

Have you - as a driver - been involved in a road traffic serious incident/accident during the last 3 years?

☐ yes, where I had some blaim ☐ yes, where I had no blaim ☐ no

If you have been involved in a serious traffic incident/accident, how many serious traffic incidents/accidents have you been involved in? _____

If you have been involved in a serious traffic incident/accident, where did the incidents/accidents occur? (Choose all that apply)

☐ In city traffic

☐ On rural road(s)

☐ On highway/motorway(s)

☐ Other types of roads. Which:

_____

If you have been involved in a serious traffic incident/accident, how severe were the consequences? (Choose all that apply)

☐ Minor damages to the vehicle(s) involved

☐ Major damages to the vehicle(s) involved

☐ Personal injuries (minor)

☐ Personal injuries (major/death)

USE OF TRANSPORTATION MODES

In wintertime, how often do you in general use each of the following modes of transportation? (Tick one box for each row. Choose the option that best describes your situation)

	Every day of the week	3-5 days per week	1-2 days per week	2-3 days/ month	1 day/ month or less	Never
Car	☐	☐	☐	☐	☐	☐
Motorcycle/moped	☐	☐	☐	☐	☐	☐
Bicycle	☐	☐	☐	☐	☐	☐
Bus/tram/underground	☐	☐	☐	☐	☐	☐
Train	☐	☐	☐	☐	☐	☐
Walk (whole trip)	☐	☐	☐	☐	☐	☐

In wintertime, for what types of journeys do you typically use the following modes of transportation? (Tick one or more boxes for each row)

	Journeys to/from work or school	Business related journeys (e.g. to/from business meetings, clients etc.)	Shopping journeys	Journeys to/from leisure activities (hobby, sports, etc.)	Holiday journeys	Not used
Car	☐	☐	☐	☐	☐	☐

Motorcycle/moped	☐	☐	☐	☐	☐	☐
Bicycle	☐	☐	☐	☐	☐	☐
Bus/tram/underground	☐	☐	☐	☐	☐	☐
Train	☐	☐	☐	☐	☐	☐
Walk (whole trip)	☐	☐	☐	☐	☐	☐

In summertime, how often do you in general use each of the following modes of transportation?
(Tick one box for each row. Choose the option that best describes your situation)

	Every day of the week	3-5 days per week	1-2 days per week	2-3 days/ month	1 day/ month or less	Never
Car	☐	☐	☐	☐	☐	☐
Motorcycle/moped	☐	☐	☐	☐	☐	☐
Bicycle	☐	☐	☐	☐	☐	☐
Bus/tram/underground	☐	☐	☐	☐	☐	☐
Train	☐	☐	☐	☐	☐	☐
Walk (whole trip)	☐	☐	☐	☐	☐	☐

In summertime, for what types of journeys do you typically use the following modes of transportation? (Tick one or more boxes for each row)

	Journeys to/from work or school	Business related journeys (e.g. to/from business meetings, clients etc.)	Shopping journeys	Journeys to/from leisure activities (hobby, sports, etc.)	Holiday journeys	Not used
Car	☐	☐	☐	☐	☐	☐
Motorcycle/moped	☐	☐	☐	☐	☐	☐
Bicycle	☐	☐	☐	☐	☐	☐
Bus/tram/underground	☐	☐	☐	☐	☐	☐
Train	☐	☐	☐	☐	☐	☐
Walk (whole trip)	☐	☐	☐	☐	☐	☐

How satisfied are you with the modes of transportation that you presently use?

☐ Very dissatisfied ☐ Dissatisfied ☐ Neither dissatisfied, nor satisfied ☐ Satisfied ☐ Very satisfied

DEVICES AND FUNCTIONS

Please indicate how familiar you are with the following types of, so called, 'handheld wireless devices'?

	Not at all	I know what it is but never	Some use experience	Considerable use experience

		used it		
Navigation device (personal navigation device, GPS navigation device)	☐	☐	☐	☐
Smartphone (an advanced mobile phone with computer-like functionality, e.g. the possibility to browse the internet, iPhone)	☐	☐	☐	☐
PDA (personal digital assistant, e.g. Palm Pilot)	☐	☐	☐	☐

Please indicate how familiar you are with using the following functions/services on a 'handheld wireless device' (such as a PDA, navigator or smartphone) or an 'aftermarket device'?

	Never heard of it	I know what it is but never used it	Some use experience	Considerable use experience
Traffic information (real-time info about the status of the traffic system, including road works, queues, accidents, etc.)	☐	☐	☐	☐
Dynamic navigation support (route guidance with real time info on the status of the traffic system)	☐	☐	☐	☐
Static navigation support (route guidance without real time traffic info)	☐	☐	☐	☐
Speed limit information (displays speed limit and vehicle speed)	☐	☐	☐	☐
Speed limit alert (warns when the speed limit is exceeded)	☐	☐	☐	☐
Speed camera alert (warns when approaching a potential speed camera location)	☐	☐	☐	☐
Green driving support (eco-driving)	☐	☐	☐	☐
eCall (wireless automatic emergency call)	☐	☐	☐	☐
Forward Collision Warning (FCW, monitor the roadway in front of your vehicle and warns in case of risk for collision)	☐	☐	☐	☐
Adaptive Cruise Control (ACC, automatically adapts and maintains the speed of your vehicle in relation to the vehicle in front)	☐	☐	☐	☐
Lane Departure Warning (LDW, warns when the vehicle begins to move out of its lane without the use of the indicator)	☐	☐	☐	☐
Lane Keeping Assistance (make minor steering corrections if the vehicle makes a lane departure without the use of the indicator)	☐	☐	☐	☐

Do you at present have access to any of the following functions?

	Yes	No

Traffic information (real-time info about the status of the traffic system, including road works, queues, accidents, etc.)	☐	☐
Dynamic navigation support (route guidance with real time info on the status of the traffic system)	☐	☐
Static navigation support (route guidance without real time traffic info)	☐	☐
Speed limit information (displays speed limit and vehicle speed)	☐	☐
Speed limit alert (warns when the speed limit is exceeded)	☐	☐
Speed camera alert (warns when approaching a potential speed camera location)	☐	☐
Green driving support (eco-driving)	☐	☐
Traffic information (real-time info about the status of the traffic system, including road works, queues, accidents, etc.)	☐	☐
eCall (wireless automatic emergency call)	☐	☐
Forward Collision Warning (FCW, monitor the roadway in front of your vehicle warns in case of risk for collision)	☐	☐
Adaptive Cruise Control (ACC, automatically adapts and maintains the speed of your vehicle to the vehicle in front)	☐	☐
Lane Departure Warning (LDW, warns when the vehicle begins to move out of its lane without the use of a turn signal)	☐	☐
Lane Keeping Assistance (make minor steering corrections if the vehicle makes a lane departure without the use of a turn signal)	☐	☐

OPINIONS

Indicate to what degree you personally agree with the following statements.

	Strongly disagree	Disagree	Neither disagree, nor agree	Agree	Strongly agree
Traffic congestion is a serious problem from an environmental point of view	☐	☐	☐	☐	☐
Driving my own car is too convenient to give up for the sake of the environment	☐	☐	☐	☐	☐
I would reduce my car use if traffic congestion increased further	☐	☐	☐	☐	☐
Technical development will play an important part in solving any risks associated with driving	☐	☐	☐	☐	☐
I feel safe when driving a car	☐	☐	☐	☐	☐

The emissions from private cars are one of the causes of global warming	☐	☐	☐	☐	☐
People should try to limit their car use for the sake of the environment	☐	☐	☐	☐	☐
I would reduce my car use if the cost associated with driving increased further	☐	☐	☐	☐	☐
New technology plays an important role in solving the problem of traffic congestion	☐	☐	☐	☐	☐
I would reduce my car use if the cost for travelling by public transport decreased	☐	☐	☐	☐	☐
New technology plays an important role in solving the negative environmental impact of car use	☐	☐	☐	☐	☐

eCall before, final version 2010-09-30

Participant code

Country code (FR) FOT code (FOTXX) Participant number (T/P/C000)

1. What is your immediate reaction to the eCall Service?

Very negative	*Negative*	*Neutral*	*Positive*	*Very positive*
☐	☐	☐	☐	☐

2. How do you judge the potential benefit of having access to this eCall Service yourself?

No benefit	*Small benefit*	*Moderate benefit*	*Large benefit*	*Very large benefit*
☐	☐	☐	☐	☐

3. To what degree do you, based on your present knowledge, trust the eCall Service to provide the support intended?

Not at all	*To a small degree*	*To a moderate degree*	*To a large degree*	*Completely*
☐	☐	☐	☐	☐

4. Do you think that any of the following will change with your access to the eCall Service? (tick one response per row)

	Will radically decrease	*Will decrease slightly*	*No change*	*Will increase slightly*	*Will radically increase*
Your safety when driving?	☐	☐	☐	☐	☐
Your possibilities to choose the optimal route according to your preferences (e.g. shortest, quickest)?	☐	☐	☐	☐	☐
Your stress associated with travelling?	☐	☐	☐	☐	☐
The time it takes you to reach your destinations?	☐	☐	☐	☐	☐
Your fuel consumption?	☐	☐	☐	☐	☐
Your compliance with speed regulations?	☐	☐	☐	☐	☐
The number of journeys you make by car?	☐	☐	☐	☐	☐
The number of journeys you make by public transport?	☐	☐	☐	☐	☐
The distance you cover to reach your destinations?	☐	☐	☐	☐	☐
Your use of highways/ Motorways	☐	☐	☐	☐	☐
Your use of rural roads	☐	☐	☐	☐	☐

Your comfort when travelling	☐	☐	☐	☐	☐
Your time driving without taking a break	☐	☐	☐	☐	☐

5. Based on your present impression of the eCall Service?

	-2	-1	0	+1	+2	
Useful	☐	☐	☐	☐	☐	*Useless*
Pleasant	☐	☐	☐	☐	☐	*Unpleasant*
Bad	☐	☐	☐	☐	☐	*Good*
Satisfying	☐	☐	☐	☐	☐	*Disappointing*
Effective	☐	☐	☐	☐	☐	*Ineffective*
Irritating	☐	☐	☐	☐	☐	*Likeable*
Assisting	☐	☐	☐	☐	☐	*Obstructing*
Undesirable	☐	☐	☐	☐	☐	*Desirable*
Raising alertness	☐	☐	☐	☐	☐	*Sleep-inducing*

6. Based on your present impression of the eCall Service would you consider paying to get access to it?

No, definitely not	*No, probably not*	*Perhaps, cannot decide*	*Yes, probably*	*Yes, definitely*
☐	☐	☐	☐	☐

7. If you consider paying for access to the eCall Service?

☐ 1-10 EURO
☐ 11-25 EURO
☐ 26-50 EURO
☐ 51-100 EURO
☐ More than 100 EURO

8. Additional comments on the eCall Service

_____

_____

_____

eCall during, final version 2010-09-30

Participant code

Country code (FR)	FOT code (FOTXX)	Participant number (T/P/C000)

1a. To what extent have you used the eCall service in relation to your number of car journeys?

☐ *Never*
☐ *Less than 25% of the total number of journeys*
☐ *Between 25 and 75% of the total number of journeys*
☐ *More than 75% of the total number of journeys*
☐ *Always, for all journeys made*

1b. If you have used the eCall system for some journeys only, are these a particular type of journeys? (several options possible)

☐ *No*
☐ *Yes, when the route/destination has been unfamiliar*
☐ *Yes, when there has been a time pressure*
☐ *Yes, when congestion has been expected*
☐ *Yes, when the journey has involved many changes between different modes of transport*
☐ *Yes, other*: _____

2. What is your present reaction to the eCall service?

Very negative	*Negative*	*Neutral*	*Positive*	*Very positive*
☐	☐	☐	☐	☐

3. How do you now judge the potential benefit of having access to this eCall System yourself?

No benefit	*Small benefit*	*Moderate benefit*	*Large benefit*	*Very large benefit*
☐	☐	☐	☐	☐

4. To what degree do you, based on your present knowledge, trust the eCall System to provide you with accurate information?

Not at all	*To a small degree*	*To a moderate degree*	*To a large degree*	*Completely*
☐	☐	☐	☐	☐

5. Do you think that any of the following has changed as a result of your access to the eCall System)? (tick one response per row)

	Has radically decreased	*Has decreased slightly*	*No change*	*Has increased slightly*	*Has radically increased*
Your safety when driving?	☐	☐	☐	☐	☐
Your possibilities to choose the optimal route according to your preferences (e.g. shortest, quickest)?	☐	☐	☐	☐	☐
Your stress associated with travelling?	☐	☐	☐	☐	☐
The time it takes you to	☐	☐	☐	☐	☐

reach your destinations?					
Your fuel consumption?	☐	☐	☐	☐	☐
Your compliance with speed regulations?	☐	☐	☐	☐	☐
The number of journeys you make by car?	☐	☐	☐	☐	☐
The number of journeys you make by public transport?	☐	☐	☐	☐	☐
The distance you cover to reach your destinations?	☐	☐	☐	☐	☐
Your use of highways/ Motorways	☐	☐	☐	☐	☐
Your use of rural roads	☐	☐	☐	☐	☐
Your comfort when travelling	☐	☐	☐	☐	☐
Your time driving without taking a break	☐	☐	☐	☐	☐
Your driving (i.e. number of journeys and/ distances) in adverse weather conditions	☐	☐	☐	☐	☐
Your driving (i.e. number of journeys and/ distances) in the dark	☐	☐	☐	☐	☐

6. Based on your present impression of the eCall System, how would you describe it? (Indicate on the scale, tick one response per row)

Useful	☐	☐	☐	☐	☐	*Useless*
Pleasant	☐	☐	☐	☐	☐	*Unpleasant*
Bad	☐	☐	☐	☐	☐	*Good*
Satisfying	☐	☐	☐	☐	☐	*Disappointing*
Effective	☐	☐	☐	☐	☐	*Ineffective*
Irritating	☐	☐	☐	☐	☐	*Likeable*
Assisting	☐	☐	☐	☐	☐	*Obstructing*
Undesirable	☐	☐	☐	☐	☐	*Desirable*
Raising alertness	☐	☐	☐	☐	☐	*Sleep-inducing*

7. Based on your present impression of the eCall System, would you consider keeping it when the test is completed (without any charge)?

No, definitely not	*No, probably not*	*Perhaps, cannot decide*	*Yes, probably*	*Yes, definitely*
☐	☐	☐	☐	☐

8. Based on your present impression of the eCall System would you consider paying to get access to it?

No, definitely not	*No, probably not*	*Perhaps, cannot decide*	*Yes, probably*	*Yes, definitely*
☐	☐	☐	☐	☐

9. If you consider paying for access to the eCall System, how much would this access be worth, to you, per month?

☐ 1-10 EURO (*current exchange rate approx. 1EURO=10SEK, 1EURO=1GBP*)
☐ 11-25 EURO
☐ 26-50 EURO
☐ 51-100 EURO
☐ More than 100 EURO

10. Additional comments on your impressions and thoughts regarding the Traffic Information System (change to the name of the Traffic Information System tested):

eCall after, final version 2010-09-30

Participant code

Country code (FR) FOT code (XXX) Participant number (000000)

1a. To what extent have you used the eCall service in relation to your number of car journeys?

☐ *Never*
☐ *Less than 25% of the total number of car journeys*
☐ *Between 25 and 75% of the total number of car journeys*
☐ *More than 75% of the total number of car journeys*
☐ *Always, for all car journeys made*

1b. If you have used the eCall system for some car journeys only, are these a particular type of journeys? (tick all that apply)

☐ *No*
☐ *Yes, when the route/destination has been unfamiliar*
☐ *Yes, when there has been a time pressure*
☐ *Yes, when congestion has been expected*
☐ *Yes, when the journey has involved many changes between different modes of transport*
☐ *Yes, for longer journeys*
☐ *Yes, for journeys on rural roads*
☐ *Yes, for journeys on highways motorways*
☐ *Yes, other*: _____

1c. How would you describe your usage of the eCall service? (tick one)

☐ *I have only used it for private journeys*
☐ *I have primarily used it for private journeys*
☐ *I have used it for both private and work-related journeys equally*
☐ *I have primarily used it for work-related journeys*
☐ *I have only used it for work-related journeys only*

2. What is your present reaction to the eCall service?

Very negative	*Negative*	*Neutral*	*Positive*	*Very positive*
☐	☐	☐	☐	☐

3a. Has your impression of the eCall service changed during the course of the test?

Considerably more negative now	*Somewhat more negative now*	*Unchanged*	*Somewhat more positive now*	*Considerably more positive now*
☐	☐	☐	☐	☐

If your impression is unchanged ➔ Go directly to question 4.
If your impression is somewhat or considerably more negative ➔ Go to questions 3b.
If your impression is somewhat or considerably more positive ➔ Go to questions 3d.

3b. If your impression is somewhat or considerably more negative, what are the reasons for this change in impression? (Tick all that apply)

☐ *convenience (poor access to information)*
☐ *efficiency (little or no effect on travel times, no effect on exposure to traffic disturbances/traffic jams, etc.)*
☐ *safety (safety risk, attention drawing)*
☐ *reliability (incorrect/unreliable information, poor advice)*
☐ *usability (function difficult to access and use, poor user interface)*
☐ *other*: _____

3c. If possible, please elaborate on your reasons:

_____
_____
_____
_____
_____

3d. If your impression is somewhat or considerably more positive, what what are the reasons for this change in impression? (tick all that apply)

☐ *convenience (easy access to information)*
☐ *efficiency (positive effect on travel times, reduction in exposure to traffic disturbances/traffic jams, etc.)*
☐ *safety (more confident driving, less irritation due to traffic jams and traffic disturbances, etc.)*
☐ *reliability (correct and reliable information, good advice)*
☐ *usability (function easy to use, good user interface)*
☐ *other*: _____

3e. If possible, please elaborate on your reasons:

_____
_____
_____
_____
_____

4a. How do you <u>now</u> judge the benefit(s) of having access to the eCall service?

No benefit	*Small benefit*	*Moderate benefit*	*Large benefit*	*Very large benefit*
☐	☐	☐	☐	☐

If no benefit ➜ Go directly to question 5.
If some benefit ➜ Go to question 4b.

4b. If you have perceived any benefit(s), what are they? (tick all that apply)

☐ *convenience (easy access to information before and/or during journey)*
☐ *economic (less cost due to e.g. less fuel consumption as less time spend in traffic congestion/traffic jams etc.)*

☐ *environmental (e.g. less emissions due to less fuels consumption, less time spend in traffic congestion/traffic jams, etc.)*
☐ *safety (e.g. more confident driving, less irritation)*
☐ *travel comfort (e.g. being able to plan ahead, being able to avoid undesirable traffic situations)*
☐ *other:* _____

4c. If possible, please elaborate:

_____

_____

_____

5. To what degree do you perceive that the eCall has provided you with accurate information?

Not at all	*To a small degree*	*To a moderate degree*	*To a large degree*	*Completely*
☐	☐	☐	☐	☐

6. Did using the eCall service result in any of the following situations?

	Never	*Very rarely*	*Rarely*	*Occasionally*	*Frequently*
Difficulty positioning the vehicle with respect to lane	☐	☐	☐	☐	☐
Unintentional decrease of speed	☐	☐	☐	☐	☐
Unintentional increase of speed	☐	☐	☐	☐	☐
The distance to a vehicle ahead got smaller than acceptable	☐	☐	☐	☐	☐
Late detection of another vehicle or obstacle	☐	☐	☐	☐	☐
Choice of other route than you would normally have chosen?	☐	☐	☐	☐	☐

7. Do you find that any of the following has changed due to your access to the eCall service

	Has radically decreased	*Has decreased slightly*	*No change*	*Has increased slightly*	*Has radically increased*
Your safety when driving?	☐	☐	☐	☐	☐
Your possibilities to choose the optimal route according to your preferences (e.g. shortest, quickest, etc.)?	☐	☐	☐	☐	☐
Your stress associated with travelling?	☐	☐	☐	☐	☐
The time it takes you to reach your destinations?	☐	☐	☐	☐	☐
Your fuel consumption?	☐	☐	☐	☐	☐
Your compliance with speed regulations?	☐	☐	☐	☐	☐
The number of journeys you make by car?	☐	☐	☐	☐	☐

The number of journeys you make by public transport?	☐	☐	☐	☐	☐
The distance you cover to reach your destinations?	☐	☐	☐	☐	☐
Your use of highways/motorways?	☐	☐	☐	☐	☐
Your use of rural roads?	☐	☐	☐	☐	☐
Your comfort when travelling?	☐	☐	☐	☐	☐
Your time driving without taking a break?	☐	☐	☐	☐	☐
Your driving in adverse weather conditions (such as fog, rain, snow, etc.)?	☐	☐	☐	☐	☐
Your driving in the dark?	☐	☐	☐	☐	☐
You delays when travelling?	☐	☐	☐	☐	☐
Your getting stuck in traffic jams?	☐	☐	☐	☐	☐
Your feeling of uncertainty when travelling (e.g. regarding fining route, destination, being on time etc.)?	☐	☐	☐	☐	☐

8. What is your opinion of the design of the device (i.e. the physical device) through which you get access to the eCall service?

	Strongly disagree	*Disagree*	*Neither agree or disagree*	*Agree*	*Strongly agree*	Not applicable
The device was easy to carry around	☐	☐	☐	☐	☐	☐
The device was easy to transfer in/out of the vehicle	☐	☐	☐	☐	☐	☐
The device had an attractive design	☐	☐	☐	☐	☐	☐
The quality of the screen/display was high (e.g. no glare, no reflections, strong enough backlight)	☐	☐	☐	☐	☐	☐
The size of the screen was appropriate	☐	☐	☐	☐	☐	☐
The design of the device matched the interior of my car	☐	☐	☐	☐	☐	☐

9. What are your opinions regarding the design of the user interface and the dialogue through which you get access to the eCall service (change to the name of the Traffic Information Service tested)?

	Strongly disagree	*Disagree*	*Neither agree or disagree*	*Agree*	*Strongly agree*	Not applicable
Installation and setup were easy	☐	☐	☐	☐	☐	☐
The instruction/manual was helpful	☐	☐	☐	☐	☐	☐
Learning how to use the device was easy	☐	☐	☐	☐	☐	☐

The text on the screen was easy to read (big enough letters, good contrast)	☐	☐	☐	☐	☐	☐
The symbols/icons on the screen were easy to see (big enough, good contrast)	☐	☐	☐	☐	☐	☐
The meaning of symbols/icons was easy to understand	☐	☐	☐	☐	☐	☐
The user interface was easy to control with whilst stationary (e.g. enter information, press buttons, etc.)	☐	☐	☐	☐	☐	☐
The user interface was easy to control with whilst driving (e.g. enter information, press buttons, etc.)	☐	☐	☐	☐	☐	☐
The system responded quickly to my input	☐	☐	☐	☐	☐	☐
I could easily understand and act on the information provided	☐	☐	☐	☐	☐	☐
The amount of information presented on the screen was not too little, not too much	☐	☐	☐	☐	☐	☐
The help function was useful	☐	☐	☐	☐	☐	☐
Error messages were useful	☐	☐	☐	☐	☐	☐

10. Based on your present impression of the eCall service how would you describe it? (Indicate on the scale, tick one response per row)

Useful	☐	☐	☐	☐	☐	*Useless*
Pleasant	☐	☐	☐	☐	☐	*Unpleasant*
Bad	☐	☐	☐	☐	☐	*Good*
Satisfying	☐	☐	☐	☐	☐	*Disappointing*
Effective	☐	☐	☐	☐	☐	*Ineffective*
Irritating	☐	☐	☐	☐	☐	*Likeable*

Assisting	☐	☐	☐	☐	☐	*Obstructing*
Undesirable	☐	☐	☐	☐	☐	*Desirable*
Raising alertness	☐	☐	☐	☐	☐	*Sleep-inducing*

11. Based on your present impression of the eCall service would you consider keeping it for future usage (without any charge)?

No, definitely not	*No, probably not*	*Perhaps, cannot decide*	*Yes, probably*	*Yes, definitely*
☐	☐	☐	☐	☐

12. Based on your present impression of the Traffic Information Service would you consider paying to get access to it?

No, definitely not	*No, probably not*	*Perhaps, cannot decide*	*Yes, probably*	*Yes, definitely*
☐	☐	☐	☐	☐

13. If you consider paying for access to the eCall service, how much would this access be worth, to you, per month?

☐ 1-10 EURO (*current exchange rate approx. 1EURO=10SEK, 1EURO=1GBP*)
☐ 11-25 EURO
☐ 26-50 EURO
☐ 51-100 EURO
☐ more than 100 EURO

14. Indicate to what degree you personally agree with the following statements.

	Strongly disagree	*Disagree*	*Neither agree or disagree*	*Agree*	*Strongly agree*
Traffic congestion is a serious problem from an environmental point of view	☐	☐	☐	☐	☐
Driving my own car is too convenient to give up for the sake of the environment	☐	☐	☐	☐	☐
I would reduce my car use if traffic congestion increased further	☐	☐	☐	☐	☐
Technical development will play an important part in solving any risks associated with driving	☐	☐	☐	☐	☐
I feel safe when driving a car	☐	☐	☐	☐	☐
The emissions from private cars are one of the causes of global warming	☐	☐	☐	☐	☐
People should try to limit their car use for the sake of the	☐	☐	☐	☐	☐

environment					
I would reduce my car use if the cost associated with driving increased further	☐	☐	☐	☐	☐
New technology plays an important role in solving the problem of traffic congestion	☐	☐	☐	☐	☐
I would reduce my car use if the cost for travelling by public transport decreased	☐	☐	☐	☐	☐
New technology plays an important role in solving the negative environmental impact of car use	☐	☐	☐	☐	☐

15. Additional comments on the eCall service: